

**Communicating Climate Change In
Internet Discussion Fora: Processes and Implications**

Po-Han Hsu

A Thesis submitted for the degree of Doctor of Philosophy

School of Environmental Science

University of East Anglia, UK

February 2014

©This copy of the thesis has been supplied on condition that anyone who consults it is understood to recognise that its copyright rests with the author and that use of any information derived there-from must be in accordance with current UK Copyright Law. In addition, any quotation or extract must include full attribution.



UEA E-THESES DEPOSIT AGREEMENT

Applicable only to students depositing an e-thesis of their final approved thesis
(See <http://www.uea.ac.uk/is/etheses> for more information about e-theses)

Non-Exclusive Rights

Rights granted to the UEA Thesis Repository through this agreement are entirely non-exclusive. I am free to publish the Work in its present version or future versions elsewhere and no ownership is assumed by the repository when storing the work.

Permissions given to the repository

The UEA E-Theses Repository administrators may, without changing content, translate the Work to any medium or format for the purpose of future preservation and accessibility.

I understand that work deposited in the UEA E-Theses Repository will be accessible to a wide variety of people and institutions - including automated agents - via the World Wide Web and that an electronic copy of my thesis may also be included in the UK Electronic Theses Online Service (EThOS).

I understand that the UEA E-Theses Repository reserves the right to remove the Work for any professional, administrative or legal reason. Equally, I may request the Work is removed at any point in the future.

I understand that once the Work is deposited, a citation to the Work will always remain visible, although the author retains the right to update the Work.

Depositors Declaration

I agree as follows:

That I have the authority of the authors to make this agreement and to hereby give the UEA E-Theses Repository administrators the right to make available the Work in the way described above.

That I have exercised reasonable care to ensure that the Work is original, and does not to the best of my knowledge break any UK law or infringe any third party's copyright or other Intellectual Property Right, or other rights whatsoever.

That the disc or memory stick deposited with the Learning, Teaching and Quality Office contains a readable file of your thesis that is the same in all respects as the final approved and accepted print copy.

The administrators of the UEA E-Theses Repository do not hold any obligation to take legal action on behalf of the Depositor, or other rights holders, in the event of breach of intellectual property rights, or any other right, in the material deposited.

Disclaimer

While every care will be taken to preserve the Work, the UEA E-Theses Repository is not liable for loss or damage to the Work or other data while it is stored within the repository.

Definition & terms

In this licence document:

'Work': means the thesis or material being deposited including abstract, text, images and related data.

Signed (candidate) 許博涵 Po-Han Hsu Date: 26th, Feb, 2014
Candidate's name (BLOCK CAPITALS) PO-HAN HSU Reg No: 3812375

Abstract

Communicating climate change issues in the Internet era requires new strategies that incorporate online communication. The rapid growth of new media and widespread use of the internet has marked everyday lifestyles in modern society. Information on a wide range of social issues, including climate change, is disseminated and debated through online discussions in internet fora.

In this research, communication on internet fora and other potential forms of online social interaction are explored, to identify ways to enhance climate change communication on the Internet. The thesis raises three research questions to explore the communication context of internet fora discussion, namely: what are characteristics of the communication process on internet fora? Who is involved in the communication process? What influences do these online communication activities have on users' everyday activities? The research applies a mixed-methods approach of analysing the usage of Internet fora and the contents of fora communication activities to explore these questions. This includes qualitative reviews of topic-thread discussions to reveal users' roles in discussions, as well as surveys of fora users. It is argued that with increasing levels of interaction among communicators (people who post or reply to articles in order to express or respond ideas) on internet fora, these communicators are mobilised to join the online discussion process, competing for opinion leadership. The online discussions further contribute to the formation of opinions on climate change, as climate change and related issues are discussed. The thesis thereby aims to contribute to the development of effective approaches for opinion formation and climate change communication online, and to encourage individuals to discuss changing behaviour patterns and public engagement of greenhouse gas reduction actions.

Acknowledgements

I would like to specially thank those people without whom this work would not have been possible. For their advice, support, friendship, and superior editing skills, I thank my supervisors, Irene Lorenzoni, Peter Simmons, and Lorraine Whitmarsh. Having had their input, support and valuable suggestions, I have precious memories at the University of East Anglia. For guidance in my development and taking care of my family, I thank the faculty of Dean of Students' Office. I especially thank and give my gratitude to The Leverhulme Trust, who sponsored this research project for three years.

For the kind assistance of collecting contents and statistics from four fora, I specially thank the Administrators of Climate Concern in Yahoo! Groups, OurPlanet / EarthDay on MySpace.com, the forum on the Transition Town Movement Website, and LocalSustUK in Yahoo! Groups.

For instilling in me a respect for education and a determination to always finish what I start, I thank my grandmother Hsu-Hon Wo-Xi, who guided me since I was very young and supported my growth until her last day. I thank my mother Hsu-Yeh Shuan Bao, who told me, “do what you love and the money will come” together with my grandmother. I particularly thank my wife Wen-Chi Shih, who also dedicated to support our family in every aspect, taking care of me and our angel, Ruei-Cen Hsu, and keeping my spirits high. I also thank my family’s unending words of encouragement and support.

A dissertation is a labour of love shared by many. For their friendship, encouragement, and frequent assistance, I owe a debt to Professor Xin-Jun Wang at Fudan University, Mr. Henry, Dr. Zhou, and all those who continue to encourage me and support my work in finishing the PhD thesis. Thank you also to all friends who have supported me.

Table of Contents

Abstract	1
Acknowledgements	2
Chapter 1 Introduction	8
1-1. Communicating Climate Change in Internet Media.....	8
1-2. Research Context.....	9
1-3. Research Aims and Questions	12
1-4. Thesis Overview	13
Chapter 2 Literature Review: Climate Change Understandings, Communication, and Use of New Media	16
2-0. Introduction	16
2-1. Perspectives on Climate Change	16
2-2. The Process of Communicating Climate Change.....	23
2-3. Roles in Communicating Climate Change: Opinion Leadership	36
2-4. Communication in New Media: Internet Fora.....	41
2-5. Conclusion	51
Chapter 3 Methodology	53
3-0. Introduction	53
3-1. Research Approach	53
3-2. Data Collection	56
3-3. Terminology in Research.....	65
3-4. Frameworks for Analyses of Fora Discussions	68
3-5. Qualitative Analysis of Fora Discussions.....	79
3-6. Eliciting Members' Perceptions of Online Communication.....	87
3-7. Conclusions	96
Chapter 4 Characterising the Communication of Climate Change in Online Fora	98
4-0. Introduction	98
4-1. Characteristics of Fora Contents: Archives of Online Communication Process	98
4-2. Distribution of Fora Contents: Few Members Speak.....	100
4-3. Forms of Communication.....	105

4-4. Members' Motivation for Participating in Fora Communication	
Process	116
4-5. Conclusions	120
Chapter 5 Roles in Online Communication.....	123
5-0. Introduction	123
5-1. Observers' Roles in Communication.....	123
5-2. Roles of Active Authors and Key Authors.....	127
5-3. Supporters, Challengers, and Communicators: Repliers' Roles	
in Topic-Threads	137
5-4. Competition for Opinion Leadership in the Topic-Threads	161
5-5. Conclusions	170
Chapter 6 Communication in Internet Fora:	
Influences on Views.....	171
6-0. Introduction	171
6-1. Influence of Fora Climate Change Communication on Users'	
Perception	171
6-2. Influence of Fora Communication on Users' Attitudes and Behaviours	180
6-3. Sources of Influence	182
6-4. Conclusions	186
Chapter 7 Discussion	188
7-0. Introduction	188
7-1. Who Is Communicating Climate Change Online?	188
7-2. Building Opinion Leadership Online	191
7-3. Revisions to the Two-Step Flow Model	199
7-4. Implications for Practice on Climate Change Communication	204
7-5. Conclusion	206
Chapter 8 Conclusions and Future Research	207
8-0. Introduction	207
8-1. Major Findings	208
8-2. Contribution of the Study	209
8-3. Limitation of the Research	215
8-4. Further Research Directions and Challenges.....	218
Bibliography.....	221

Appendices	254
Appendix I: Questionnaire.....	254
Appendix II: Coding Table for Qualitative Analysis.....	269
Appendix III: Record of Qualitative Analysis — Topic- Thread	
Coding Record	271

List of Boxes

Box 3-1. Definition of Key Author	72
--	-----------

List of Figures

Figure 1-1. Thesis Structure	15
Figure 2-1. The anthropogenic effects on global temperature	17
Figure 2-2. The Shannon-Weaver communication model (1949).....	25
Figure 2-3. Helical model of communication (Dance, 1970)	26
Figure 3-1. Diagram of research in relation to key questions	55
Figure 3-2. Questionnaire ‘response-flow’	93
Figure 4-1. Cumulative number plot of fora authors’ total posts (AT)	102
Figure 4-2. Cumulative number plot of fora authors’ total posted articles (ATA)	103
Figure 4-3. Cumulative number plot of fora authors’ total posted replies (ATR)	104
Figure 4-4. Model 1 of online communication flow	109
Figure 4-5. Model 2 of online communication flow	112
Figure 4-6. Model 3 of online communication flow	113
Figure 4-7. Respondents’ experiences on seeking opinions.....	115
Figure 5-1. Respondents’ access of climate change information.....	124
Figure 6-1. Percentage responses from Q10-1: “Overall, do you feel there could be any prevalent view / viewpoint shared by members of this forum?”	173
Figure 6-2. Percentage of responses from Q10-2: “If you answered “Yes” in Q10-1, would you please indicate how the forum’s main views are communicated?”	174
Figure 6-3. Percentage of responses from Q11: “Overall, how do you feel other forum users regard your opinion?”	175
Figure 6-4. Respondents’ agreement of networking statement.....	177

Figure 6-5. Effect of being a member in forum (Q15-4, Q15-5, Q15-7).....	179
Figure 6-6. Users' perceptions of sharing views among members (Q10-3).....	182
Figure 7-1. Interaction of KAs and communicators in forming opinion leadership.....	194
Figure 7-2. Revised Two-Step Flow in Online Fora Communication	201

List of Tables

Table 3-1. Details of Selected Internet Fora.....	59
Table 3-2. Fora-specific Terminology Used in the Thesis.....	66
Table 3-3. Data Types of Fora Statistics.....	69
Table 3-4. Topic-Threads Chosen from Four Fora	82
Table 3-5. Coding of Support / Challenge in Replier's Posts.....	84
Table 3-6. Questionnaire Types Sorted by Distribution Methods	88
Table 4-1. Classification of Posts in the Four Fora by Content Format (total numbers and percentages)	99
Table 4-2. Length of Posts in the Four Fora (based on number of words).....	99
Table 4-3. Percentage of Authors and Repliers in Four Fora	100
Table 4-4. Authors' Activeness in the Four Fora	101
Table 4-5. Distribution of Initial Posters and Repliers in the Four Fora	106
Table 4-6. Distribution of Author-Initiated Topic-Threads	107
Table 4-7. Authors' Posting Activities in the Four Fora	108
Table 4-8. Comparison Statistics of Authors' Activeness (α -List)	109
Table 4-9. Comparison Statistics of Authors' Frequency of Communication (β -List)	111
Table 4-10. Comparison Statistics of Authors' Networking Ability (γ -List).....	113
Table 4-11. [Q6] What are the main reasons you visit / have joined this forum?	117
Table 4-12. [Q8] Members' Motivations of Initiating Discussions.....	119
Table 5-1. [Q14-1]Information Sought from the four fora combined.....	125
Table 5-2. [Q14-2] Reasons Why Respondents Do not Access or Get Involved in Discussion.....	126
Table 5-3. Total Ranking of Four Fora' Authors' Performances	128
Table 5-4. Performance Comparison of Key Authors (KA) and Total Authors (Activeness)	129

Table 5-5. Performance Comparison of Key Authors (KA) and Total Authors (Participation Frequency).....	130
Table 5-6. Networking Capability of KA.....	131
Table 5-7. Topic-Threads Chosen from Four Fora.....	133
Table 5-8. Initial Postings' Content of SN1 ~ SN8.....	134
Table 5-9. Coding Table of Supporting / Declining Attitude in Replier's Postings	135
Table 5-10. Repliers' Content Types in Selected Topic-Threads	136
Table 5-11. Classification of Repliers' Roles of SN1	139
Table 5-12. Classification of Repliers' Attitude to the Original Post of SN1....	141
Table 5-13. Classification of Repliers' Roles of SN2.....	143
Table 5-14. Classification of Repliers' Attitude to the Original Post of SN2....	144
Table 5-15. Classification of Repliers' Roles in SN3.....	146
Table 5-16. Classification of Repliers' Attitude to the Original Post of SN3....	147
Table 5-17. Classification of Repliers' Roles of SN4.....	149
Table 5-18. Classification of Repliers' Attitude to the Original Post of SN4....	150
Table 5-19. Classification of Repliers' Roles of SN5.....	152
Table 5-20. Classification of Repliers' Attitude to the Original Post of SN5....	153
Table 5-21. Classification of Repliers' Roles of SN6.....	154
Table 5-22. Classification of Repliers' Attitude to the Original Post of SN6....	155
Table 5-23. Classification of Repliers' Roles of SN7.....	156
Table 5-24. Classification of Repliers' Attitude to the Original Post of SN7....	157
Table 5-25. Classification of Repliers' Roles of SN8.....	158
Table 5-26. Classification of Repliers' Attitude to the Original Post of SN8....	159
Table 5-27. Tendency of Opinion Leadership in Topic-Threads.....	169
Table 6-1. [Q11] Self Evaluation of Respondents' Opinion in Fora	176
Table 6-2 Respondents' Assessment of the Internet Fora Influence on Themselves	181
Table 6-3. Nominated Leading Authors in Four Fora	184
Table 7-1. Activities of Opinion Leaders in Online Communication.....	191

Chapter 1 Introduction

1-1. Communicating Climate Change in Internet Fora

Climate change is not only a scientific issue, but also a public one (Bray & Von Storch, 1999). While people may hear and learn about climate change from various sources (i.e. news media or government statements), messages and ideas regarding climate change issues are now widely and rapidly circulated through the Internet. In particular, discussing climate change issues online is becoming very popular on Internet media. As with other public issues, online discussions about climate change can become a rich source of information and exchange of ideas. These communication activities are usually publicly accessible and involve a wide base of participants. As a result, Internet services act as “virtual spaces” for initiating, developing and recording these discussions; they are new media that provide not only information and knowledge but also that enable users to interact on their views such as relating to climate change.

In order to improve climate communication online, in-depth research of the communication process on Internet media would be required. This chapter details the research context, aims and research questions, as well as the contents of following chapters in the thesis.

1-2. Research Context

Climate change issues have been the subject of extensive media and public interest in recent years. These are manifest as discussions on the findings of climate science, the politics of recognising the science findings and taking actions, and efforts of mitigating and adapting to climate change. Through media reports and public campaigns, these issues are communicated to the public, but communicating climate change issues remains a complex process.

Studies have demonstrated an increase in media coverage of climate change since the turn of the century (Carvalho & Burgess, 2005; Boykoff & Rajan, 2007). This media coverage can affect people's attitudes and perceptions on climate change issues. However, communication of information and messages can be manipulated and distorted. For instance, following the theft of emails from the Climatic Research Unit of the University of East Anglia (termed "Climategate"), distorted information of research and rumours were widely forwarded to various Internet fora, which provoked intense debate (Leiserowitz *et al.*, 2010). This series of events demonstrated the interactive nature of the Internet and how it allows plural voices, information, biases, and opinions to be spread in a very short space of time and without verification (i.e. they went 'viral'). The "Climategate" event demonstrated that online discussions can transform conversations about "objective" scientific considerations of climate change to much more subjective rumours or even gossip. Yet how these climate-related communication processes take place online, including the formation of opinions, flow of messages, and influences on Internet users' perceptions and their attitudes, is still under-researched.

The use of the Internet as an information source has increased dramatically in

recent years, and people tend to access the Internet to widen their knowledge and understandings, even after accessing other types of media (Lupia & Baird, 2003). Jennings & Hulme (2010) demonstrate how most national and local newspapers and news broadcast services in the UK now have their own Internet sites where the public can easily check the latest headlines, read articles online and find details about environmental issues. In addition, people are increasingly using the Internet to communicate with each other, as shown in the Eurobarometer poll (May, 2010). Therefore, Internet users are familiar with accessing Internet fora as platforms of online communication. In the context of online communication (the “virtual space”), their discussions are usually recorded in publicly accessible formats.

Moreover, the recent and rapid development of “interactive” communication services based on Internet (i.e. Internet fora, online social networks, online chat rooms, etc.) has quickly increased the importance of the Internet as a modern communication means. It is suggested that online discussions may have positive effects on the individuals taking part by providing them access to diverse information (Bauer *et al.*, 2002), by widening users' social circles (Hampton & Wellman, 2003), or by enhancing psychological well-being (Kang, 2007). Some researchers argue that online discussion is a new form of computer-based interaction and leads to a virtual public sphere (Wright & Street, 2007), that the Internet is a “cyberspace” (Volkmer, 2003; Poell, 2009) for discussing public issues such as climate change and greenhouse gas (GHG) reduction schemes. Therefore online discussion is regarded as the representation of “freedom of speech” and “electronic democracy” via modern communication technology (Frissen, 2008). On the other hand, some researchers have suggested that the characteristics of Internet communication may also have “negative effects” such as isolating individuals from "real" society and decreasing their ‘real’ (as

opposed to virtual) interaction with family members and friends (e.g. Kraut *et al.*, 1998; Kraut *et al.*, 2002; Sanders *et al.*, 2000). It has also been argued that there may develop an “addiction” to the new media (e.g. Kim *et al.*, 2009).

The rapid growth of the use the Internet has created relatively new forms and platforms for communication. The “Internet forum” is one of the most popular online communication platforms; it refers to an online space where people can hold conversations through messages exchanged and communicated online. Forum users can access other users’ opinions, express their own ideas and respond to others’ messages (“posts”). Internet fora allow users interactively communicate with others asynchronously. Facilitated by Internet technology, Internet fora have the following characteristics:

1. Hosting remote and interactive communication;
2. The coexistence of synchronous and asynchronous modes of communication;
3. Anonymous, or identified (ID-tagged) participation is allowed;
4. Individuals’ opinions are expressed, personalised, and discussed by others (usually fora members).

Internet fora host an immense range of discussions. By enabling information exchange networks to be used by citizens, the value of the Internet in facilitating public participation in social movements and public involvement is recognised (e.g. Drache, 2008). In particular, studies have identified the importance of “grassroots” uses of the Internet; and groups encouraging their members to engage with sustainable behaviour change for GHG reduction (Rajan, 2004; Seethaler & Rose, 2006).

A more in-depth understanding of the influences of Internet communication on engaging individuals in climate change issues is critical because of the potential consequences of online discussions. These include (see Schrire, 2006):

1. Discussions on the Internet could enhance Internet users' knowledge and affect their views of climate change by making both scientific information and people's viewpoints and perceptions accessible to them;
2. Discussions on the Internet generate records of the "contents" of such discussions including online discussion threads that reflect people's perception of climate change issues as well as their interactions with other participants in the discussions;
3. Online discussions may reveal to researchers, policy makers and social groups how messages are being presented and interpreted via Internet communication.

Given the potential of these impacts of online discussions, the research in this thesis focuses on exploring climate change communication in Internet fora.

1-3. Research Aims and Questions

This thesis aims to understand the communication processes in online discussions of climate change issues. In particular, the thesis seeks to investigate: (1) the characteristics of climate change communication processes in Internet fora including users' interactions; (2) users' roles in the online discussion processes and their engagement in climate change discussions; and (3) the influence of online communication on people's views and attitudes.

The communication activities that are investigated include users' expression of opinions and exchange via posting, replying, or forwarding contents in various fora. Their interactions such as supporting, challenging or networking with others are also examined, as are the roles of participants in the communication process.

Since the Internet enables users of these fora to have interactions with each other in a specific virtual online space, it provides an opportunity to observe the communication processes in a reviewable, accessible, and topic-selectable manner, without interrupting users' communication activities. This makes it possible to study the details and interactions of climate change communication online.

In order to achieve the research aims, three research questions are identified. These questions are derived from key gaps in the literature identified in Chapter 2.

1. How do individuals communicate climate change issues and interact with others through online discussions in Internet fora?
2. What are the roles of online communicators in Internet fora and how do these develop?
3. Does communication around climate change in online fora change individuals' perceptions and motivate them to consider changing behaviours?

These research questions cover some fundamental issues related to communication of climate change through Internet discussions. Specifically, they address how Internet discussions of climate change could be initiated and developed; who are involved, what the roles Internet users have and why they are motivated to join discussions online; and, perhaps most importantly, what influence these discussions could have on users' perceptions, behaviours and actions.

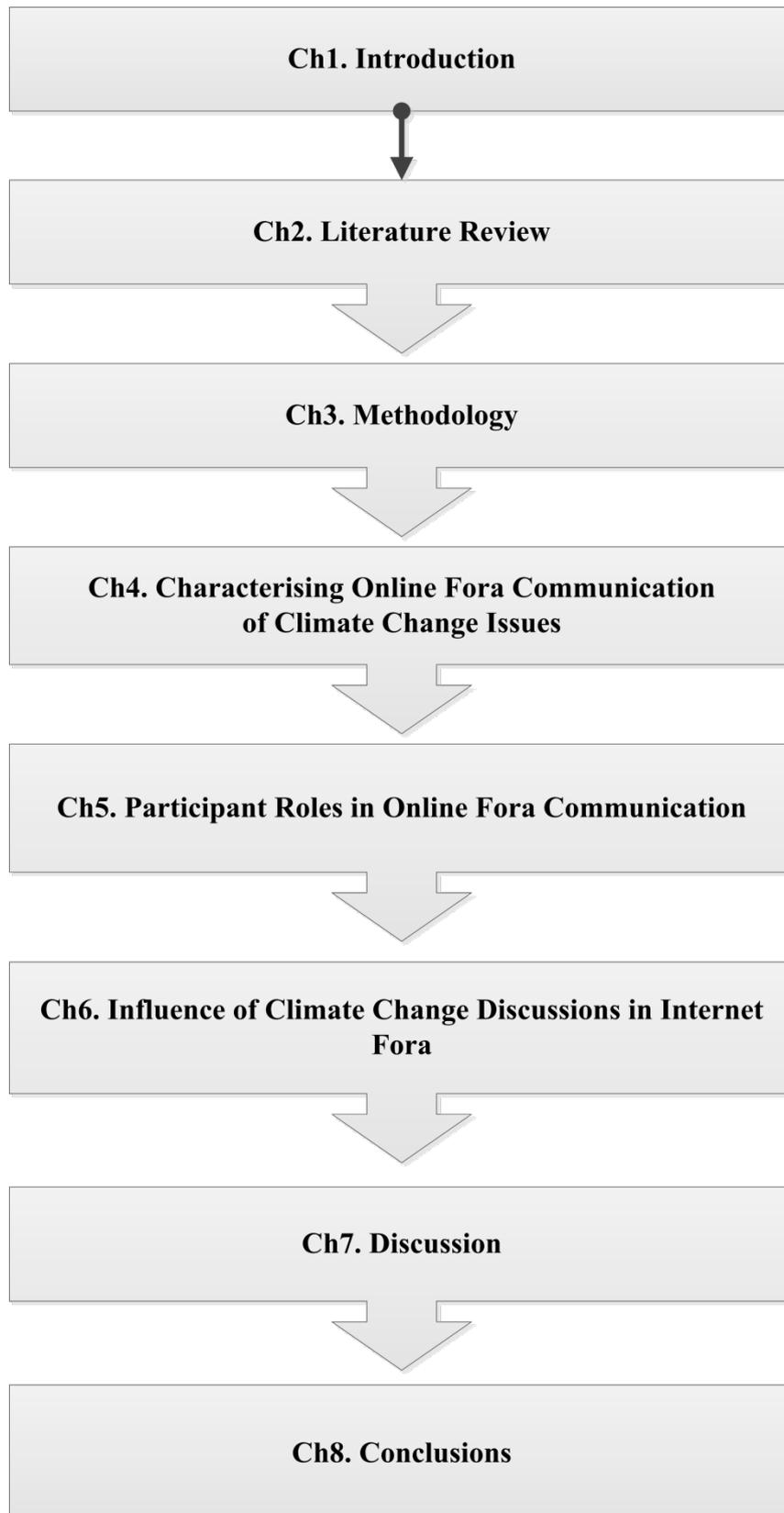
1-4. Thesis Overview

Following this introduction, Chapter 2 reviews studies relevant to the three research questions in the thesis. The scientific evidence of climate change is explored,

as well as current studies regarding people's perceptions of climate change issues. Research on the influence of media on people's perceptions is reviewed, including characteristics and implications of Internet communication processes. Chapter 3 introduces the methodological approaches used in the study, and justifies the use of a multi-method approach. This chapter also outlines the development of ways of analysing fora statistics and studying recorded contents (archives) of online discussions, both quantitatively and qualitatively.

The first research question is addressed in Chapter 4, where characteristics and features of online climate change communication are examined. This involves analyses of Internet discussion content, of online communication, and motivations for participation and initiating communications in these fora. Chapter 5 addresses the second research question, through an analysis of participants' roles in online discussions. Chapter 6 addresses the third research question, exploring influences of online communication processes on fora users, by examining their self-evaluations of the use of fora, participation in online discussions, and the implications on their everyday lives. Chapter 7 discusses the overall findings of the research. The final chapter, Chapter 8, considers the limitations of the research and outlines implications for formulating effective strategies of communicating climate change online. The entire structure of the thesis is presented in Figure 1-1.

Figure 1.1 Thesis Structure



Chapter 2 Literature Review: Climate Change Understandings, Communication, and Use of New Media

2-0. Introduction

This chapter reviews the literature on the scientific evidence for anthropogenic climate change, how people's perceptions have changed over time, how the communication of climate change has developed in traditional as well as new media, and what influences the communication process may have on people's attitudes and actions. This chapter also reviews work on the processes of online communication, roles in these processes and online users' interactions within online fora.

2-1. Perspectives on Climate Change

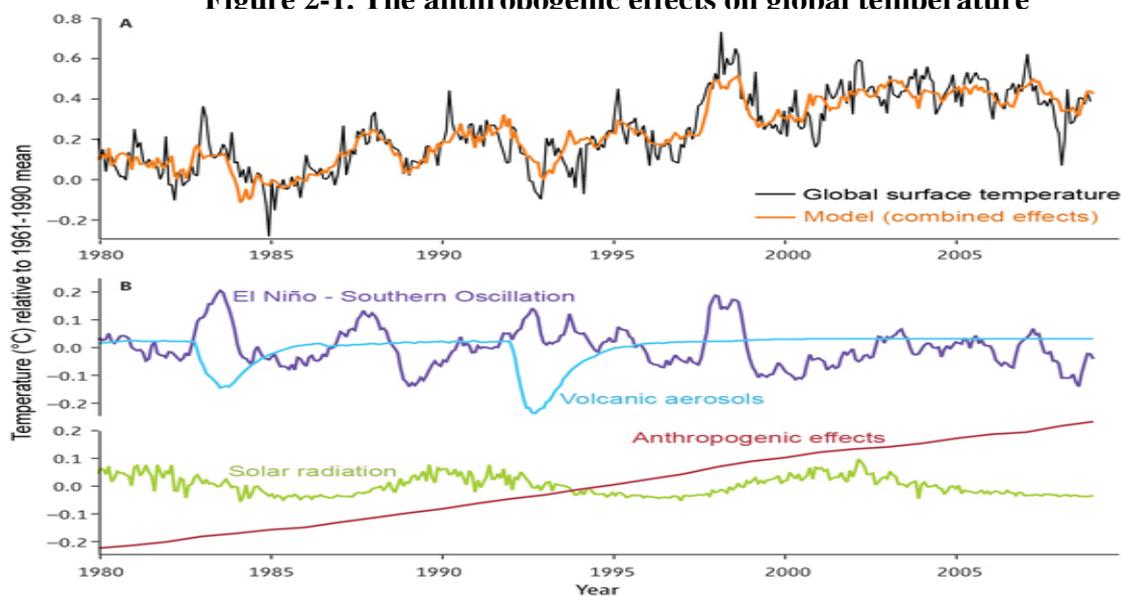
Since worldwide attention has been drawn to the effects of long-term accumulation of human-made greenhouse gases (GHGs) observed as far back as the turn of the century (Abbot & Fowle, 1908, cited by Weart, 2008), the anthropogenic influences on the global climate have been of interest to a variety of social actors including individuals, international organisations and governments around the world. Regular reports from Intergovernmental Panel on Climate Change (IPCC) reveal major evidence for, and the potential impact of, climate change. However, some scientists disagree with the IPCC's conclusions and these mainstream projections of climate change. The next two subsections examine the arguments posed by both

sides, given that these discussions have triggered intensive debates in the public realm and may possibly affect people’s perceptions of climate change.

2-1-1. Arguments for Anthropogenic Influences on the Climate

In order to understand the science of climate change and explore the potential consequences of human activities on the global climate, the IPCC was established in 1988 jointly by the United Nations Environmental Panel and World Meteorological Organisation. The IPCC aims to perform continued assessments of the state of knowledge on various aspects of climate change including “scientific, environmental and socio-economic impacts and realistic response strategies” (IPCC, 2004:2). The IPCC publishes reports regularly, the most recent of which suggests that global climate change is already having an impact and is primarily induced by human actions. Moreover, improved computer models and observational data from multiple sources in this latest report have contributed to strengthening the assertion that human emissions are very likely to cause serious climate change (Lean & Rind, 2009; See Figure 2-1).

Figure 2-1. The anthropogenic effects on global temperature



The IPCC's Fourth Assessment Report (AR4), published in 2007, underscores the urgent need of stabilising global GHG concentrations at particular levels, so that the risk of severe future climate change damage can be limited. The IPCC's projections of future GHG concentrations in the atmosphere range from optimistic estimates (if GHGs emissions are cut substantially, atmospheric CO₂ concentrations will stay below 560 parts per million (ppm) during the 21st century – IPCC AR4, 2007:803) to much more extreme projection levels (e.g. 1550 ppm by the year 2100 in the “A1F1” fossil intensive scenario). Estimates of GHG concentrations by others echo IPCC projections to some degree, and some are accompanied by normative statements. For example Hansen *et al.* (2008:217) indicate that the level of 350ppm CO₂ should be the ceiling “if humanity wishes to preserve a planet similar to that on which civilization developed and to which life on Earth is adapted”, while Roy and Pal (2009) reflect the assertions of other mainstream researchers who urge for lifestyle changes to address climate change risks (Weber & Perrels, 2000; Wei *et al.*, 2007; Roy & Pal, 2009; Carrico *et al.*, 2010). In this context, it is important to note how the IPCC reiterates its scientific authority announcing the AR4 in terms of the geographical coverage of its authors and the extensive reviewing process (IPCC flyer, 2007). The IPCC's conclusions have also been endorsed by the national science academies of the G8 nations and the five leading emerging economies, namely Brazil, China, India, Mexico, S. Africa, Canada, France, Germany, Italy, Japan, Russia, US, UK (Joint Science Academies' Statement, 2007, 2008, 2009).

2-1-2. Sceptical views of Climate Change Science

While IPCC authors claim they are “90% certain” that global climate change is already having an impact and is primarily induced by human influences (See

Summary for Policy Makers of IPCC WGI Fourth Assessment Report, 2007), the so-called “climate sceptics” (Antilla, 2005:339; Poortinga *et al.*, 2011) maintain that the evidence linking human activities to changes in the current and future climate are very uncertain. Some of the sceptics’ popular arguments (e.g. Brenchley, 2011) suggest that the explicit trend of climate change shown by collected climate data has been manipulated by scientists, using “highly uncertain” computational models while considering only limited factors that could affect the complex climate system (Lindzen, 1992). Sceptics' arguments to this regards were supported by inaccuracies found in scientific reports, such as the claim that the calculation of “climate sensitivity” used in the IPCC's AR4 actually leads to predictions different to the IPCC's scenarios (but the IPCC’s counter argument was that these calculations were not used to perform the published IPCC temperature projections). Though the IPCC later clarified their procedures, sceptics are not convinced and gained some support following the controversies surrounding the hacking of climate scientists’ emails before the 15th session of the Conference of Parties (COP 15) in Copenhagen.

2-1-3. Evolving Public Perceptions on Climate Change

Much research has looked at how public perceptions are related to public understandings and responses in various social contexts (Wynne, 1992). In this research, public perceptions are explored in the context of public understandings and feelings regarding climate change. Over last ten years, many studies have explored public views of climate change. Leiserowitz (2007; 2010) summarises multiple assessments of global public opinion of climate change, from numerous cross-national surveys (including GlobalScan, 1998, 1999, 2001, 2005; Leiserowitz, 2003, 2004, 2005; PEW, 2006, CCGA/WPO, 2007; Gallup, 2007). These surveys are from across developed countries including the US, UK, Australia and other EU countries, as well

as some developing countries including China, India and Pakistan. Leiserowitz's meta-analysis (2010) indicates that the publics in surveyed countries expressed significant concern about climate change while the necessity/urgency of taking immediate and drastic actions remained contested between different countries. A notable difference is that respondents from developed countries are less convinced than people in developing countries that global warming will directly affect them, their families and their communities.

The survey results include country-specific findings that show recent changes in perceptions around the anthropogenic nature of climate change. During the time that the thesis was conducted between 2008 and 2010, a notable decrease has been observed in American publics of those who believe "global warming is human caused" (57% in November 2008 to 47% in January 2010). Since then the percentage who believe climate change has returned to near where it was before (back to 54% in September 2012), according to the latest result of survey conducted by Yale Project and George Mason University Center for Climate Change Communication. Meanwhile in the UK, there has also been a reduction in the number of people between 2005 and 2010 believing in the climate change as risk (Spence *et al.*, 2010). However, this UK survey also found that the majority (65%) of people are willing to reduce their energy use in order to tackle climate change. BBC (2010) polls found that the British public still mainly believe the climate is changing, that it is partly human-made, and that they are willing to act on this despite a slight fall of 8% in the number who believed global warming is taking place (83% to 75% from November 2009 to February 2010). It appears then that in both the US and the UK, the proportion of the public who believe climate change is man-made dropped in 2010 but has since started to increase again. A recent UK survey (2012) conducted by

YouGov / Sunday Times that the proportion of people believing in man-made global warming (43%) slightly increased since 2010 (39%), but was not back to the level in 2008 survey when 55% of British people reported to agree that global warming was due to humans' activity.

A survey conducted by UK Department for Transport (DFT) (2009-2010) gives more insight on climate change attitudes and specifically the relationship between people's attitudes toward climate change and actions on cutting emissions. A substantial majority (58% of survey respondents) of people believe that the climate is changing but a considerable proportion (39%) also believed they have done as much as they can do to reduce emissions. In other words, a large proportion of the public are not welcome to potentially painful changes in lifestyle. For example, only 10% stated they would make a lifestyle change such as only using public transport.

All the above surveys were mainly conducted by questionnaires and telephone polls; however the increasing use of the Internet provides an opportunity of surveying internet users' attitudes and perceptions on climate change across multiple countries. In Nielsen's 2011 Global Online Environment & Sustainability Survey (2011), 69% of more than 25,000 internet users in 51 countries said they were "very concerned" or "quite concerned" about climate change, showing a slight downturn from 72% in a similar poll four years ago (2007) but up from 66% in 2009. It is important to note that the trend from this online survey is similar with the survey results from Leiserowitz (2010) and Spence *et al.*, (2010) above. However, in Nielsen's 2011 Global survey, some countries with fast-growing economies such as China show fluctuating attitudes toward climate change in this longitudinal survey: 60% of respondents from China express concerns in 2007, in 2009 this rose to 72%, but then fell back to 64% in 2011.

Based on all of these survey results, it is suggested that people's attitudes could shift and fluctuate despite the growing evidence and knowledge of climate science. While there is evidence that the level of concern for human-induced climate change has decreased all over the world since around 2008, the causes of this decline remain unclear. Some in-depth analysis in the US (Krosnick & Tompson, 2010; Leiserowitz, 2010) suggests that the reasons for this decline maybe a combination of responses to the media reporting on the University of East Anglia email hacking, and fears about the economic downturn.

Gavin A. Schmidt, a senior climatologist with NASA's Goddard Institute of Space Studies (GISS) and co-founder of the famous blog "Real Climate.org"¹, expressed his concerns in the New York Times regarding the media setting the agenda for climate science, describing these chapters of events as "a perfect storm" for climate science which allows the sceptics' to control the agenda (Broder, 2010). Indeed, these controversial discussions by sceptics on the manipulation of "climate sensitivity" (Broder, 2010:21) indicate a certain uncertainty in the general public on the climate science, derived from media reporting on events. The controversial debates over climate change, including its existence, causes, and risks, cannot be eliminated from public discussions; it is a feature of conversations about climate change.

¹ Real Climate.org is a blog that covers areas of climate science knowledge of mainstream views and latest updates—Schmidt is a cofounder and work with others to communicate and discuss global climate change and relevant phenomenon online. It is regarded as a successful example of using internet to communicate climate change (Placing *et al.*, 2012).

2-2. The Processes of Communicating Climate Change

While they show us certain trends in attitude, the polls and surveys mentioned above offer limited help in understanding other aspects of climate change communication, including: how public perceptions of climate change are formed and communicated, who plays which roles in the communication process, and how the communication processes influence people's ideas on climate change (Marin & Berkes, 2012). The surveys also provide little insight into the type of media people use to communicate climate change, whether online (internet media) or offline (through people's social groups or specific individuals). However, other research provides observations into how people form their perceptions within this communication process, and how the subject of climate change has developed and moved from the natural sciences into the public sphere, as will be introduced in following sub-sections.

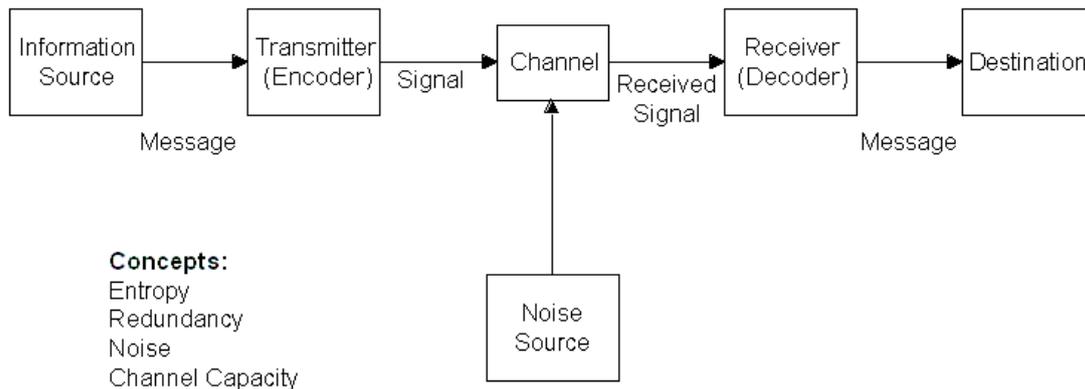
2-2-1. Communication Processes and Models

People's perceptions are an active and fundamental process of learning and interpreting things (Rubin, 1993; Zhou & Moy, 2007). The formation of such perceptions can easily be affected by the context of the communication process (Zhou & Moy, 2007). In Shannon and Weaver's (1949) communication model, communication is defined as the exchange of information between a sender and a receiver, which involves the process of encoding (from senders) and decoding (by receivers). In the process, individuals' perceptions of meaning are regarded as part of the contents of their decoding (Walter, 2004); thus the perceptual model of communication is regarded as a process in which receivers create meaning in their own minds (Ibid.). Other models suggest that content transmitted by mass media

can affect people's perception of specific issues, through a process of "framing" the world (Scheufele, 1999; Nisbet & Mooney, 2009), their own mind-set about a specific issue (Preston & Clair, 2011) or interpersonal communication (Burkitt, 2010; West & Turner, 2010).

It has been found that roles of scientists in online communication are mostly limited to being the source of information about scientific knowledge; few interact in the process of online communication (Lederbogen & Trebbe, 2003), while sceptics and activists on the other hand frequently use the Internet and circulate their opinions (Lockwood, 2008; DeLuca, 2009). Communication is a complex process of discussion amongst individuals, the public and the media, and it has been studied in various research fields. Research on 'communication flow', the flow of information in the communication processes, has been studied at least since the 1940s. Harold Lasswell (1948) described a linear communication model characterised by several key aspects (Lasswell, 1948; cited by Schulz, 2009). In the basic description of communication flow, Lasswell identified research directions on communication roles ('Who'), communication contents ('Says what'), communication media and patterns ('In which channel'), studies of audiences ('To whom'), and influences of communication process ('With what effect'). Shannon and Weaver's (1949) mathematical model of communication breaks the process down further into sub-processes of encoding and decoding, each of which is carried out by senders and receivers, and process of transmitting via communication channels (See Figure 2-2 below). In the communication model, the process of communication is regarded as procedure of encoding and decoding messages that flow through specific media / channels. Therefore research on communication focus on how messages are encoded / decoded, and how messages are delivered via media.

Figure 2-2. The Shannon-Weaver communication model (1949)

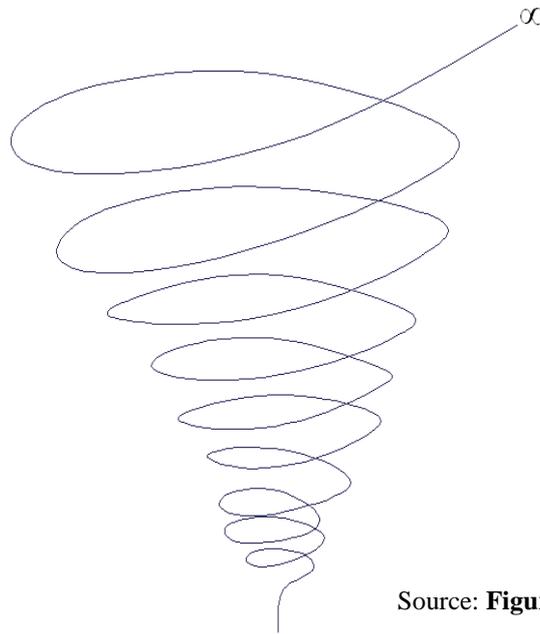


Source: Adapted from **Figure 1** in Flensburg (2009)

The Shannon-Weaver model identified several components of the communication process, including an information source, transmitter, channel, noise, receiver, and the destination, as shown in Figure 2-2. The communication model has been widely studied in the communication research field, and the early study reveals the nature of communication as the process of encoding and decoding meanings. Other pioneering research investigated the functions and roles in the process, and later it was found the model over-simplified the process, which should be diverse and constantly changing all the time. By comparison in Dance's "helical spiral" model of communication (1970), communication flow is proposed as a continuous and evolving process, where participants (communicators) accumulate their communicative experiences based on non-repeatable events. Dance's model emphasises the dynamic nature of communication, including changing roles of communicators and different standpoints in varied contexts. He and scholars since have regarded the complexity of communication as the evolutionary paths through which an organism develops to be self-consistent and socially meaningful (Machin, 1989; Blackburn, 2007; Bramwell, 2011). Based on the helical model of communication, Dance further suggests relationships between communicators as a

“social helix” or “triple helix” (as shown in Figure 2-3), which refers to the process of communication with consideration of individuals' past behaviours and influences on activities of communication back and forward.

Figure 2-3. Helical model of communication (Dance, 1970)



Source: **Figure 1.9** in Hill *et al.* (2007)

Research on communication models has turned to exploring the interactions between information providers and receivers. Questions remain on whether the process is static or dynamic, linear or non-linear, directional or non-directional, and are highly relevant to the contexts and participant roles in communication activities. In recent years, some other communication models (i.e. uses and gratifications model, “computer-mediated communication CMC”, etc.) (Thurlow *et al.*, 2004; Wang *et al.*, 2008) have emphasised the importance of researching models of communication flow. They have particularly focused on the active roles (i.e. media “users”) in the communication process where users are treating communication as a means for accessing information and ideas they want. For instance, the uses and gratification

model proposes that individuals use media to fulfil their various needs, and people will choose media according to their expectations and desire to attain a gratifying experience (Park *et al.*, 2009). Within these theories, media effects are limited: such theories seek to understand the audience that the media attract (and in turn, the audiences that use the media) in light of their social and psychological needs, rather than focusing on the components or directions of the media's influence.

The assumption that audiences are active in the communication process fits well with the study of new media, which are designed for active use and known for interactivity (Raacke & Bonds-Raacke, 2008; Park *et al.*, 2009). The Internet allows users to actively choose contents they want to access, and messages they preferred in topic discussions, and get satisfaction (Ko *et al.*, 2008). Based on this "active user" assumption, it would suggest internet users are actively sending and seeking information as 'communicators' on climate change too.

The communication models above imply a communication context that has limited media effect, suggesting that communicating climate change depends more on media users' interpretations of climate change than information providers' statements on this (e.g. media, or opinion leaders). However other research such as studies of "the spiral of silence" (Noelle-Neumann, 1984; Scheufele, 2008; Liu & Fahmy, 2011), or Mcleod *et al.*'s "O-S-O-R" Model (Mcleod, *et al.*, 1994; Cho *et al.*, 2009 – see below) suggest the processes should focus on participation in the communication process than interpretation of communication by individuals. Noelle-Neumann (1984) suggests that people tend to avoid feelings of isolation in communication process, and so prefer to sense the 'climate of opinion' to see if they stand on the majority of side of public opinion. Opinions of "majority" are further reinforced by the silent minority. This phenomenon is named the "spiral of silence", meaning that even though

information can be accessed and interpreted according to users' needs, in many cases individuals will be reticent to express minority opinions. This creates a direction of messages or ideas flow from the majority to the minority. Scholars argue that the fear of isolation is an integral part of public opinion formation, and has profound implications for one's susceptibility to social influence (Noelle-Neumann, 1984; Page *et al.*, 1987).

The O-S-O-R model was derived from the original stimulus–response (S–R) theory of direct communication effects, based on Markus and Zajonc's O-S-O-R cognitive framework (Markus & Zajonc, 1985). The first “O” includes “structural, cultural, cognitive, and motivational characteristics the audience brings to the reception situation that affect the impact of the message”, and the second "O" represents "what is likely to happen between reception of the message and the response of the audience member" (McLeod *et al.*, 1994:146–147). Therefore this model recognizes both the importance of individuals' characteristics and the context of communication in interpreting messages and generating responses. The research on the “spiral of silence” and the general O-S-O-R perspective provide theoretical foundations for recognizing the effects of communication mediation, and support findings of individuals' roles in diverse communication contexts. In other words, these studies provide hints to depict the communication process and individual roles by recognizing the effect of individual characteristics and importance of communication contexts. Messages through media can be interpreted differently by media users. Communication contexts can also vary and affect users' perceptions and interpretations of opinions communicated.

2-2-2. Two-Step Communication Flow

The communication studies reviewed in the previous section focus on users' participation in communication, without much attention to how the nature of media affects users' perceptions. However, many studies have found that media affects individuals' perceptions via indirect communication flows. For instance, in Katz and Lazarsfeld's research (1948) on voters' decision-making processes during a 1940 presidential election campaign, they found that voters depend on opinion leaders to deliver and interpret information from mass media. It is suggested that information from media first reaches "opinion leaders" who filter information to their associates, with whom they are influential. The study demonstrated that the flow of mass communication is less direct than scholars previously supposed. The cascade connecting voters, opinion leaders and mass media has been described as a "two-step" model of communication flow.

Two-step models have been widely tested and discussed in the past². Weimann *et al.* (2007) address the relationship between opinion leaders in internet communication and agenda-setting effects. Agenda-setting effect is a specific term that describes media's ability of focusing on specific topics and raising wider discussions. Weimann *et al.*'s work (Ibid.) sparked new interest in observation of opinion leaders is extended to not only their role in relation to mass media, but also to the ability of setting the agenda. More recently, Nisbet & Kotcher (2009b) set out to explain media effects on climate change communication by using of the theory of two-step communication flow. Nisbet and Kotcher explored modes of communication in the Internet, and conclude that a two-step communication process also occurs in internet fora. Their

² More recently, some researchers have focused on studying what they call "multi-levels" of communication flow, forming a theoretical framework for further research including the "diffusion of innovation" theory (Rogers, 2003; Benedetto, 2010).

work reveals how opinion formation takes place based on individuals' perception and their in-depth cognition. However, Nisbet and Kotcher's, and others' research that is based on the two-step flow of communication rarely consider shared values and emotional responses on climate change. Since various forms of social media (internet fora, online social networks, etc.) are getting popular, the boundary of opinion leaders and their social groups has blurred. Furthermore, the importance of the interaction between opinion leaders and their social web is recognised as important in this generation (Wright & Hinson, 2010). There are no clear indications of individuals' roles in online interactions found in literature or in the two-step communication research.

2-2-3. Evolution of Two-Step Flow: Multi-step Communication Flow

Research on the two-step flow of communication flow model offered an insight into the flow of information and ideas (from mass media, to opinion leaders, to people in general) (Lowery & DeFleur, 1995). Many scholars then tested the two-step flow process in follow-up research, and suggested that information actually tends to travel via multi-step flow processes, with multiple directions and iterations (Robinson, 1976; Weimann, 1982; Burt, 1999). Indeed, the simplicity of the two-step flow model, which relies heavily on opinion leaders as interpreters and disseminators of information, has been challenged by some within the communication research field (i.e. Rogers, 2003; Weiman, 1982; Burt, 1999; Bennett & Manheim, 2006). These studies showed how two-step flow theory can evolve into multi-step communication flow (Stoneman & Kwon, 1994), as various stakeholders could develop interests at

different points in time³.

As communication technology advances, with an evolution of media formats, individual media use habits, and social distribution of media, the media landscape with its flow of communication process is changing (Bennett & Manheim, 2006). The technological and media changes over the last thirty years have made it possible for interest groups, including individuals or active organizations, to target their messages at increasingly more specific areas of the general public. . It seems that the boundary between two-step and multi-step flows has been blurred with recent advances in communication technologies too. The idea of messages flowing through key roles in a social network as “steps” is becoming more important. Therefore scholars have recently focused on opinion leaders when conducting communication studies involving new media (e.g. Nisbet & Kotcher, 2009; Wright & Hinson, 2010). Furthermore, communicators and social movement campaigners may find that the rise of internet communication, such as internet fora discussions or online social networks, should lead to increased efforts to reach opinion leaders as active social media users (Wright & Hinson, 2010).

2-2-4. The Role of the Media in Climate Change Communication

The process of communicating climate change not only refers to the flow of information between transmitters and receivers as Shannon and Weaver’s model calls them, but it also refers to the channels of the communication activities. Mass media have traditionally become our primary communication channels and information sources. In early research media was supposed to be a magic bullet for propaganda

³ The “diffusion of innovation” process proposed by Rogers (2003) can also be regarded as part of multi-step communication flow theory.

and information delivery, while later studies found that the effect of media was limited due to the two-step communication flow (Katz & Lazarsfeld, 1955). Studies of the effect of media on “agenda setting” (Pralle, 2009) revealed further effects – that people’s behaviour may not be directly affected by media campaigns, but rather their views on climate change. It is argued by some that audiences’ attentions to certain issues are selected by media (McCombs & Shaw, 1993; McCombs., 1997; Miller & Wanta, 1996; Wanta & Ghanem, 2007). In other words, media may not only decide “what we think”, but also “what we think about” (Wanta & Golan, 2004).

While the public may get involved in the discussions around social change, the role of the media in shaping public opinion is increasingly recognised (Wilson, 2000; Moser & Dilling, 2007). However, recently scholars have warned that the media influence public understanding of climate science and perception of risk by focussing on reporting the controversies or disaster outcomes of climate change, rather than providing balanced information and motivating actual behaviour change. Lowe *et al.* (2006) make the point that the media usually offer images of climate change as “disaster narratives” (such as melting ice and global flooding, rising sea levels and wiped out island cultures, submerged coastlines and climate refugees, etc.).

Studies have shown how media contents are frequently exaggerated, sensationalised (prone to bias), as well as based on contradictory framings (Boykoff & Boykoff, 2004; Lowe *et al.*, 2006; Petersen *et al.*, 2009; Nisbet & Mooney, 2009). Some researchers have even argued that the media is a major contributor to the decline in civic and political participation, due to it channelling time away that might be spent in civic engagements (Putnam, 1995).

In order to tackle the challenge of communicating climate change, Ockwell *et al.* (2009) argue that communication should meaningfully engage implicit values,

emotions, and attitudes of individuals. To help with this, different means of communication can encourage people to express their views and discuss how to overcome difficulties with engagement. The theory of “active audiences” suggests that individuals can actively select and freely choose their information sources and interpret their messages (Ko *et al.*, 2008; Bruns, 2008), however relatively few studies have explored how these conditions and processes operate online. Barr’s (2007) work focuses on how people interpret information they receive, based on their own personal experiences and their social contexts. He argues that how the way information is received, rather than its actual content, is of much stronger influence in determining environmental action. Indeed, research on climate change communication has also found a very limited correspondence between information provision and concern about climate change (e.g. Moser & Dilling, 2007).

As a result, environmental issues (e.g., nature, pollution, biodiversity, etc.) are supposed continuously to be constructed and redefined by engaged individuals and media (Macnaghten, 2003; Hannigan, 2006; Hansen, 2010). Information provided by the media has the power to influence public opinion about crucial public issues, such as climate change (Carvalho & Burgess, 2005; Boykoff & Boykoff, 2007). The media may draw attention to specific aspects or particular perspectives of issues, thus affecting public opinion on them by setting the agenda and framing the issues in a particular way (Wanta *et al.*, 2004). For example, despite the growing scientific consensus about the threat of climate change, the mass media frequently portrays the subject as one of scientific controversy and debate by giving equal balance to opposing views (Boykoff & Boykoff, 2004), by presenting climate change as a global problem. By doing so, the risks are kept increasingly distant and irrelevant to individuals’ mental worlds (Lorenzoni *et al.*, 2007; Hulme, 2009).

2-2-5. A Network Perspective of the Communication Process

In addition to studying the effects of the media on internet users, scholars have also explored the relationships between media and communicators, and the information flows generated. Analysing communication processes through a network perspective can be an effective approach for observing how knowledge can be distributed and improved by coordinating people with competing information, interests, or agendas (Newman & Dale, 2005). The network perspective is different from linear models that focus on senders and receivers in the communication process (e.g. Shannon and Weaver's model). In "communication networks" models, communicators are not simply information providers and receivers (Wellman, 2001, 2007; Foth, 2006; Monge & Contractor, 2003). Instead, they are considered as part of interpersonal networks which connect different sources of information and communication, and form a networked society (Castells, 1996; 2001). The relationships of such networks are often measured by strength (i.e. levels of communication activities), multiplicity (that usually refers to multiple contents flow between two individuals), asymmetry (that regards to comparison of communication levels between two individuals), and status, referring to people's ranks in communication activities (i.e. if someone's opinions are strong and dominant). Within the concept of 'space of flows', Castells describes private 'portfolios of sociability' that people create and maintain, which not only include family and kinship ties but also a variety of other social ties – both strong and weak – with friends, co-workers, peers and other acquaintances (Castells, 2001:132).

The network-based perspective of communication processes leads to the popularity of networking approaches in climate change communication. For instance,

based on the idea of encouraging behaviour change within individuals' social context, Global Action Plan (GAP) formed as an international network with the aim to establish programmes for enhancing pro-environmental behaviour – including promoting 'carbon neutral' households (assisting communities, families) and coordinating company staff to reduce carbon in the workplace. GAP helps individuals and group members who are willing to adopt environmental friendly behaviours, with the support of new technologies including the internet, to facilitate communication. In their programme called “Eco-Team Households”, GAP works with households and communities, demonstrating good practice and playing a role in fostering action within their own neighbourhoods / communities (James & Lahti, 2004). Such schemes offer the opportunity to establish channels for dialogue and conversation, which aims to gather visions in order to promote actions for climate change (see Cooper, 2006). Indeed, only through effective communication can enhanced dialogues of potential risks occur and civic actions be mobilised; unfortunately, the “fear-based” communication strategies, such as setting climate change as disaster narrative, frequently fail in achieving desired behavioural outcomes (O'Neill & Nicholson-Cole, 2009).

The networking approach of GAP and their experiences of "Action at Home" programme (that encourages carbon neutral' households) gained the support of local government, including with advertising, local knowledge, financial input, and financial support in establishing local volunteer networks to support the participating households. However, there has been little research on how the information is delivered online, interpreted, and communicated by new media users. In particular, there is little understanding how opinions are formed, reinforced, or altered. Recently Baker, Coaffee, and Sherriff (2007) argued that public participation in schemes

increases sharply when specific ‘online opinion leaders’ emerge and maintain weak social ties within the social network. Opinion leaders and voluntary associations serve crucial roles in local communities (and within our larger democratic society) by aggregating shared interests, collective will, and cultivating civic competencies that nurture “democratic actions” in groups (i.e. encouraging discussions for ideas of low-carbon community actions) (Baker *et al.*, 2007). Therefore, identifying roles in “communication networks” is critical when conducting network approaches in communication campaigns.

2-3. Roles in Communicating Climate Change: Opinion

Leadership

In early studies, individuals’ roles in communication processes were not given much attention. Instead, they were regarded as uniformly controlled by mass communication, reacting to “whatever 'stimuli' came along” (Lowery & De Fleur, 1995: 400).

The role of communicators was first studied in the context of two-step communication flows. The two-step model offers a perspective on the influences of “opinion leaders” in their social groups. Scholars such as Elihu Katz (1957) found that these opinion leaders in social groups (such as active neighbours in a community) actually have even more influence on public opinions and perceptions than the media (Katz, 1957; cited by Rogers, 2003). In a later book, “*The Tipping Point*”, Malcolm Gladwell (2000:273) argues that social views are driven in large part by a very small minority of special individuals, often opinion leaders, who are unusually “active,

persuasive, or well-connected”. Keller and Berry (2003) studied (2003) the actual roles and characteristics of opinion leaders. Keller and Berry (2003) defined opinion leaders (termed as “influentials”) as the top ten per cent of individuals who are most active and most frequent communicators in social groups. In their study, the activeness of opinion leaders as the frequency of expressing opinions were used as one of the major indicators of leadership, alongside the effect of the interaction between “leaders and followers”. Kotler (2006) further identifies aspects that underpin opinion leaders’ influence, including their special techniques, knowledge, personalities, and other unique characteristics. Leaders diffuse their views effectively, for they are seen as trustworthy, knowledgeable, and non-purposive – people do not feel they are being tricked into thinking a certain way about something from someone they know. Thus opinion leaders are indicated as having more influence in shaping individual views than the media.

With influence and leadership in their social groups, these opinion leaders play a crucial role in the communication process. Opinion leaders seem constrained to particular topics; individuals who act as opinion leaders on one issue may not be considered opinion leaders on other issues (Rogers, 2003). Nevertheless, some scholars argue that only active communication in the media brings out people’s interests and participation (Litvin *et al.*, 2008; Fu & Chen, 2008), and so an opinion leader has to be more active in accessing and communicating information than their followers. Opinion leadership does not mainly derive from an individual’s knowledge, but rather from their influence in the process of ‘agenda setting’. As an example, the forum opinion leader on the online “Free Tibet” movement was a strong opinion leader (Fu & Chen, 2008). In addition to the influence of agenda-setting through selective information provision by the media, these studies have shown how opinion

leaders may greatly influence the process of agenda-setting too.

In Moser's analysis (2007) of the process of communicating climate change, she identified communicators who carry messages with their own views and deliver information through 'channels' and 'messengers'. She refers to influential individuals, regarding them as messengers who are able to communicate information interpreted in particular ways. Nisbet & Kotcher (2009) indicate that opinion leaders deliver selective (i.e. framed) climate change information, which reflects the background of their targeted audiences, and addresses their personal information needs. The actions of opinion leaders (e.g. advocating actions for tackling climate change) encourage and assist online group members in their interpretation of the climate change.

Though the role of opinion leaders was suggested as far back as the 1940s, it remains a challenge to identify the effectiveness of opinion leadership in different disciplines (Mckenna & Green, 2002; Valente & Pumpuang, 2007). Some studies show the way in which opinion leaders influence the perception of others. Valente and Pumpuang (2007) found that opinion leaders have influence through intervening in people's information selection, and building their motivation for behaviour change; opinion leaders act as gatekeepers for information and views regarding change to social norms, and thus are in a position to present both the advantages and disadvantages of behaviour change. Weimann and colleagues (2007) suggest that opinion leaders must be socially accessible in order to spread information and exert influence (see also Rogers, 2003). In fact, opinion leaders generally have a greater influence on social groups through interpersonal communication context. In research of social ties in mobile telecom networks, it was found how interpersonal communication and interaction can affect the formation or consolidation of people's social networks (Dasgupta *et al.*, 2008). In contradiction to these studies, some have

found that opinion leaders have far less impact on public views than is generally supposed (Watts & Dodd, 2007), while others suggest the origins of opinion leader's influence come from implicit operations, such as circulating meanings and systems of representations (Nisbet & Kotcher, 2009). Nisbet and Kotcher (2009) studied Al Gore's Climate Project, which successfully utilised opinion leaders to increase public engagement with climate change in the US. The project first attracts opinion leaders by recruiting individuals who were educated on environmental issues and saw themselves as influential in their community and amongst their friends and family; then the project trains these opinion leaders by providing skills and the correct climate change information. The opinion leaders become effective role of communicating climate change as they passed on selectively framed information about climate change that resonated with the background of the target audiences and addressed their personal information needs (Nisbet & Kotcher, 2009). By using opinion leaders, Al Gore's project was able to persuade and influence the public in US to take notice of climate change and change their actions. In fact, Al Gore himself can be regarded as one of the most influential opinion leaders on this topic – for instance the Nobel Committee recognised his influence, saying: "*He is probably the single individual who has done most to create greater worldwide understanding of the measures that need to be adopted*" (the Nobel Committee, 2007 cited by Gibbs & Lyall, 2007).

In a more recent study, on energy saving approaches, Heiskanen and Lovio (2010) show how expertise among lay people in apartment buildings was developed on a voluntary basis through a communication network. The study was based on the Finnish Energy Expert programme, in which professional institutes (e.g. the House Association VVO, the Finnish energy agency, Motiva, and others) trained over 3000 lay experts to form a communication network. These experts not only share

information and have discussions with their associates, but also organise a peer-to-peer network for mutual support. Through training opinion leaders as “lay experts”, these opinion leaders can mitigate the gap between experts and the public, motivate behaviour changes, and contribute to real actions. Their influence and advice in their networks has clearly had an impact on resident behaviour, as the results show electricity consumption is approximately 10% lower and water consumption about 20% lower than average.

Nevertheless, whilst the idea of an opinion leader and its importance in the two-step communication model is intuitively compelling, it does not explain how these roles have been formed, how information is obtained (either from the media, opinion leaders, or others), or how people’s thoughts and views actually spread. If how people interact and interpret the messages from opinion leaders are indeed decisive factors in people’s decision-making processes, these factors will need to be further clarified.

The increasing popularity of interactive media technology means individuals can actively partake in shaping communication according to their preferences and characteristics. Indeed, they are no longer a homogenous ‘mass’ as identified in early communication studies (Berger, 1995). New media allows users to interact with each other in an anonymous way, contributing to the formation of media discussions (posted articles in internet fora). Studies of electronic word-of-mouth (eWOM) - which refers to informal communication through a persuasive message designed to spread, typically online, both positive and negative, between individuals about characteristics of a supplier and/or his products, and services (Helm 2000:158) - stated that the informal information delivery (termed “viral communication”) can be regarded as a marketing communication tool for building word of mouth via

electronic communication contexts. The eWOM involved into interpersonal communication, including users' roles, their use of the Internet, as well as the gratification, motivations, and effects on their behaviours (Baym, 2000; Kiecker & Cowles, 2002; Gruen *et al.*, 2006; Goldsmith & Horowitz, 2006; Edwards *et al.*, 2007).

Though internet users' roles and their activities in online communication process have been the subject of several eWOM studies (Offenhuber & Donath, 2008; Windahl *et al.*, 2008), the categorisation of communicator roles in these studies may not be comprehensive enough for clarifying online interactions of communicators. These categorisations are based only on fora users' activeness and so are restricted to communicators who 'speak' (express ideas or respond to others in fora). These categorisations do not explore motivations to participate in the communication processes, nor their actions and influences on the communication process.

2-4. Communication in New Media: Internet Fora

A number of studies have recently shown how online communication technologies (e.g. email, instant messages, online chat and fora, social network sites) have become new media that provide information instantly and remotely, with different levels of interactions among editors and communicators (Wellman & Haythornthwaite, 2002; Fallows, 2004; Boase *et al.* 2006). Communication processes in new media consist of the sharing and exchanging of information, understanding, values, and beliefs among communicators, or "participants" (Baym, 2000; Wellman, 1997; Baym, 2000; Fortner, 2007). Although scholars have long acknowledged the

importance of communication, there are relatively few studies about the exchange of climate change information on the Internet, and the process of forming opinion on this topic in the online context.

Early discussions of the role of online communication ranged from wildly optimistic scenarios of their potential to a return to “direct democracy” (Bimber, 1998; Morris, 2001), and from producing empowered citizens to deeply pessimistic predictions of the rise of ‘push-button’ democracy and a fragmentation of the public sphere (Coleman, 1999). Woo-Young (2005) characterised the relationship between the Internet or new media, and public policy dialogue by: (1) convenient access to detailed information, (2) free expression and exchange of opinions, (3) online activism led by a politicised agenda, and (4) active formation of cyber groups (Woo-Young, 2005).

While new media seems to have become a virtual public area where people can join the discussion of public policies, it is still disputed if s people’s engagement of public issues has been improved in new media. Gregson’s (2001) study of citizen participation within new media concluded that new media can enhance dialogue over public policies. McDevitt and colleagues (2003) argue that a spiral of silence exists within the virtual sphere and evolves as a “spiral of moderation”; what this means is that expression of opinions in computer-mediated discussion is impeded for minority viewpoints, due to the overflow of information, inequity of accessibility to information, as well as information gaps (McDevitt *et al.*, 2003). Garrett (2005) found a similar finding in recent research of audiences' attitudes towards online information. This study revealed that individuals consistently seek information that supports their own views, from the Internet, and avoid repeated contact with challenging viewpoints, even though they do not intend to exclude it entirely (Garrett, 2005).

2-4-1. Internet Fora as Popular Communication Platforms

Among various types of Internet applications that enable users to interact and network with other users, internet fora are a significant and highly popular tool to express opinions online. In the latest Eurobarometer poll (May 2010), Internet fora were found to be one of the most popular applications for internet users to communicate online: within the EU, 62.7% respondents said they frequently access internet fora, which exceeded those who used online social network web sites for the same purpose (53.1%), and only websites (79.2%) have more frequent access (Eurobarometer, 2010). Unlike social networking sites that only emerged recently, Internet fora have been around since the 1970s when the bulletin board system (BBS) and news groups became popular.

Many scholars regard internet fora as a popular application of online discussion, and therefore a manifestation of the public sphere (e.g. Poell, 2009; Yang, 2009; Gerhards & Schafer, 2010). For example in China, some types of fora (e.g. Bulletin Board Systems, BBS) are regarded as a hotbed for challenging opinions, existing policies, and even political systems (Yang, 2009). The anonymity in online fora communication also facilitates discussions as people are able to express their opinions without exposing their real identities.

Internet fora do not directly provide information to users, but record the process of communication as “contents”, that in many cases are accessible to members. Communication on internet fora is characterised as “asynchronous interaction” (Montero *et al.*, 2007), meaning that users are able to leave messages with each other at different times, and they can read and respond posted messages within a discussion thread. The interaction eventually will be recorded as content in internet fora. Other

types of internet services allow similar interactions, but differ in that they are with specific individuals (e.g. blogs), and are usually non-recordable (e.g. internet chat rooms).

2-4-2. Characterising Communication Processes in Internet Fora

While members of fora become part of a group on the basis of discussions in the fora, the communication process also requires their involvement back into the fora. It is important to note that the exchange of information and opinions among participants in internet fora is not distributed equally (Kollock & Smith, 1999; Baym, 2000; Keitaro & Moasao, 2006). Kollock and Smith (1999) describe online fora as “pull” media, suggesting that people select groups to participate in, in an active way. Online fora do not “push” information as traditional mass media or E-Mail does, but instead they allow users to select topics that interest them, and to contribute more information on the topic if they wish. In fact, most online fora are interest-based (Baym, 2000; Rheingold, 2007). The engagement and interactions of internet fora users could share information or their thoughts daily, hourly, or even in real-time; moreover, content generated through interactive communication processes is dynamic and attracts further engagement (either from original content posters or respondents) (Biggar & Middleton, 2010)..

As most information on these fora is presented through interaction processes and exchanges of opinion, it is important to consider the influence of opinion leaders in the process (Lyons & Henderson, 2005). It has been found that communication between opinion leaders and their followers occurs mainly through 1-to-1 communication (i.e. instant chatting or replying someone’s articles), or 1-to-many (i.e. posting articles) interactions. These studies indicate a centralised communication flow

surrounding opinion leaders and their followers (Kollock & Smith, 1999; Soroka & Rafaeli, 2006; Sloep & Kester, 2009). Internet fora have triggered debates about the consequences of the centralised communication process in fora and the effects of discussing specific agendas within the asynchronous interaction context (Kollock & Smith, 1999; Johnson *et al.*, 2010; Mital *et al.*, 2010); for instance, Kollock & Smith (1999) suggest that through online communication in fora, the relationship between users and some opinion leaders are built and thus benefit information provision and discussion., Johnson *et al.* (2009) examined online verbal aggression messages and readers' reactions in experimental settings, and they found that the posted messages were associated with anger directed toward the online discussion context, including the discussion topics, texts of messages, and attitudes presented by other participants.

Johnson, Cooper, and Chin (2009), examining online verbal aggression messages and 148 undergraduate students' anger in a laboratory, found that the behaviour of students posted online verbal aggression messages was associated with anger directed toward the negotiating context and negotiator's partners.

Other studies have focused on how interaction among online communicators has occurred. Gunawardena and colleagues (1995; 1997a) argued that the computer-mediated environment has depressed the importance of mass media communication, creating a more networked model of information flow. Interactions are regarded as the foundation of peoples' social ties in a network, as described in Jankowski's research (2009) on community environmental decision-making context. Koh and colleagues (2007) found that the perception of a large amount of useful information triggers more frequent viewing by group members. As a result, users receive and share information in online fora attracts more users' access and their motivations of "being recognized" by other group members, which leads to the

interaction process in fora (Koh *et al.*, 2007). However, how people's interaction in online fora relates to their "offline" social network is not yet clear, and requires further study. Initial research has shown that new media and information technologies can play a positive role in the development of knowledge-based urban communities, with a focus on living, working, learning and recreation (Foth *et al.*, 2008).

When examining how interactions could affect people's opinions, the way in which users were organised as "virtual communities" (i.e. discussion groups in internet fora) had a significant influence on the collective construction of opinions. Dholakia and colleagues (2004) characterised small virtual communities (e.g. Harley Owners Group) with a two-tiered typology of small groups and networks. In small-group-based virtual communities, participants are centred around active roles and form small groups; these small groups are also networked as units of virtual communities (two-tiered as users-active roles and groups-communities). In networked-based-communities, users are inter-connected and consider their groups as communities (two-tiered as users-groups and users-communities). These virtual groups had higher-level interactions online, sharing similar values on an issue. This appeared to influence those who took part. Some researchers have suggested that online interaction could enhance, support or even replace (face-to-face) interpersonal communications as interactive new media technology becomes increasingly used, and sometimes preferred, as a means of communication (Wellman *et al.*, 2001). Online relationships allow formal and informal communication networks to coexist in a group (Monge & Contractor, 2003). As recently explored in Bar-Ilan (2005) and Song and colleagues' (2007) research, this often occurs in internet fora, where members obtain their information primarily from opinion exchange online, and thus contents of interaction have formed their fundamental knowledge and perceptions of specific

issues.

Recent research has started examining how internet fora offer a flexible communicative space for different groups of people (Feenberg & Bakardjieva, 2004). Baym (2000) described online interaction as “*a novel hybrid between written, oral, interpersonal and mass communication*” (p13), and argued how personal relationships and communities may emerge through the process of interaction. Hence the online communication process can also be regarded as a means of forming social networks (Wellman, 2007), which are a series of personal links created, established and maintained by individual internet users.

2-4-3. Roles in Fora Communication

Some researchers (e.g. Kollock & Smith, 1999) have claimed that traditional opinion leadership theory can be applied to communication in new media and offers perspectives on opinion leaders in internet fora. In this study, fora participants were identified as opinion leaders for they displayed strong influential ability; in contrast, the many free-ride “lurkers” (the “silent” majority) had few interactions in the online groups (Kollock & Smith, 1999; Soroka & Rafaeli, 2006; Sloep & Kester, 2009). These studies are also supported by Keitaro and Moasao's analysis (2006) of internet fora statistics, which shows that posts submitted to a communication ‘thread’ follow a lognormal distribution, indicating that some people are heavy posters, while most participants seldom submit posts.

To identify roles in process of online communication, Baym (2000) suggested that people who are involved in processes of communication should be regarded as “participants”, that can be further subdivided into “activists” (individuals who are active in reading articles, posting and replying etc.) and “lurkers” (individuals who

only read messages without actively taking part). These different roles and online behaviours reflect the importance of users' involvement and participation in communication processes (Offenhuber & Donath, 2008; Windahl *et al.*, 2008). Since "activists" are the individuals who contribute explicitly to content generation and the online communication process, some scholars only identified these respondents as communicators in the online communication process (e.g. Sun *et al.*, 2006). "Communicators" thus usually refer to those individuals who are more active in participation and tend to express their ideas, share information, and form dialogues with each other.

The continuous process of interaction that occurs (e.g. updating articles or real-time chatting) builds the "credibility" of information (Mankoff *et al.*, 2010).

The relationships between communicators, information channels (e.g. mass media or opinion leaders), and the larger social system can be regarded as social ties. It is recognised that we all depend on these ties to meet information needs and achieve information gratifications (Castells, 2002). However which information source we depend on (e.g. opinion leaders or media), how we seek the information, and what type of information we obtain differs during the process (Castells 2002). Previous research on the relational aspects of computer-mediated communication has pointed out that social interaction is the basic element of any online communication activity, which then allows individuals to further establish their interpersonal contacts and social networks (Liaw & Huang, 2000; Northrup, 2002; Kreijns *et al.*, 2003). The selection and translation of information into comprehensible public messages occurs through various media channels. Much research has focused on this process in the area of computer-mediated communication (CMC), particularly in the context of online fora (Sun *et al.*, 2006).

Mao and You (2006) suggest that the level of communication and type of communication behaviour among participants can be further classified on the basis of quantitative assessments of their contributions, such as the volume and frequency of messaging, posting, or reply to articles in fora, Mao and You (2006) classified participants into five types, in terms of their behaviours patterns and influences: 1) leaders; 2) respondents; 3) browsers; 4) learners.

2-4-4. Influence of Fora Communication

In addition to the processes and roles in internet fora communication, the way in which communications influence users' perceptions must be considered too. Users may be influenced by specific fora users' contributions (i.e. by opinion leadership) (Hennig-Thurau *et al.*, 2004; Lyons & Henderson, 2005). Sun and colleagues (2006) observe the formation of popular opinions by exploring how some individuals take a leading role in information dissemination and encouraging discussions on behaviours online (Sun *et al.*, 2006). In the online discussion process, these individuals affect communication process by identifying agendas in the media and contribute to setting the agenda of discussion for the group. Further, the influences of internet fora discussion are explored by tracking the representation of opinion exchange among members in the virtual communities. Bodendorf and Kaiser (2010) suggest a process of evaluating the recognition of opinion in online fora whilst also identifying opinion leaders. Bodendorf and Kaiser apply computer software to calculate numbers of terms that present repliers' support towards the original postings of discussion thread. As a result, the higher numbers of words that express repliers' support are regarded as the evidence of repliers' level of support and endorsement of the posters' opinions. Through measuring "supporting levels" among repliers provides an indication of the

influence of opinion leaders on repliers' discussions.

Online interactions could also affect individuals' opinions regarding climate change. As discussed, the Internet could play an important role in discussions on climate change, for it enables the provision of information in almost any format that can be spread widely and instantly, and be accessible to almost anyone with the facilities to link up to the internet. Given this potential role, its influence on users' attitudes and perceptions of climate change should be further evaluated. In literature, it is supposed that the way in which people's perceptions are influenced by online interactions among communicators is not fully researched (Mao & You, 2006; Montero *et al.*, 2007).

What's more, pro-environmental behaviours can be more sustained through online peer-support (e.g. Bottrill, 2007 with Carbon Action Reduction Groups). It is important to consider how online users perceive and interpret online communication activities and how it affects their offline behaviours. Mankoff and colleagues (2007) studied how online interactions may change behaviour by developing an experimental analysis of social interactions online, but their pilot studies only focus on the development of behaviour change via encouraging online interaction and getting supports online; the 'real' situation of people's everyday communication and media context at the time has been overlooked. The theoretical basis for the effectiveness of new media in influencing behaviour change for tackling climate change has not been clearly established, and to date that no research examines how interactions and communication in online fora may influence (or not) participants' willingness to engage in behaviour change for tackling climate change.

2-5. Conclusions

Scientists are confident about the importance of anthropogenic influences on the climate. Since the IPCC's first assessment report (AR1) in 1990, growing scientific research and assessments suggest human actions that result in greenhouse gases (GHGs) being emitted into the atmosphere will continue to induce global climate change. A significant part of GHG emissions comes from the household and transportation sectors, which are linked to individual behaviour and energy consumption activities.

However the findings of climate science are not what people discuss day to day. Therefore it is even more important to acknowledge how effective communication can play a significant role in changing perceptions, build trust between experts and the public, and foster engagement. Some researchers have argued that the development of internet media has changed the ways individuals communicate, and the influences this has on individual views and perceptions. As internet communication becomes an increasingly used source of information and discussion, this becomes highly relevant to how people perceive the issue, exchange ideas online, and decide how to engage with the change.

Research on internet fora recognises that the process of communication through this platform is complex and awaiting further investigation. Internet fora are different from conventional media channels, as they offer a mechanism of interpersonal interactions (via users' identifications, or IDs) and a virtual place for discussion among people's social networks. As well as providing information, it is argued that the interactive context and online social groups may result in significant influences on people's behaviour. Within this communication, the influence of 'opinion leadership'

is a key factor; opinion leaders can have an influential role in the online interpersonal communication process. The assumption of online discussions having an influence on users' perceptions and potentially their behaviours requires further exploration, specifically how the online debates affect individuals' perceptions, attitude, and actions to combat climate change. To date there is a lack of research on communicating climate change via internet fora, the interactions that occur and the formation of opinions through this, and this thesis will add knowledge to this field. The following chapters of the thesis discuss how the research in this thesis, into the communication process in internet fora, is conducted; how people's interactions with each other (providing and sharing information) and with the collective groups (supporting opinion leaders) is examined; and how people who are involved in the online discussions perceive and respond to climate change.

Chapter 3. Methodology

3-0. Introduction

This chapter outlines the multi-method research approach chosen for exploring the research questions in this thesis; this approach enables a comprehensive exploration of the communication of climate change in internet fora. This includes quantitative analysis of records of online communication activities (to examine archived content and authors' performance in the internet fora); a qualitative analysis of communicators' ideas in online fora discussions to understand their roles and their interactions in online climate change communication processes, and exploration of the influence of climate change communication on fora users' perceptions, through an online survey.

3-1. Research Approach

Communication in internet fora is a complex interactive process among fora members and social groups (Preece & Maloney-Krichmar, 2003; Quinton & Harridge-March, 2010), and thus researchers have applied several methods to explore them (i.e. Schneider & Foot, 2004; Gil-Garcia and Pardob, 2006). Various quantitative and qualitative approaches have been used in internet communication media research, including online content analysis (Rössler, 2002), interviews of internet users (Nonnecke & Preece, 2000), and focus groups of cyber groups (Preece &

Maloney-Krichmar, 2003). A multi-methods exploratory approach enables the application of different methods, drawing upon different data sources and types, in order to explore complex interactions.

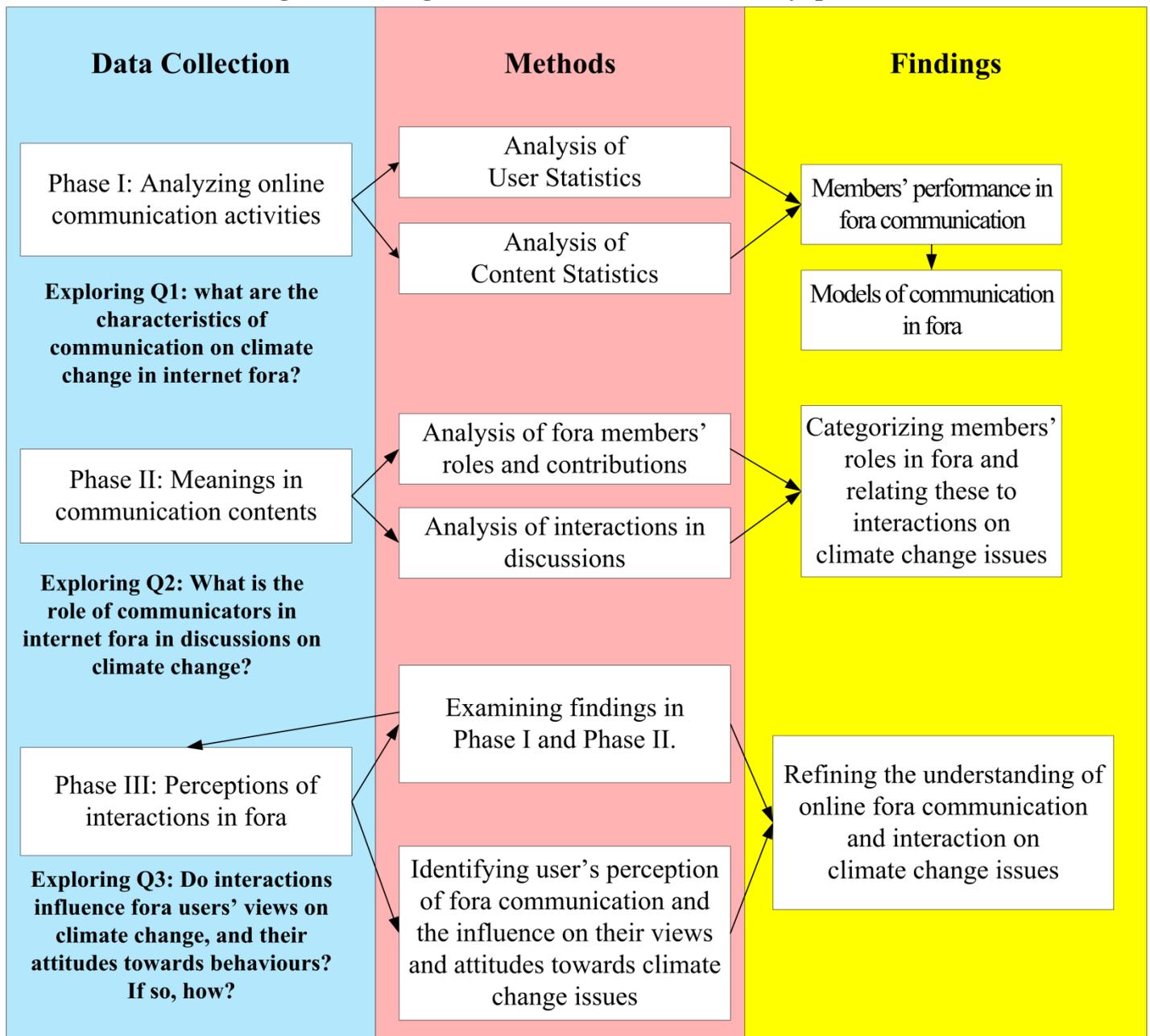
To address the first question of this thesis, regarding how individuals communicate climate change issues and interact with others through online discussions in Internet fora, archived records of interaction among fora members were examined. Records of online discussions and fora members' activities were collected to review the details of communication activities, including when and how frequently these activities were initiated by members. This phase aims to identify models of online communication activities and members' performance in the communication process.

The second phase of the research addresses the second research question, regarding what roles of online communicators in Internet fora and how these roles could have been developed. It is concerned with understanding meanings in the content of fora communication and also explores roles of communicators in internet fora. Fora discussions regarding climate change and related issue, with many responses and popular authors were selected, classified on the basis of interaction models among communicators, and analysed in terms of how the discussion was initiated and the responses received.

The third phase of enquiry, relating to the third question, regarding whether fora communication around climate change may affect individuals' perceptions and motivate them to consider changing behaviours, explores fora users' perspectives on the influence of online communications, such as the effects of communication on their views of climate change and on their attitudes towards actions to tackle climate change.

Figure 3.1 below illustrates the three phases of the research, corresponding to the three research questions.

Figure 3-1. Diagram of research in relation to key questions



As shown in the above diagram, the three phases of research apply a combination of two main methods, qualitative and quantitative. These are applied during different phases of the work, as outlined here:

1. Quantitative analyses:

- a.) of fora statistics in phase I: an exploration of general characteristics (of users and content) of online communication in the four fora, and identification of key authors (see findings in chapter 4);
- b.) of the performance of fora authors in phase II, based on data of members' interactions recorded in accessible fora archives (results are in chapter 5);
- c.) of fora users' survey regarding perceived leadership and influences on views and attitudes in phase III (results are in chapter 6).

2. Qualitative analyses were used to identify roles of fora members in the online communication process, through the analysis of topic-threads (phase II) regarding the content of participants' communication activities (results are in chapter 5).

The application of a multi-method approach requires careful consideration of possible sources of uncertainty and bias inherent in each approach (Brewer and Hunter, 2005) and reflection on variation between data sources, their collection, their analysis and interpretation. The results chapters of this thesis contain such reflections by the author.

3-2. Data Collection

Since the number of internet fora is huge and the scale (referring to numbers of members and discussion threads, volume of posting articles, and replies to those articles) and rules of operation for each vary, it was critical for the research to select a sample of suitable fora, for exploring the processes of online climate change communication. The selection process and methodology of data collection are

introduced in this section.

3-2-1. Selection of Internet Fora

To explore internet communication of climate change, it was important to identify arenas or means through which members of the public communicated on this issue. Internet fora were identified as a popular means through which people exchange ideas and information online. In order to answer the research questions it was also necessary to use fora whose members frequently discuss climate change. However, since climate change is widely discussed in internet fora also in relation to broader environmental issues, it was considered relevant to consider online fora that solely focus on climate change discussion and communication, alongside those interested in the topic but discussing also broader environmental issues and ideas, as a comparison. Therefore, criteria for inclusion of fora in this study were as follows:

1. Fora characterised by extensive discussions of climate change.
2. Fora that discuss broader climate change and other environmental issues.
3. Fora that have similar volume of posting articles, and replies to those articles, and analogical principles / rules of membership and authorship (i.e. rules of posting and replying articles).
4. Fora whose discussions are accessible (as archives of interactions to be used in this research).
5. Fora that communicate in the same language, to minimise such variations: it was agreed the fora selected should communicate in English and originate in an Anglo-Saxon context.

With these considerations in mind, “climate change-focused” fora and “broader

environmental (including climate change) - related” fora were identified. During this selection process it became evident that fora also differ in terms of their links to defined groups. In other words, some fora are direct expressions of groups existing in the physical world, while others were constituted by individuals discussing issues almost exclusively via online communication. Bearing these differences in mind, four fora were identified as the subjects of this study:

- two climate change-focused fora, which are widely known and directly linked to information exchange on climate change. One forum is a pure virtual platform (Climate Concern), the other represents an existing community network (Transition Towns).
- two fora discussing broader environmental issues including climate change: one is a virtual platform based on specific interests (OurPlanet / EarthDay¹), and the other is a forum of existing social groups (LocalSustUK).

Fora from purely virtual platforms can be regarded as social groups of members from ‘borderless’ cyberspace; selecting fora from platforms of existing social groups allows access to individuals communicating in a virtual space of discussion, for social groups that also exist physically. The two ‘real’ fora were mainly located in the UK. The characteristics of these four fora are in Table 3-1:

¹ OurPlanet on MySpace® is a very popular online social group that has attracted more than 190,000 members since 2006. Besides the forum, OurPlanet also had a photo album and even published a real book in 2008 (available on Amazon Store) advocating green lifestyles. The forum was renamed “EarthDay” on MySpace by its administrators and declared as one of Earth Day activists’ groups online in 2010. This was due to the intention of promoting Earth Day activities around the world and declining membership in MySpace® with the rise of other online social networking services (i.e. Facebook®). As the research for this thesis was conducted during Sep. 1st 2007 ~ Sep. 15th 2009, the forum is referred to as OurPlanet / EarthDay (original and renamed forum).

Table 3-1. Details of Selected Internet Fora (1)

Forum Name	Basic Info	Description	Founded Year	General Characteristics
Climate Concern	Members: 2993 Language: English Site: http://group.yahoo.co.uk/climateconcern	<ol style="list-style-type: none"> 1. Based on Yahoo!’s Group service. 2. An Internet Forum (Bulletin Board). 3. Major topics of discussion are relating to global climate change science. 4. Open to all members of Yahoo! Groups 	Jul 15, 2000 (Archive retrievable since founding date)	<ol style="list-style-type: none"> 1. Encourage well-developed and recorded text-based interaction. 2. One of few long-lasting discussion groups about climate change, allowing longitudinal content analysis for this research. 3. Also established well-developed links to other information resources about climate change including news, studies, and blog articles.
OurPlanet (2006-2010) – which became Earth Day (2010-)	Members:190,383 Friends on MySpace Language: English Site: http://uk.myspace.com/ourplanet	<ol style="list-style-type: none"> 1. A group of pro-environmentalists specifically discussing behaviour change for greener and sustainable lifestyles. 2. Widely known on the MySpace social network for sharing knowledge and tips on protecting the environment. 	May 2006 – Discussion group established	<ol style="list-style-type: none"> 1. Network-based virtual group. 2. A combination of network members including various NGOs, environmentalists, and other MySpace users who have “Our Planet” members as their friends. 3. Based on the idea of sharing common values, some celebrities (e.g. Al Gore) also joined the group on the basis of similar goals.
Transition Towns (Forum)	Members: 3697 (243 Communities) Language: English Site: http://transitiontowns.org	<ol style="list-style-type: none"> 1. Focuses on twin challenges: climate change & energy issues (e.g. Peak Oil) 2. Devoted to encouraging local community response the challenges. 3. Multi-communication platforms include BBS on Google Group, public forum, website, and their own social networks and blogs. 	May 2005 – Kinsale, UK, was the first community to use this facility. In Dec 2005 Lewes, UK, also joined	<ol style="list-style-type: none"> 1. The idea of “Transition Towns” (TT) has spread across the UK and increasingly further afield, serving as a catalyst for new communities. 2. Lewes TT tends to use this as their communication platform and records their interaction data well. 3. The online platforms are inter-networked among community committees, local authorities, and individuals. 4. Lewes now has largely transferred their transition town tasks to a series of activities on the Internet. 5. Transition Town movement is widely known as a successful example of local movement of promoting low carbon lifestyle.

Table 3-1. Background Data of Selected Internet Fora (2)

Forum Name	Basic Info	Description	Founded Year	General Characteristics
Local Sustainable UK (LocalSustUK)	Members: 2337 Language: English Website: http://group.yahoo.co.uk/localsustuk	<ol style="list-style-type: none"> 1. Based on Yahoo!'s Group service. 2. An open-content discussion forum and community portal for local and grassroots groups to create and share their own knowledge and concepts about sustainability. 3. Open membership and administration. 4. Define sustainable development as "everyone's quality of life and our actions". 5. Linking relevant communities and personal actions for sustainability. 6. Now primarily focused on community actions in U.K. 	December 2004	<ol style="list-style-type: none"> 1. LocalSustUK emphasises sustainable development which is related to their local community interests. 2. Provides updates on local groups' action progress and local projects. 3. The members have well-connected social networks. 4. Specially address how people evolve their "off-line" physical interaction and relationships into their more hybrid social networks through using new media.

Note: membership calculated as at 15th, Sep. 2009

Fora selection for this research was not driven by representativeness of Internet fora, but by the likelihood of finding active discussions on climate change issues within the fora. Though it is acknowledged that these discussions could be biased by campaigns and the influence of participants to the discussions, the processes and contents of these discussions are examples of online opinions on climate change in fora, which are frequently accessed as sources of climate change information when internet users look for peoples' discussions about the issue online. In other words, internet users access and potentially learn from discussions about climate change in these fora, whether biased/distorted or not.

In selecting the fora, it was acknowledged membership of internet fora is heterogeneous (i.e. that members' attitudes towards climate change may vary considerably in different fora) and that discussion could be biased by the attribution of fora members (i.e. environmental activists). Nevertheless, this research did not specifically deal with such diversity, apart from selecting the fora as outlined above, and therefore exploring what types of discussions were held in the fora set up for different purposes.

Control fora were not included in the analysis. The reason for focusing on fora that specifically discussed climate change and fora that discussed broader environmental issues was to have a means of comparison between fora users who seek information of climate change and those who may not have been seeking information specifically on climate change. As researchers have shown (McKenzie, 2003; Savolainen, 2011) internet users are active in choosing what information they want to access and retrieve (see active audience theory in Chapter 2). It was also acknowledged that some internet fora have specific boards or subgroups for discussing climate change issues. However this research did not include these as most

of these types of boards have very different characteristics and are set up in varied contexts, making them relatively difficult to compare with fora that have specific membership and authorship of posts. It was also critical for the research to use fora with well-documented and accessible archives of online discussions.

3-2-2. Exploring Fora Discussions

Once fora were selected, the next step was to access discussions among their members. All fora selected have accessible archives of discussions, ensuring communication activities are well-documented. These were considered adequate records of the forums' communication activities, enabling their study during the same period of time. In the thesis, the study of climate change discussions (including the process, involved roles and evaluation of influences) in the selected fora was restricted to the two-year period between the COP 13 Conference in Bali (collected fora archives from 1st, Dec. 2007) and the COP 15 in Copenhagen (collected fora archives until 15th, Dec. 2009). COP 13 was considered a practical starting point, as during the COP 13 Conference countries of the United Nations negotiated and agreed on the Bali Action Plan – also called the Bali Road Map – intended to establish the route for reaching a global long-term agreement at the COP 15 conference in Copenhagen in December 2009. The cut-off point at COP 15 was intentional as the event has resulted in huge public debate about climate change issues and actions before the conference was duly held in Copenhagen (Fisher, 2010). Since online fora have been widely perceived as online sphere of public discussion, during the period of time discussions of climate change in fora are significantly popular especially in the selected fora. In the four selected fora, information about these authors includes their

internet identity (forum ID, or nickname), their activities, and their access time. These data enable us to calculate numbers of fora members, fora members' access, numbers of members' posts (including articles and replies), and members' initiated topic-threads (see definition in Table 3-2 below).

The archives of all four selected fora preserved recorded online discussions during the two-year exploration period (Dec 2007-2009). These discussions include titles, original posts, responses, and other messages in discussion topic-threads. In addition, archives of all these four fora are accessible to all fora users, and thus these archives can be reviewed by all fora users. By registering as forum members and agreeing to the conditions of forum participation, it was possible to access and review contents in these archives. These texts can also be downloaded to a user's computer by using an internet browser (e.g. Microsoft Internet Explorer® or Google Chrome®), but in this research the information was accessed using a shareware named "Teleport Pro". Through the shareware, these fora archives are retrieved as readable pages and collected into an XML-based database. The database was established on 17th May 2010. Retrieving the data, collecting data, and storing data into the database were set as batched programmes running in a PC with Windows® environment. Thus these data (fora archives) should have been collected and categorised automatically; however, after a week's trial, some information in certain fora (Forum of Transition Towns and OurPlanet / EarthDay) were found missing (authors' information, posting IDs and date-time). It was concluded that some data were not retrieved by Teleport Pro®, which sends a request of retrieving content data to internet fora and collects received contents to a database. In these cases, missing data was collected and recorded in the XML database manually: data were retrieved as a raw text file and manually divided into several categories in a Microsoft Excel® datasheet. All data were exported into

Excel datasheets for further analysis.

The format of statistics and texts of fora communication activities retrieved from fora were not consistent, as the fora are based on different internet web platforms. The formats of these data usually required pre-processing before statistical analyses could be carried out. To do so, information was retrieved from the raw data (including numbers of articles and replies, length of posts, authors' ID, date of posts, numbers of topic-threads and participants in topic-thread discussions) and used to check the statistics and texts downloaded from the fora. This ensured that information contained was comparable among the four fora.

3-2-3. Web Survey

The above mentioned sources of data do not provide insight into fora members' views about communication activities in fora; to obtain this, an internet web survey was conducted among members of the four fora selected. This elicited fora users' backgrounds, their frequency and experiences of accessing and using fora, reasons for access and participation in fora, perceptions of online communication in fora, and influences of the fora communication process on their attitudes and actions.

It is recognised that fora members' prior beliefs and commitments are of fundamental importance in interpreting the findings of this data collected. Bias may be inherent in the fora discussions, and the effect of collective opinions should also be considered when analysing climate change communication process and participant roles in the process in fora.

3-3. Terminology in Research

Before the methods used in this research are outlined, specific terms used in describing online communication are described here. These terms are frequently used on the Internet and online fora, and will be referred to throughout the thesis (Table 3-2). This table also includes some terms coined specifically by the author for the purposes of the research in this thesis.

Table 3-2. Fora-specific Terminology Used in the Thesis

Nouns (adapted from vBulletin®) ¹	
Forum	<p>A service-based platform in the internet world that enables interaction among individuals by posting and replying information asynchronously. Forum provides communication service including: a) Posting and / or forwarding articles / contents; b) Replying to articles / contents or giving comments; and c) Forwarding contents inside / outside the forum.</p> <p>Membership is usually required in using internet forum for posting and replying messages.</p>
Posts (incl. Article and Reply)	<p>Nouns that describe contents generated by fora members in their discussion activities; to categorize these contents, posts initially written by fora members, in text form, and circulated in fora (accessible by fora users), are regarded as articles in the research; messages as responses to the articles or other replies (also written by fora members and circulated in fora) are regarded as replies. Both articles and replies should include types of information, commentary or discussion. Note that terms can be also used as verbs to denote action (‘to post’, ‘to reply’).</p>
Topic-Thread	<p>Discussions or debates in fora formed by the combination of articles and replies. A post (usually article) attracts replies from other forum users, and members post articles / replies or respond to others’ replies in topic-threads as a way of initiating / joining discussions (Morzy, 2009); the development of discussion and its generated contents are regarded as topic-thread in the research. Fora users may “initiate” a topic-thread by posting an article in a board and raise discussions.</p>
Forward	<p>Posts (either from other fora boards or information sources in internet) relayed to other users with the purpose of sharing contents. The approach of forwarding includes posting the relay contexts (texts or hyperlinks of the posts) as new articles in fora boards, emailing the contexts to other fora users, etc. Note ‘forward’ can also be used as a verb (‘to forward’).</p>

¹ vBulletin® is a widely used platform establishing and developing internet fora. As a result, many fora now follow policies set by vBulletin.Org, a global community dedicated to extending vBulletin® services which created a series of fora policies (<http://www.vbulletin.org/forum/info.php?s=33eb158a209967eae7ebb78cfa7b03a&do=rules>).

Archive	Recorded communication activities in a forum, including posted articles, replies, authors' names for unique identity in fora (as regarded fora members' "ID"s in the research), posting time, etc. as defined users' communication records (Bruckman, 2004, 102-3). Most internet fora have well preserved archives of communication activities for members' references of discussion (including topics and contents generated) in the fora.
Terms describing people in fora (adapted from vBulletin®)	
Fora Users	Individuals who use internet fora to seek and exchange information are regarded as fora users in the research. These fora users refer to anyone who accesses the fora, including fora members and non-fora members that will defined as follows.
Fora Members	Fora users who not only access to fora, but also register to fora are supposed as their members in the research. It is also recognized that fora members are those who have permission to post and reply articles in fora, as regulation widely applied in many fora.
Authors	Fora members who post or reply articles. By posting or replying articles in fora, these authors are also members who can only interact and participate in topic-thread discussions in fora.
Repliers	Members who reply to others' posts in the discussions in online fora. Fora members respond to others in fora by replying their articles and thus they can have discussions with each other. As a result, these members sometimes in the thesis are specifically called "repliers", and they are also authors who posted replies to express their ideas, deliver information or interact with other authors.
Terms specifically created to describe fora users' performance in communication activities for this thesis	
Volume	Number of words of articles and replies as an indication of text length in the thesis research. Nevertheless, only the volume of accessible and well preserved (in fora archives) content is considered and calculated in the research.
Lifetime	Period of an individual's access to the forum is suggested as fora users' "lifetime" in fora, expressed in days from his / her registered date and the last active login time (during the period covered in this research).
Frequency	Number of times a member has accessed the forum during his / her active forum lifetime. Members' frequency of access is calculated by dividing access times with his /her lifetime in the forum (to find out how often members accessed their internet forum).

3-4. Frameworks for Analyses of Fora Discussions

Two different ways of analysing online social interactions were utilized for this research: a) quantitative statistics of when, how, and what users post and reply in fora, and what role they assume when interacting in the forum; and b) qualitative analyses of discussion texts that represent fora users' thoughts, understandings, feelings, and perceptions of issues. These methods are supported by analyses that have been carried out in various research fields, as introduced as below.

3-4-1. Quantitative Analysis of Fora Data

Communication activities can be measured by the intensity of communication, frequency of activities, content length and other statistics (see Table 3-3 below). In a study about social roles in internet fora, Morzy (2009) proposed that topics, posts, and user characteristics fora can provide insights into communication activities. These aspects can help researchers to explore the development of online social networks, and social roles within the interactions. Many authors have also carried out quantitative analyses of fora contents from a variety of research traditions (i.e. Burnard, 1991, 1996; Krippendorff, 2004; Riffe *et al.*, 2005). Though essentially limited to examining texts for the frequency of occurrence of identified terms (i.e. word counts), Riffe *et al.* (2005) proposed analysing contents through a more in-depth and systematic quantitative approach,. This quantitative content analysis should include classifying contents into categorizes, coding contents, sampling contents to enhance reliability, and designing a framework of analysis (Riffe *et al.*, 2005). By selecting contents randomly from messages and conducting coding procedures on the basis of coding sheets, the information obtained should allow for assessment of data

quality and enhance the examination of theories (Ibid.).

A similar approach to Riffe *et al.* is developed in this thesis in order to establish content statistics for analysing characteristics of communication in fora. Information and contents of fora, including numbers of topic-threads, posted articles and replies, fora members' replies, comments and online discussions (as topic-threads), were collected from selected fora. This information was then categorised according to content statistics of fora posts, and user statistics of fora members' activities. A breakdown of this information is shown in Table 3-3.

Table 3-3. Data Types of Fora Statistics

Fora Data	Collected Statistics
Content Statistics (of Fora Posts)	Types of Posting
	Length of Posting
	Distribution of Posts (by ranking of authors' contribution)
User Statistics (of Members' Activities)	Authors in Members
	Authors who Post Articles (as Posters)
	Authors who Post Replies (as Repliers)
	Authors who Obtained Replies in Research Period
	Active Author (>1post Author)
	Authors' Performance

Having collected this data, communication activities in four selected fora can be evaluated and compared through their characteristics of the communication process. In Chapter 4, the interaction of fora members is explored by analysing post contents, authors of postings, posting date and time, and length of posts; the similarities and differences between communication processes in these fora are also compared.

3-4-2. Quantitative Analysis of Authors' Performance

The second type of quantitative data analysis undertaken in this research focuses on fora authors' performance. Since fora contents are mainly posted (and replied to) by authors, analyses of authors' performance should help understanding interactions in fora communication activities. Relatively few studies consider users' quantitative performances in online fora; in a study by McDonald's (2008), the ability of forum users to initiate communication and collaboration in fora was evaluated by their numbers of posts using descriptive statistics. Morzy (2009) also proposed that the volume of posts by internet fora users, length of posts and topic-threads could be used to calculate content statistics of fora, revealing users' participation levels in fora communication. The result of Morzy's study – which focussed only on users' participation levels in online discussions - shows that users are motivated to post more contents if they participate in threads.

Drawing upon McDonald's and Morzy's research, a new method is developed and used here for evaluating and ranking fora authors' performance. In the research, the analysis should also include their frequency of participating in discussion and their ability of networking with others. Moreover, a "baseline" setting has to be applied to define the most active authors, the most frequent authors, and the most capable of networking authors before their attributions can be clearly identified.

An assessment of an author's performance of activeness and frequency is conducted by numerically calculating fora authors' posts and authors' replies to the authors' posts, to evaluate users' activeness, in addition to authors' frequency of fora access and participation in discussion.

Several criteria are considered in order to assess authors' performance in fora communication activities, including how long or how often authors participate in

contributing online communities, and how personal emotion could be motivated or associated with messages. Thus an examination of fora authors' performance is expanded in this thesis to include the authors' activeness and frequency of contributing and participating in online communication, as well as authors' opinion leadership. To categorise these criteria for evaluating authors' performance, three indices of authors' performance are established to denote their activeness, participation frequency, and networking ability within the forum. These three performance indices - authors' activeness, participation frequency, and networking ability (labelled as alpha, beta and gamma) - are detailed below.

In terms of measures, authors' activeness can be regarded as volume of authors' posts, and length of posts and threads, which are calculated by the numbers of authors' posted articles, numbers of authors' replies, and length of these posts. The index is to reveal users' participation levels in fora communication.

Authors' participation frequency is an indication of frequency of access to fora and the interval between posting articles or replies in these fora; the participation frequency is calculated from topic statistics, post statistics, and user statistics, following Morzy's study (2009) (mentioned earlier in this Chapter). In this thesis, the participation frequency is used to specify authors' involvement in joining discussions and expressing ideas in the two-year research period.

Authors' networking ability is the authors' performance of networking and interacting with others by initiating discussions and encouraging others' responses. The index is measured by number of initiated topic-threads and of obtaining others' responses in the research.

With these indices, a threshold has to be applied to define the most active authors, the most frequent authors, and the most capable of networking authors before their

attributions can be clearly identified. Keller and Berry (2003) suggest that the “influential” individuals in group communication processes are the top 10% of active authors because these are the most involved in the communication process. Other works also recognise and use this measure (i.e. Watts & Dodds, 2007; Bakshy *et al.*, 2011). It is possible that similar influential authors (or ‘influentials’, as Keller and Berry, 2003, use) could exist in internet fora. However, in this research, it is argued that Keller & Berry’s criteria for selection of influentials are not sufficient: in this thesis it is maintained that not just the activeness of authors should be considered, but also the frequency of authors’ participation and their networking ability – before some authors can be regarded as “opinion leaders”. This 10% threshold in the three indices therefore is used in this research: only fora authors ranked as top 10% in the three indices of authors’ performance are regarded as “key authors”, that is, authors who frequently participate and activate discussions in fora by initiating topics and interacting with fora members. (See definition in Box 3-1, and chapter 4 for criteria defining inclusion in the top 10%).

Box 3-1. Definition of Key Author

Key Authors (KA). Authors who are active, frequently participating in online discussions (as fora communication process), and capable of networking with other fora members and activate discussions in the online fora. They are significant active authors who post a considerable volume of posts (articles and replies), have a high frequency of joining fora, and actively network with others by initiating discussions and replying to other members. It is supposed in the research that key authors should play significant and influential roles in the online communication process.

As a result, fora authors’ ranking table of three performance indices are developed for this research. The development of authors’ performance indices and

lists for evaluating level of activeness, participation, and networking ability is outlined in the sections below.

1. The α List: Author's Activeness Performance Table

The study sets authors' performance ranking list (α list) of activeness, which can be represented as follows:

$$\alpha_p = \frac{ATP}{TP} ; \alpha_r = \frac{ATR}{TR} ; \alpha_w = \frac{ATW}{TW}$$

Note:

ATP: Author's Total Posting articles; TP: Total Posting articles in forum;

ATR: Author's Total Replies; TR: Total Replies in forum;

ATT: Total of Author triggered Topic-Threads; TT: Total Topic –Threads in forum;

ATW: Author's Total post length by Words; TW: Total Length of Words in forum

The α list:

$$R(\alpha_p) = \text{Rank of } \alpha_p ;$$

$$R(\alpha_r) = \text{Rank of } \alpha_r ;$$

$$R(\alpha_w) = \text{Rank of } \alpha_w$$

In the α list, $R(\alpha_p)$ represents the score that an author obtains from the ranking of posted articles. The ranking is calculated based on the fraction (α_p) of an author's number of posted articles out of the total number of posted articles in the forum. $R(\alpha_r)$ is the score that one author obtains from the ranking of replies. The ranking is calculated based on the fraction (α_r) of an author's total replies out of all replies in the forum. $R(\alpha_w)$ is the score from the ranking of total posting length (number of posted words in posts and replies). The ranking is calculated based on the fraction (α_w) of author's total word count out of the total number of words in posts in the forum.

Since the numbers of posts and authors are similar in each forum, the total ranking scores in activeness analysis can be calculated as 0 to 100, where the highest

rank obtains 100 and the lowest rank obtains 0. This is calculated using the following formulae:

$$S[R(\alpha_p)] = 100 - \frac{100}{Q\alpha_p} \times [R(\alpha_p) - 1]$$

$$S[R(\alpha_r)] = 100 - \frac{100}{Q\alpha_r} \times [R(\alpha_r) - 1]$$

$$S[R(\alpha_t)] = 100 - \frac{100}{Q\alpha_t} \times [R(\alpha_t) - 1]$$

$$S[R(\alpha_w)] = 100 - \frac{100}{Q\alpha_w} \times [R(\alpha_w) - 1]$$

Where $Q\alpha_p$ presents the range of α_p ranking from the lowest to the highest; $Q\alpha_r$ presents the range of α_r ranking; $Q\alpha_t$ presents the range of α_t ranking. In the following calculation, α_{ACT} is normalised as the ranked score of authors, which will be calculated with the results of the frequency analysis:

$$R(\alpha_{ACT}) = \text{RANK of } \sum \{ S[R(\alpha_p)] + S[R(\alpha_r)] + S[R(\alpha_t)] + S[R(\alpha_w)] \};$$

and

$$S[R(\alpha_{ACT})] = 100 - \frac{100}{Q\alpha_{act}} \times [R(\alpha_{ACT}) - 1]$$

where $Q\alpha_{act}$ represents the range of $R(\alpha_{ACT})$ ranking from the lowest to the highest. The value of the $R(\alpha_{ACT})$ score is then used to rank for authors' performance of activeness; the top 10% of authors in ranking performance in the α list will be identified as the most active ones.

2. The β List: Author's Frequency Performance Table

Authors' frequency performance is the assessment of their posting frequency, replying frequency, and average interval of posting and replying in an 'author's

lifetime' (explained below). It also sets a score list (β list) for calculating authors' participation intensity in the online communication process, which can be represented as follows:

$$\beta_p = \frac{ATP}{APD^*} ; \beta_t = \frac{ATT}{APD^*} ; \beta_{ld} = \frac{APD}{ALD^*}$$

Note:

ATP: Author's Total Posting articles; APD: Author's total Participation Dates in forum;
 ATT: Total of Author triggered Topic-Threads; ALD: Author's participation "lifetime" span.
 *calculated by unit: Day (APD>0, ALD>1)

The β list:

$$R(\beta_p) = \text{Rank of } \beta_p;$$

$$R(\beta_t) = \text{Rank of } \beta_t;$$

$$R(\beta_{ld}) = \text{Rank of } \beta_{ld}$$

In the β list, the "author's lifetime" (ALD) (in days) is calculated based on the interval between his/her first posting date (whether posting articles or replying to others' posts) and his/her latest posting date, $R(\beta_p)$ represents the score (ranked β_p) of posting frequency among total authors. The post frequency is calculated based on the number of authors' total posted articles divided by the author's lifetime, and the author's lifetime, on the Internet forum. The next score, $R(\beta_t)$, represents an author's ranking of the frequency of triggering a topic-thread. The ranking is calculated based on the number of an author's total triggered topic-threads divided by the author's lifetime (in days) in the forum. Finally $R(\beta_{ld})$, represents the ranking of post length in the author's lifetime. The ranking is based on the word lengths of an author's total posts divided by his / her days participating in the forum communication activities.

The ranking scores in the frequency analysis are calculated using the following

formulae:

$$S[R(\beta_p)] = 100 - \frac{100}{Q_{\beta p}} \times [R(\beta_p) - 1]$$

$$S[R(\beta_t)] = 100 - \frac{100}{Q_{\beta t}} \times [R(\beta_t) - 1]$$

$$S[R(\beta_{ld})] = 100 - \frac{100}{Q_{\beta ld}} \times [R(\beta_{ld}) - 1]$$

Where $Q_{\beta p}$ presents the range of β_p ranking from the lowest to the highest; $Q_{\beta t}$ presents the range of β_t ranking; $Q_{\beta ld}$ presents the range of β_{ld} ranking. In the following formula, β_{FREQ} is normalized as the rank of total communicators, which can be combined with the results of the above activeness analysis:

$$R(\beta_{FREQ}) = \text{RANK of } \sum \{S[R(\beta_p)] + S[R(\beta_t)] + S[R(\beta_{ld})]\}$$

and

$$S[\beta_{FREQ}] = 100 - \frac{100}{Q_{\beta FREQ}} \times [R(\beta_{FREQ}) - 1]$$

where $Q_{\beta FREQ}$ presents the range of $R(\beta_{FREQ})$ ranking from the lowest to the highest. The score value of $R(\beta_{FREQ})$ is used to rank fora authors' frequency performance; the top 10% ranking performance authors in the β list will be identified as the most frequently participating fora participants.

3. The γ List: Author's Networking Ability Performance Table

The analysis of authors' networking ability is an evaluation of authors' ability to initiate topic-threads and obtain responses, in an author's lifetime. In the research, authors' ability to raise more discussions should also contribute to his/her influences on fora communication processes. The score list (γ list) is calculated using the numbers of topic-threads and responses triggered by authors. This can be represented

as follows:

$$\gamma_t = \frac{ATT}{TT} ; \gamma_r = \frac{AR}{TR}$$

Note:

ATT: Total of an author's initiated topic-threads;

TT: Total topic-threads in research period;

AR: Repliers recorded in an author's initiated topic-threads;

TR: Total Repliers recorded in forum

The γ list:

$$R(\gamma_t) = \text{Rank of } \gamma_t;$$

$$R(\gamma_r) = \text{Rank of } \gamma_r;$$

The γ list is based on the ranking of two fractions (" γ_t " and " γ_r "). The first fraction " γ_t " refers to the number of an author's initiated topic-threads divided by the total recorded topic-threads in fora during the research period. This fraction represents an author's ability of initiating discussions in forum and can be ranked as " $R(\gamma_t)$ ".

In the second fraction " γ_r " refers to the number of repliers who respond to an author's initiated topic-threads divided by total repliers in forum. This fraction represents an author's ability of having interactions with other fora members and can be ranked as " $R(\gamma_r)$ ".

Based on the ranking of the two fractions, authors' ability of initiating topic-threads is quantified as the ranking of numbers of initiated topic-thread and replier in the topic-threads during the period the research considers. $R(\gamma_t)$ is the ranking of γ_t and γ_r , and it is used in scoring authors performance. Scores of ranking in the four selected fora can also be presented as the following formula:

$$S[R(\gamma_t)] = 100 - \frac{100}{Qrt} \times [R(\gamma_t) - 1]$$

$$S[R(\gamma_r)] = 100 - \frac{100}{Q_{rr}} \times [R(\gamma_r) - 1]$$

Where Q_{rt} presents the range of γ_t ranking from the lowest to the highest; Q_{rr} presents the range of γ_r ranking (from the lowest to the highest). In the following formula, it is normalised as the $R(\gamma_{NET})$, which represents the rank of the score based on the two fractions, as shown below:

$$R(\gamma_{NET}) = \text{RANK of } \sum \{S[R(\gamma_t)] + S[R(\gamma_r)]\}$$

and

$$S[\gamma_{NET}] = 100 - \frac{100}{Q_{rNET}} \times [R(\gamma_{NET}) - 1]$$

Where Q_{rNET} represents the range of $R(\gamma_{NET})$ ranking from the lowest to the highest, and $S[\gamma_{NET}]$ refers to the score value of $R(\gamma_{NET})$. The score value $S[\gamma_{NET}]$ is then used to rank authors' networking ability performance; the top 10% ranking performance authors in the γ list will be identified as authors who are the most capable in networking (initiating discussion and interacting with other fora members) in the forum.

As a result, authors' performance on activeness, frequency, and networking will form three quantitative indicators of authors' performance as $S[\alpha_{ACT}]$, $S[\beta_{FREQ}]$ and $S[\gamma_{NET}]$. As definition of key author offered above, authors who are in top 10% ranking of the three indicators will be regarded as the "key authors" in the research. That is, if an author is subject to all these three lists, it is supposed as a key author in his / her belonging forum.

By identifying key authors in the selected fora, the communication process between these key authors and other fora members are addressed. Key authors (KAs),

if existed on the basis of the three index lists, should actively participate in fora communication and intensive interact with others. However, the communication process will be explored not only by finding out key authors and their performance based on statistics of their contributions, but also on an assessment of their interactions with other fora members, which is conducted in the research on the basis of a qualitative approach as introduced below.

3-5. Qualitative Analysis of Fora Discussions

The fora communication process is the process of online discussions among fora members, which generates contents that are accessible by all fora users and could be influential on these users. The format of a topic-thread can be characterised by an article that initiates a discussion, followed by replies that establish the discussion thread. To depict the communication process presented in topic-threads, topic-threads initiated by “key authors” and the contents generated by the interactions between the KAs and other fora members are specifically selected and studied, for their interactions (as topic-threads) are found major contents of online discussion in selected fora. Archives of the discussions exist either as hyperlinked articles in mainstream media and online message providers, or as archives on blog sites that maintain a record of a given day’s content. These fora archives and recorded interactions preserve contents and format of the topic-threads ever discussed by fora members.

To study the interactions between KAs and other fora members and to clarify communication roles in the major part of fora communication process, a qualitative

analysis of the recorded contents of these interactions is further applied in the research. As discussed above (See Section 3-4), Riffe and colleagues (Riffe *et al.*, 2005) demonstrated a series of sophisticated methods that content can be analysed as long as the data can be retrieved and quantitatively coded. Nevertheless, Hinduja and Patchin (2008) propose conducting a qualitative content analysis by analysing interactions in online social groups on Myspace, and they argue that the interactions can only be depicted by the qualitative approach. They also suggested that analysing contents generated by internet communities should focus on the users' interactions reflect by the texts rather than simply on words, and on semantic relationships rather than just on presence of texts and calculation of authors' posts and replies.

As to the study of users' interactions in internet fora, Bodendorf and Kaiser (2010) also proposed a text-mining approach to evaluate the level of support of authors' posts in forum discussions. The level of support was detected by analysing the users' attitudes in forum posts and replies. They argued that this form of text-mining can detect polarity of attitude, i.e. positive and negative, by applying a process-based algorithm that took learning into account. Bodendorf & Kaiser's suggestion of analysing the level of support of individuals' posts is indeed useful to identify opinion leaders online; however, their text-mining approach seems to filter out some meaningful information, for their approach use keywords to establish the learning process of their algorithm and some important connotations in online discussion posts are neglected.

Drawing upon these studies, qualitative analysis of fora content in the research was undertaken by 1.) selecting contents for qualitative analysis from archived records of fora communication process, 2.) categorizing fora users' attitudes in discussions and their interactions presented in topic-threads, and 3.) coding contents

in selected topic-threads according to the categories set in previous step. Unlike Bodendorf and Kaiser's approach, this thesis uses qualitative analysis to analyse online discussions in key authors' initiated topic-threads. Instead of the text-mining approach that is highly dependent on the performance of an algorithm, the qualitative analysis of topic-threads in this thesis is based on qualitatively determining the level of support for fora member's opinion. This involved reading through the selected topic-threads in great detail, coding each response to the initial post as well as each response to subsequent responses (i.e. the whole topic thread), in terms of the attitudes of individuals who took part in the discussion.

3-5-1. Topic-Thread Selection

Though it is considered a useful approach for exploring the processes and the roles of fora members involved in online communication as argued above, not all topic-threads are indicative of climate change communication in a forum however. Some topic-threads relate only remotely to climate change; moreover, there are topic-threads that were initiated by authors who seldom use fora, while key authors' initiated topic-threads are found massive parts of discussion in four selected fora according to the descriptive statistics collected. The total number of topic-threads in each forum has been listed in Appendix III. It was found that across the four fora, key authors initiated more than 78% topic-threads in four selected fora; on average only 38.6% of total topic-threads were relevant to issues of communicating climate change online.

As a result, purposely selecting topic-threads for conducting qualitative analysis of the contents is supposed necessary in the research. In order to find discussions between key authors and other fora members, which occupied major part of collected

data (archives in selected fora), key authors' initiated topic-threads are selected for the qualitative analysis of topic-thread contents; to exclude from topic-threads that are not relevant to climate change discussions, only topic-threads initiated by key authors and attracted discussions of issues relevant to climate change were selected as the contents for qualitative analysis in the research.

This strategy should ensure the exploration of fora users' discussions about climate change in relation to major communication activities in fora. Based on the sampling strategy and criteria, eight topic threads, two from each forum, were chosen (Table 3-4).

Table 3-4. Topic-Threads Chosen from Four Fora

Topic-Thread (initiated by KA)			
Topic SN	Title of Topic-Thread	Sampled Fora	Topic
SN1	Global Warming - a century of warming or not?	ClimateConcern	DCC*
SN2	Tropical tropospheric warming...today's IPCC scientist report		DCC*
SN3	What are you doing to be green?	OurPlanet/ Earth Day	RCC**
SN4	Go NUCLEAR!!!!!!		RCC**
SN5	Hopenhagen to Brokenhagen at Copenhagen - "Where do we go from here?"	Transition Towns	DCC*
SN6	Collaborative approach: comments invited.		NW for DCC** *
SN7	Home owners Are Not Ready For Zero Carbon Homes, Research Shows.	LocalSustUK	RCC**
SN8	EU forms algae group, plans first conference.		RCC**

*DCC: Directly relevant to Climate Change issues; **RCC: Relevant to Climate Change issues; ***NW for DCC: Networking activity for Directly relevant to Climate Change issues.

Table 3-4 shows the topic-threads that refer to climate change issues, and were initiated by key authors. All topic threads selected were initiated by key authors in most discussions, and were directly relevant to climate change. Topic-threads SN1

and SN2 were selected from ClimateConcern Forum; Topic-threads SN3 and SN4 were selected from OurPlanet / EarthDay Forum which had indirect links to broader environmental topics; Topic-threads SN5 and SN6 were selected from the Transition Towns Forum; Topic-threads SN7 and SN8 were selected from LocalSustUK Forum which also had indirect links to broader environmental topics. The selection of topic-threads aims to present the nature of discussion in each forum: ClimateConcern and Transition Towns fora discuss topics more directly relevant to climate change issues, OurPlanet / EarthDay and LocalSustUK fora discuss broader environmental issues.

3-5-2. Categorizing Fora Users' Attitudes and Interactions

The content of these selected topic-threads were classified and categorised to explore and evaluate fora users' roles, including their attitudes and interactions in the communication process of online discussions. In the research, since the selected contents for the qualitative analysis are key authors' initiated topic-threads that are discussions between key authors and other fora members, their attitudes toward climate change and their reactions to other members' opinions are categorised to identify roles of key authors and other fora members' responses to KAs' initial posts.

Before analysing the topic-threads in selected fora, a coding table is categorized to identify types of attitudes and the interactions (termed here "codes of attitude"). These codes indicate whether the responses to the initial posting were of general support, neutral or challenging of the ideas or actions discussed; and whether they reflected on communicating with other participants to the discussion (but not directly responding to the original post) (see Table 3-5).

Table 3-5. Coding of Support / Challenge in Replier’s Posts

Description of attitude coded		Code of Attitude
Express Support for OP*		SO
Express Support for Actions of Tackling Climate Change Issues		SB
Communicate with Others (not directly respond to OP*)	Agree with Viewpoints in Other Replies	C1
	Disagree / Challenge Viewpoints in Other Replies	C2
	Raise Questions to Other Replies	C3
	Reply to Questions in Other Replies	C4
	Present Clear Leadership or Strong Opinions on The Development of Discussions	C5
	Other Communication Activities	C6
Neutral Activities	Raise Non-Challenging Questions to OP*	N1
	Answer Questions	N2
	Change to Other Subjects	N3
Neutral Activities toward Action for CC issue	Open Questions	NB1
	Not Showing Preference	NB2
Reject / Raise Challenge or Questioning to OP* (D)	Reject OP*	D1
	Raising Questions to Challenge OP*	D2
Reject / Raise Challenge toward Actions for CC		DB

*OP: Original Posts by key authors (i.e. posts by key authors that generate the topic thread).

In Table 3-5, key authors' posts supporting actions for tackling climate change are marked as (S), and KAs' posts challenging the IPCC's argument of taking urgent actions for climate change are marked as (O). If KAs' posts hold neutral attitude towards climate change, these posts are marked as (N). Several coding categories of

fora members' attitudes and interactions (except KAs') are further classified, including supporting attitudes toward key authors' original posts (SO), supporting attitudes toward climate change actions (SB), communicating (with others) (C1 ~ C6), neutral activities to OP's posts (N1 ~N3), neutral activities toward climate change issues (NB1 ~ NB2), declining OPs directly (D1), or raising challenging questions (D2).

The discussions were repeatedly categorised and reviewed until the categories of attitudes and interactions revealed in contents was stable and applicable throughout the topic threads. However, it is evident from Table 3-5 that some coding could be interpreted differently, for instance 'changing to other subjects' could be considered a neutral response (instigated by a genuine reason to present a different argument), or as a challenging response (to divert the discussion elsewhere). This example demonstrates the inherent difficulty in qualitatively interpreting text and the need to do so in relation to relevant parts of the discussion, not solely with reference to text immediately preceding the reply. Even with both coders, some parts of the topic threads were ambiguous. Nevertheless, the process of categorization allows the research to extract authors' attitudes and interactions from the exchange of information and viewpoints.

3-5-3. Coding Contents in Selected Topic-Threads

By categorizing these attitudes and interactions, key authors' and repliers in KAs' initiated topic-threads are coded, and their appearance and performance become measurable, quantitative data. Qualitative analysis is used to code the attitudes and interactions from archived online fora contents. To conduct the analysis, the categories sorted as Table 3-5 is further regarded as the coding table, and a numerical code was given to each coded part of the text. Based on the coding table, KAs' and

repliers' attitudes and their interactions in topic-threads were recorded and classified, in the first instance on the basis of whether they support or challenge the views of the text they are referring to.

The codes were devised through comparison and agreement of codes allocated to text from a non-selected topic thread by the researcher and a second independent coder. This approach of coding attitudes and interactions in topic-threads leads to description of fora members' roles in key authors' initiated topic-threads. Roles are identified based on their reactions to initial posts and other participants' replies.

The benefits of conducting a qualitative topic-thread analysis therefore include identifying content types and elements in topic-threads, understanding relationships between fora members who participate in topic-thread discussions, depicting roles in the communication process and clarifying their interactions. Through the coding process, the qualitative analysis of fora topic-threads can generate "content statistics" by calculations of fora members' attitudes and interactions in topic-threads. This information may in turn offer more insights on the communication process, roles in the process, and influences of the topic-thread discussions on fora members' attitudes. Nevertheless, since the analysis relies on content from internet fora archives, potential biases inherent in fora posts should be considered. Members' prior beliefs and commitments are of fundamental importance in interpreting the findings and implications for communication. Though it is very difficult to classify subtle interactions in the selected content, the process of content analysis helps to understand where ambiguity exists in text-based online interactions. To reduce the subjectivity while maintaining the validity of the analysis, trends revealed by the topic-threads analysis are further examined through comparison with fora members' self-reported views on opinion leadership in each forum. This was carried out through a

questionnaire survey as discussed in the following section.

3-6. Eliciting Members' Perceptions of Online

Communication

As discussed in Section 3.5 and the research diagram (See Figure 3-1), the qualitative methods were to elicit members' perceptions of online communication, as well as to validate findings from quantitative analysis of fora statistics. In order to collect information about fora users' perceptions of their own activities in fora, it will be needed to contact these users. The way in which was carried out is described below.

3-6-1. Administering the Questionnaire

There are several ways to collect people's ideas and perceptions, such as sending questionnaires by posting or calling on the telephone, or launching focus groups to reach internet users. Each of these approaches has advantages and disadvantages. For instance, questionnaires are deployed as a research tool that differs from qualitative social science research methods in that they do not allow the respondents to decide which information they are willing to offer (De Vaus, 2002); instead, questionnaires consist of a series of questions defined by the researcher for specific directions of study. Due to its restricted format, questionnaires do not allow respondents to explain freely the thinking and decision-making processes underpinning their responses. Table 3-6 below shows approaches for administering questionnaires.

Table 3-6. Questionnaire Types Sorted by Distribution Methods

Questionnaire Type	Specification
Questionnaire distributed by post	Relatively cheap and can reach a very large number of people. However, it often suffers from poor response rates and ignorance about who (which member of a household) completes it.
Questionnaire distributed by phone	More expensive than a mail survey but still an efficient way to access large numbers of people. Usually needs to be short, and may bring bias into research.
Face-to-face questionnaires (Structured Interview)	Enables researchers to target the appropriate proportions of respondents and avoids bias involved in not knowing who responds. However, it is time consuming and thus expensive.
Questionnaire deployed by Internet	Cheap, fast, and efficient. But only available to certain internet users and open to bias and deliberate fraud.

Source: Edited based on Wright. K. (2006) “*Researching Internet-Based Populations: Advantages and Disadvantages of Online Survey Research, Online Questionnaire Authoring Software Packages, and Web Survey Services*”, *Journal of Computer-Mediated Communication*, Vol.10 (3), 2005

As shown above, deploying questionnaires usually requires information on respondents such as postal address, phone numbers, or emails. In contexts like internet fora, since users are generally anonymous and there are no physical contacts available, difficulties are encountered in using questionnaires to investigate users’ perceptions. In order to overcome this, web-based surveys that deploy questionnaires were utilised, to collect responses directly from online fora users. For online social groups that regularly use the Internet and who are therefore familiar with online layouts and techniques, deploying online questionnaires has been found to be a useful method of data collection and for eliciting opinions (Couper, Traugott, & Lamias 2001; Sills & Song 2002).

An online questionnaire can be regarded as a standardised list of questions that therefore enables the response process to be undertaken automatically (Bosnjak & Tuten, 2001). The advantages of deploying questionnaires online are presented in Table 3-6, but its disadvantages should also be addressed. Using web-based surveys for questionnaire research is fast, cost-effective, provides a neat layout with multi-media presentation so that respondents can easily be directed to questions they need to answer, and it provides instantaneous data entry. The research cost of using the Internet to conduct a web survey is relatively low compared to other formats such as mail distribution (See Table 3-6). It is acknowledged that a relatively low response rate of a web survey can be expected compared with face-to-face or phone surveys.

In this research, a web survey was used to collect internet fora users' perceptions of their online communication process and climate change issues. Fora members were directed to the survey through hyperlinks made available in selected fora. This avoids the challenges of assembling focus group or deploying traditional questionnaires via email or telephone calls that require personal contacts or details of personal information. Information collected by online questionnaire was used to compare and validate findings from analysing fora statistics and contents in the research. Based on Bryman (2001), a questionnaire was developed for the web survey in six steps explained below.

1. Designing & Refining the Questions

There are two major considerations in designing a questionnaire: obtaining accurate relevant information, and improving the response rate (Bryman 2001). For this study, it is important that the questionnaire should include people's usage of

internet and fora, their attitudes towards climate change issues, and perceptions of climate change communication in internet fora. The length and contents of the questionnaire were pre-tested to ensure a completion time of 5-10 minutes. The questionnaire was piloted and revised on several aspects including how and what questions will be asked, the order that they are asked, and how they will be presented (e.g. font types, wording). To increase the response rate, the questionnaire also contained an introduction that explained the purpose of survey, the importance of respondents' participation, the researcher's role in the research, and included a statement guaranteeing confidentiality.

2. Designing the Questionnaire Draft

In the web survey, questions were arranged on two web pages with interactive forms, in five sections to help respondents navigate the relevant questions. Questions were arranged from general to particular, from factual to abstract, and from relatively easier to more difficult to answer. Socio-demographic questions were placed in the last part as Bryman suggests. The first questions were closed format questions, while some of the later ones used an open-ended format to encourage respondents to provide more detail regarding their views. Although open-ended questions can be difficult to code, they allow the collection of some words, terms and views that can be compared with the previous phase of content analysis of the topic threads. Further, the questionnaire was devised to allow respondents to have some options for answering selectively some questions, using a "Skip Method" approach: respondents could begin with a closed ended question and, depending upon the response, either go to a scale response question to explore the answer in greater detail, or "skip" the scale response question altogether.

3. Piloting

The questionnaire was pretested and piloted on a small sample of selected fora users. These fora users are invited filling the draft of questionnaire to evaluate their responses. Several key aspects of the questionnaire were pre-tested: 1) Length of the questionnaire; 2) number of questions that need to be answered; 3) Wordings and sentences to clarify questions and options as respondents' answers. The task was to ensure that the order and layout of questions in the questionnaire were appropriate, and that the questions were directly related to the objectives of the research.

During piloting, each respondent was asked in detail about a limited number of questions, for example the effects of different wordings, what they have in mind when they give a particular answer, and how they understand a particular word. Analysis of the responses and comments from these questions were used to improve the main questionnaire. Based on the variations in responses among respondents, research items were rearranged to avoid placing in close proximity items that could be strongly correlated, and to reduce non-response rates by removing ambiguity in the research purpose and wordings.

4. Distribution

Selected fora were approached to distribute the hyperlinks of the web survey to their members. This was done via the web survey tools “FluidSuveysTM ¹” (<http://fluidsurveys.com/>). Fora users' attitudes and perceptions are also collected in their self-report, with their performance in the communication process. The pages of the web-based surveys could also be accessed via mobile phones and personal digital

¹ FluidSurveysTM is an online survey tool that allows individuals to create and deploy questionnaires in their own surveys. The web survey tool helps users collect data from respondents and analyse results in real-time.

assistants.

5. Monitoring Responses

The web survey approach allows the researcher to instantly monitor responses rates via web survey tools. An online database was established to record questionnaire responses and to calculate response rates. This tool was able to count the number of questionnaires that had been completed in real time, as well as how many questionnaires had been started but not completed. The database of completion was also recorded.

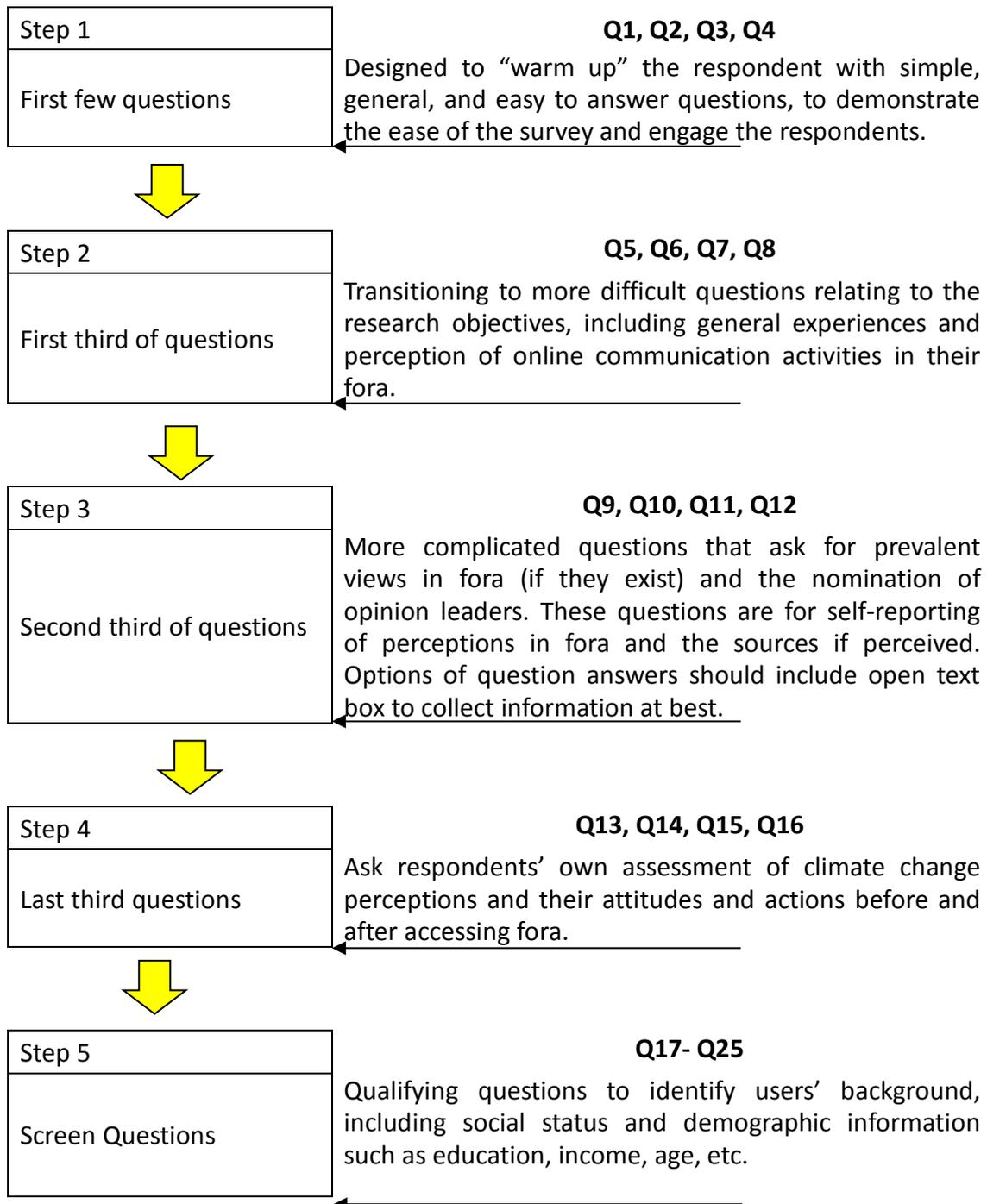
6. Categorising and Analysing Data

In addition to reducing manual data input and analytical errors, the use of FluidSurveys™ research tools added further benefits including categorising and analysing the questionnaire data according to three dimensions: 1) perceptions of the communication process and prevalent views (if they exist) in fora; 2) self-reporting of attitudes and actions on climate change; and 3) evaluation of influences on personal action. Once computer assisted data collection has been done, these data are instantly accessed and put into software for further analysis. Software packages of statistics (Excel® & SPSS®) were used to conduct the result of questionnaires. The findings of the survey analysis were then compared with previous findings from the quantitative fora statistics, as well as qualitative analysis of topic-threads contents.

3-6-2. The Questionnaire Layout

The questionnaire was designed to have a “response-flow”, which carries the respondent along and makes the survey seem simple and engaging as illustrated in Figure 3-2 below.

Figure 3-2. Questionnaire ‘response-flow’



The questionnaire aims to directly elicit respondents’ perceptions that cannot be derived either from fora statistics or qualitative analysis of topic-threads. Some questions in the questionnaire directly ask respondents to nominate users’ “ID” (i.e.

self-identity in fora, such as fora users' nickname online) (i.e. IDs of supposed opinion leaders, if perceived by respondents). The approach could result in several issues that should be considered: 1) Users' privacy to their communication activities via specific IDs and interaction with certain IDs etc. should be protected conforming to ethical requirements; 2) reported IDs cannot be validated and checked if they are one or various authors in a single or many fora; 3) nominated IDs should be compared with their performance in topic-thread discussions to identify their roles. In the response-flow, the nomination of users' ID is thus placed at a later part (Step 3) as open questions (for identifying sources of prevalent views in fora) that are not compulsory and only for reference in the questionnaire.

3-6-3. Limitations of the Web Survey

By deploying questionnaires in internet fora, the web survey approach enables researchers to study fora users' attitudes and perceptions via their self-reporting. However, as Choi and Pak (2005) suggested, one should also be aware of the limitations and biases in questionnaires. For the study of communicating climate change issues online, several aspects of research and sampling limitations need to be considered: 1) The web survey approach collects data from internet fora users' self-reports, and their perceptions of climate change communication are reported on the basis of their interpretations, which may vary; 2) People can easily quit in the middle of a questionnaire. They are not as likely to complete a long questionnaire on the web survey as they would if they were talking with a good interviewer; 3) Since the web-based survey pops up on a web page and posts a hyperlink in selected fora, there is often no control over who replies - anyone from frequent users to random visitors cruising these fora may click the hyperlink and answer the questionnaire; 4)

Though the tool of FluidSurveys™ provides IP address limitation settings for respondents filling in more than one questionnaire (i.e. it makes it impossible for respondents to complete more than one questionnaire), there is no control over anonymous users completing the survey multiple times by using different computers or devices, to bias the results. Given these four main considerations and limitations, the deployment of the online questionnaire was conducted with the assistance of administrators in each of the four selected fora. During the 30 days of web survey, the hyperlinks (for each fora) to the online questionnaire were deployed specifically via E-Mail newsletter (LocalSustUK & ClimateConcern), sent out by administrators and online forums (Transition Towns & OurPlanet / EarthDay). This ensured the reach of these fora users. As a result, there were 148 responses received in this period. After reviewing and cleaning those uncompleted responses, 119 completed responses remained, with 35 responses from ClimateConcern, 53 responses from LocalSustUK, 20 from Transition Towns, and 11 responses from OurPlanet / EarthDay. The relatively low response rate presented a limitation of the web survey approach in the research. Taking into account these considerations, it is suggested that the findings of the web survey should be regarded as respondents' self-reports of their views and experiences on using these selected fora. Respondents' reports may not be a complete and accurate description of perceptions on fora communication. Nevertheless, these self-reports are still valuable in the study of climate change communication in internet fora, especially for comparing users performance in the communication process with fora statistics and the topic-thread discussion archives. The findings of this questionnaire will also be important in evaluating the influence of the fora communication, and to reveal fora users' attitudes, as will be described in Chapter 6 of the thesis.

3-7. Conclusions

In this chapter, a multi-method approach has been introduced to explore the research questions of this thesis. In order to find out the characteristics of online climate change communication in internet fora, fora users' roles in the communication process, and the influences of internet fora communication on their attitudes, data on internet fora as well as self-reports from fora users are collected and analysed using both quantitative and qualitative approaches.

Methods include collecting and analysing fora statistics in order to evaluate communication activities and fora users' performance. Statistics on communication activities in fora are used to understand the development of online communication process and level of fora users' participation (i.e. intensity of posting articles) during the research period. By identifying "key authors" based on the fora statistics, studies of communication process and roles involved will be focused on key authors and other fora members in the KAs' initiated topic-threads.

Four fora are selected for analysis based on their interested topics of online discussion (climate change and broader environmental considerations). In terms of data collection, qualitative analysis of contents in KAs' initiated topic-threads helps further reveal roles in communication and their interaction models. The trends of people's interactions and their perceptions of climate change issues will also be depicted based on the qualitative analysis. The analysis uses historical records (i.e. archived, between 2007 and 2009) of discussions in selected topic-threads. To further explore fora users' responses, a more in-depth investigation was considered necessary. To this end, web survey of fora users' perceptions on climate change communication

in fora was carried out. Some limitations of the analyses are considered in the research, and a sophisticated research design is suggested in order to reduce biases of applying and interpreting findings, thus enhancing understandings of the research question. Through the multi-methods approach used in the research, it will be possible to compare fora users' self-reports with their online opinions, communication activities, and even attitudes revealed in fora discussions. These findings are presented in Chapters 4, 5, and 6, which cover the fora statistics analysis, topic-thread analysis, and web surveys.

Chapter 4. Characterising the Communication of Climate Change in Online Fora

4-0. Introduction

This chapter addresses the first research question, focusing on characteristics and features of communication regarding climate change in internet fora. This chapter presents quantitative and qualitative analyses of discussions in four online fora, from December 2007 to December 2009. There are three sections to the analysis, each of which corresponds to a salient aspect of online communication.

4-1. Characteristics of Fora Contents: Archives of Online Communication Process

4-1-1. Text-Based Discussion in Internet Fora

Although multimedia and other types of rich-text can be used in online communication, the most common medium of information exchange in all four fora continues to be simple text. Table 4-1 shows the overall statistics of posting contents on each forum: the majority of the content of posts is text-based articles. Images and other media are scarcely used by comparison: figures appear in only 4% of posts, graphs in 3%, and video in 2% of posts.

**Table 4-1. Classification of Posts in the Four Fora by Content Format
(total numbers and percentages)**

Numbers of Posted Articles in the Four Fora												
Posts by Content Format	Type of Posting		Climate Concern		OurPlanet (EarthDay)		Transition Towns		Local - SustUK		Total (%*)	
	Text- based	Articles		2626	66.38%	402	17.75%	633	28.55%	1895	19.84%	45.39%
		Replies		1228	31.04%	1863	82.25%	1582	71.36%	1730	45.50%	52.31%
		Others (i.e. forward article from other sites)		102	2.58%	0	0%	2	0.09%	177	4.66%	2.30%
		Total		3956		2265		2217		3802		12240
	with Image: Figures		320	8.09%	6	0.18%	18	0.81%	160	4.20%	4.11%	
	with Image: Graphs		158	3.99%	15	0.44%	1	0.05%	212	5.58%	3.15%	
	with Multimedia / Video		142	3.59%	3	0.09%	62	2.80%	92	2.42%	2.44%	

*(%): Percentage of content types in total posts.

4-1-2. Length of Posted Articles and Replies

Notable differences in the word length of posts are detected in all four fora (see Table 4-2 below). Some authors post long articles, while some others prefer to share their ideas or attitudes through relatively short texts. The average length of a posted article is 419.47 words, while responses have on average 424.60 words. However, there is a significant diversity within this: the longest article in Climate Concern was found to be 3365 words, whilst the longest in the LocalSustUK forum was 6957 words. In this forum, the article with minimum text had only 5 words.

Table 4-2. Length of Posts in the Four Fora (based on number of words)

Length of Posts (Articles and Replies)						
Length of Posts		Climate Concern	OurPlanet (EarthDay)	Transition Towns	LocalSustUK	Total
Length of All Articles (by words)	Average	549.26	208.42	441.00	479.19	419.47
	Median	317	110	362	284.5	308
	Max	5752	4505	3365	6957	6957
	Min	11	5	23	9	5
Length of Responses (by words)	Average	629.57	201.41	378.6	488.83	424.60
	Median	479	107	289	312	296
	Max	5668	4505	4366	4980	5668
	Min	21	5	16	9	5

Text length of posts in Forum of Climate Concern (Average length=549.26), Transition Towns (Average length=441.00), and LocalSustUK (Average length=479.19) are relatively similar, compared to the average text length in the OurPlanet / EarthDay Forum (Average length=208.42). Since the OurPlanet / EarthDay Forum is established on the Myspace.com platform (a famous social network site that provides personal message boards, hyperlinks, and other instant communication tools), one explanation of the shorter text length in the OurPlanet / EarthDay Forum is that that members use other communication tools provided by MySpace.com. These communication tools could distract or deter OurPlanet / EarthDay Forum’s members from writing posts directly on the forum, as the communication among members is transferred to other communication tools and cannot be recorded in the forum boards.

4-2. Distribution of Fora Contents: Few Members Speak

The fora content analyses and results of the web survey provide indications as to members’ activity (see Table 4-3).

Table 4–3. Percentage of Authors and Repliers in Four Fora

Forum Title	Climate Concern	OurPlanet (EarthDay)	Transition Towns	LocalSustUK
Members becoming authors (Average % in Four Fora =11.09%)	389 (11.70%)	442 (0.23%)**	489 (11.85%)	362 (32.31%)
Article Authors (% of All Authors)	299 (76.86%)	198 (44.80%)	292 (59.71%)	263 (73.67%)
Repliers (% of All Authors)	173 (44.47%)	306 (69.23%)	353 (72.19%)	190 (53.22%)
Authors obtaining replies (% of All Authors)	110 (28.28%)	129 (29.19%)	147 (30.06%)	116 (32.50%)
Average replies obtained per Author	4.11	9.41	5.42	6.38

** Members of OurPlanet / EarthDay are calculated on the basis of the “Friends” of “Our Planet” on MySpace.com. Individuals can freely join or add “OurPlanet” as friends or favoured group among one’s own social networks without becoming a member. These individuals can then post and reply articles as a friend of the OurPlanet Group. Members are calculated as at 12, April, 2011.

Table 4-3 reveals the statistics of authors' activities; it is significant that few members are authors in the four selected fora. Climate Concern and Transition Towns have similar percentages of authors (11.7% and 11.85% respectively), while LocalSustUK has a higher percentage (32.31%) of members who become authors in the forum. The OurPlanet / EarthDay Forum is different, for its pool of "members" (called "friends" in MySpace) is considerably high, but it has relatively few authors (442) who posted articles or replies during the research period.

Moreover, among these authors only a few individuals (32.13% in Climate Concern, 6.79% in OurPlanet, 19.63% in Transition Towns, and 35.91% in LocalSustUK) posted more than one article during the period of this research. The average number of articles per author ranged from 2.03 in OurPlanet to 7.88 in LocalSustUK (see Table 4-4). This indicates that small numbers of members become authors and the majority of these authors post only once.

Table 4-4. Authors' Activeness in the Four Fora

Forum Title		Climate Concern	OurPlanet (EarthDay)	Transition Towns	LocalSustUK
Average Posting Number (per Author)	Article	7.01	2.03	2.14	7.88
	Reply	3.16	6.09	4.61	8.78
More than 1 Posted Article by Author (% of All Authors)		125 (32.13%)	30 (6.79%)	96 (19.63%)	130 (35.91%)
More than 1 Posted Reply by Author (% of All Authors)		79 (20.31%)	108 (24.43%)	165 (33.74%)	108 (29.83%)
"One Time Only" Author (% of All Authors)		213 (54.76%)	130 (29.41%)	261 (53.37%)	160 (44.20%)
Authors have >1 post:	Number	149	312	228	202
	Post	3743 (94.62%)	1959 (86.49%)	1989 (89.72%)	3642 (95.79%)

As shown in Table 4-4, similar patterns emerge in responses to others' articles: for example only 32 % of authors in Climate Concern posted more than one reply. By identifying the proportion of authors who post more than one post (either an article or reply), the statistics reveals that relatively few authors contribute to the fora contents. Despite the relatively few number, these limited authors (286 authors in four fora) contributed thousands of posts (a total of 11333) in the past two years, and this not

only indicates that they are productive, but also that their posts constitute the main body of online discussions (92.59%).

The analysis indicates that there are a larger number of authors who only posted once (i.e. posted one article or reply) and never joined online discussions again during the research period. Climate Concern has 213 authors (54.76%), OurPlanet / EarthDay 130 authors (29.41%), Transition Towns 261 authors (53.37%), LocalSustUK 160 authors (44.20%), who posted an article or reply only once. This suggests that not only is the contribution by these authors limited, but their participation in fora is not sustained and they do not generate widespread discussions (i.e. their posts do not generate replies).

To further explore authors' performance in the four fora, numbers of each authors' posts are calculated. A series of cumulative number plots is presented in Figures 4-1 to 4-3. Figure 4-1 represents the total number of authors' postings by forum, including authors' posted articles and replies, during the research period. Authors from the four fora are ranked by their performance on posting contents, and they are grouped together based on percentiles in the rankings. Five percentage points separate each group, as shown below.

Figure 4-1. Cumulative number plot of fora authors' total posts (AT)

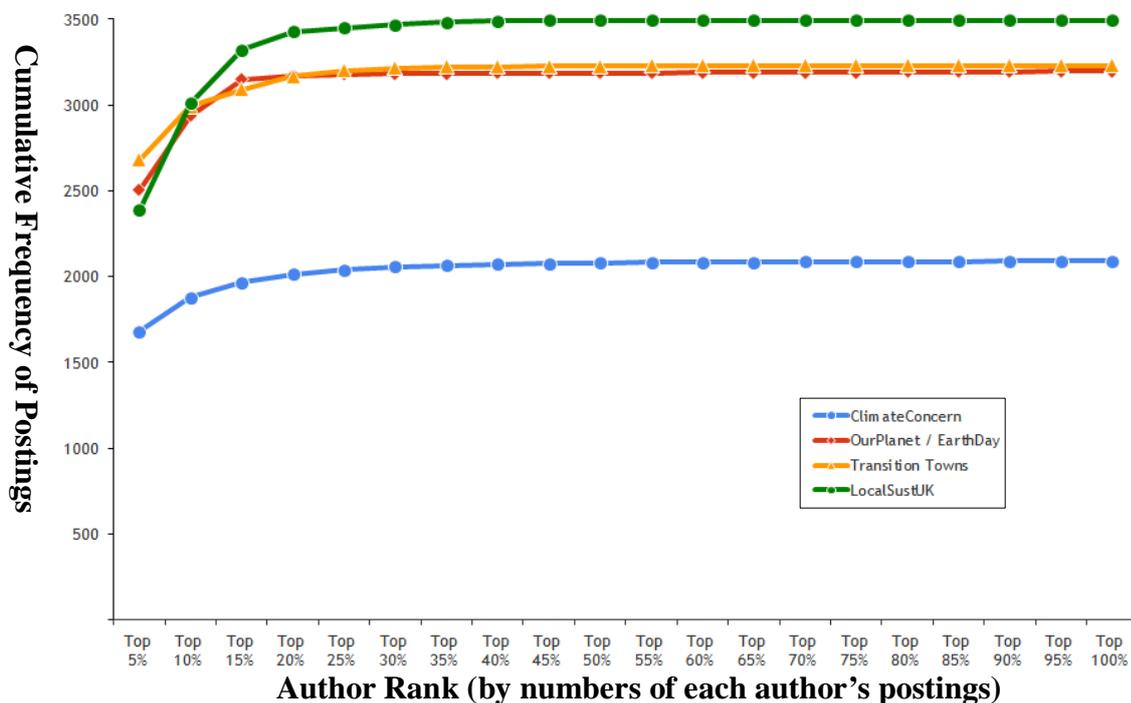
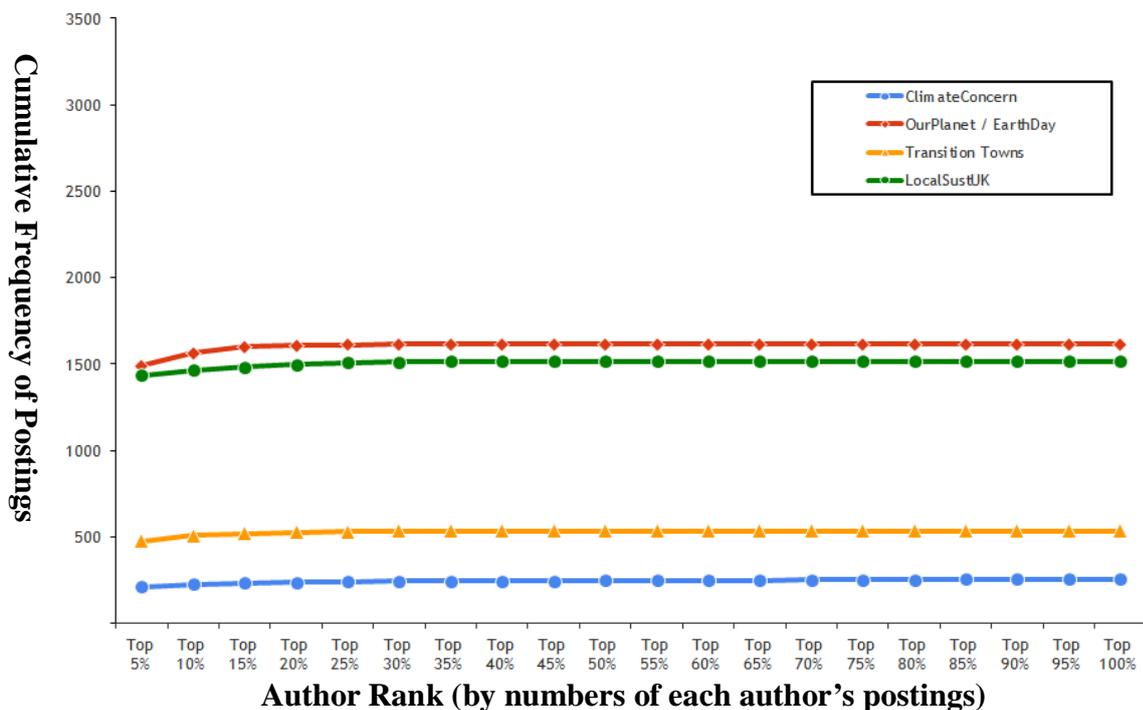


Figure 4-1 shows the cumulative distribution of numbers of authors' postings in four fora; it is clear that some authors tend to perform better than others in terms of posting contents. As Figure 4-1 reveals, authors in four fora who are top 5% in the ranking of their performance on posting contents (by counting the numbers of each authors' total postings, labelled as AT) actually contribute more than 50% of contents; authors who are top 25% in the ranking contribute to more than 90% contents in four fora in the 2 year research period. Numbers of AT are quickly dwindled that most authors have few AT numbers (1 ~ 2 postings) in the distribution; this suggests that some authors are notably active in posting contents, and thus they could be influential on the formation of contents in four fora.

Figure 4-1 suggests the total fora postings could be affected by some authors' efforts; the Figure 4-2 shows below, the top 5% authors in the ranking of their performance on posting articles (by counting the numbers of each authors' total posted articles, labelled as ATA) also contribute to more than 50% of all articles posted in four fora during the research period

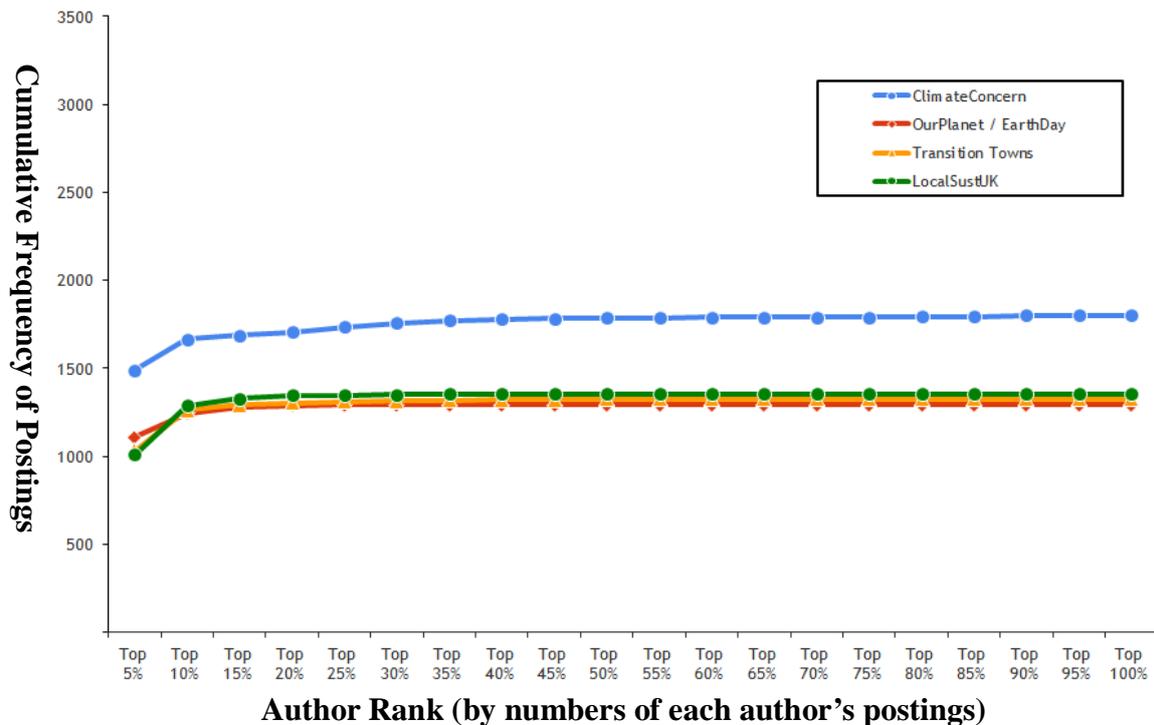
Figure 4-2. Cumulative number plot of fora authors' total posted articles (ATA)



Since authors' posted articles are not replies to fora discussions but rather original postings which could initiate discussions, the authors of these articles can be regarded as active contributors to the initiation of online discussions in fora. The centralization in ATA distribution (that more than 90% articles in all four fora are posted by top 10% authors of performance on ATA) also suggests that the number of active contributors is limited while their influences on initiating discussions are obvious.

Furthermore, the number of authors who contribute to the majority of the total replies also seems limited; in Figure 4-3, the distribution is almost identical to that of the previous two figures, indicating that authors who ranked as top 5% (in the ranking of performance on posting replies) tend to reply to posts more actively.

Figure 4-3. Cumulative number plot of fora authors' total posted replies (ATR)



Figures 4-1, 4-2 and 4-3 reveal that there are relatively few authors who contribute most of the posts to each forum. Despite the slightly different slope of distribution for the four fora, the posted contents in the four fora derive mainly from

authors who ranked as top contributors, and the distribution is notably centralized to these top-ranked contributors. As a result, it is suggested that some active authors tend to more frequently post articles and reply to others' posts. These active authors lead the main development of fora contents by generating posts, and thus they also initiate and participate in major discussions in fora. A cluster of active authors has been revealed among the members of each forum. These authors generate large volume of articles and replies in these fora. Some authors actively post articles to input information or express their ideas, while some others actively reply to posts.

In summary, this section has shown that there are very active authors among members of each forum. These active authors play crucial roles in content building in fora; by sharing information, expressing comments, and discussing ideas through directly posting articles or replying to others' comments or questions frequently and in large volume in these fora, these authors influence online public opinion and its development. Thus further exploration of the meaning of the distribution of these authors' activities and their influence is required.

4-3. Forms of Communication

Based on the above findings, forms of communication in fora are firstly depicted. Section 4-2 found that the majority of members in the four fora do not actively communicate. These members can be regarded as 'silent readers' of content (discussion threads). On the other hand, some members may be regarded as 'active authors', who contribute many and various posts.

The existence of active authors indicates that some authors could play particular and even crucial roles in fora communication process. They are different from other authors and create various models of communication, which are presented below on the basis of statistics and qualitative content analyses of the online posts.

As supposed in above findings that most communication is initiated and largely

maintained by a few authors, it is thus suggested that the development of online discussions in fora, including the process and the contents of the online discussions, are led by the limited number of authors. The statistics in previous section (See Section 4-1) shows that some authors do leave very long length posts (as specifically presented in Table 4-2). In the following Table 4-5, the distribution of the initial posters and repliers throughout the four fora is illustrated as below:

Table 4-5. Distribution of Initial Posters and Repliers in the Four Fora

Forum Title	Climate Concern	OurPlanet (EarthDay)	Transition Towns	LocalSustUK
Max Number of Single Authors' Articles	80	35	85	73
Mode Number of Authors' Articles (%)	1 (17.74%)	1 (23.76%)	1 (16.56%)	1 (20.45%)
Mean Number of Posted Articles per Author	3.95	2.06	3.56	3.70
Max Number of Authors' Replies	149	358	272	246
Mode Number of Authors' Replies (%)	1 (22.37%)	1 (44.80%)	2 (13.09%)	2 (24.65%)
Mean Number of Posted Replies per Author	6.88	6.09	8.27	9.17

In Table 4-5 it is clearly shown that some authors did post significantly more articles than others. The highest number of authors' posted articles and replies during the research period is 80 and 358 respectively, indicating some active authors voiced their views actively and passionately in comparison to others.

The findings of active authors' contributions in generating fora content suggest that opinion in fora could be led only by some particular authors. Since only a small number of authors contribute to the major body of fora contents, it is found that the discussions in fora are also among the limited population of authors. Table 4-6 below shows the number and percentage of topic-threads initiated by the top 5% of "thread initial posters" in each forum. The "thread initial posters" refers to those authors who post articles that then initiate discussion threads. Since some topic-threads are initiated by the same thread initial posters, Table 4-6 lists number of "unique initial

posters”, which refers to number of non-redundant thread initial posters in four fora.

Table 4-6. Distribution of Author-Initiated Topic-Threads

Forum Title	Climate Concern	OurPlanet (EarthDay)	Transition Towns	LocalSustUK
Number of Unique Initial Posters	110	129	147	116
Total Number of Topic-Threads	434	266	353	480
Number of Threads Initiated by Top 5% of Authors (per Author) (%*)	250 (57.60%)	105 (39.47%)	96 (27.20%)	229 (47.70%)
Number of Replies to Top 5% of Authors' Initiated Threads (%**)	168 (36.84%)	283 (43.74%)	230 (21.18%)	236 (33.86%)

* Percentage in total number of topic-threads

** Percentage in total number of replies

As shown in the Table 4-6 above, in all four fora particular authors initiate a considerable proportion of topic-threads. In Climate Concern, the top 5% of authors (six authors) initiated 58% of topic threads; in OurPlanet / EarthDay, the top 5% of authors (six authors) initiated about 40% of topic-threads; in LocalSustUK, the top 5% of authors (six authors) initiated 48% of topic-threads, while in Transition Towns, the percentage was lower: the top 5% of authors (seven authors) initiated 27% of topic-threads. Further, when comparing posters’ member IDs, which are unique nicknames used by fora members when they access and post articles in fora, it becomes evident that many of those who initially post articles are also very active in forming the discussions, by providing replies. In other words, those who initiate the most discussions in internet fora are supposed to have good networking abilities.

What is more, when calculating the total numbers of replies to topic-threads, as shown in following Table 4-7, it is found that there are many authors among the top 5% who are both initial posters (as authors who post articles to initiate discussions), and very active authors (repliers) (See Table 4-7 below):

Table 4-7. Authors' Posting Activities in the Four Fora

Forum Title	Climate Concern	OurPlanet (EarthDay)	Transition Towns	LocalSustUK
Number of Initial Posters	110	129	147	116
Number of Authors in the top 5%	6	6	7	6
Ratio of Top 5% (contribution) of authors as Initial Posters (%*)	66.67%	83.33%	71.43%	100%
Ratio of Top 5% (contribution) of authors as Repliers (%*)	83.33%	66.67%	71.43%	66.67%
Ratio of Top 5% (contribution) of authors as Initial Posters and Repliers both (%*)	66.67%	66.67%	57.14%	50%

* Percentage in top 5% ranked authors

The Table 4-7 above shows that authors in the top 5% ranked by numbers of initiated threads (per author) are generally in the lists of top 5% of authors for posting articles and the lists of top 5% of authors for replying to articles. In Climate Concern, four out of six of the top 5% of initiating authors are also in the list for posting articles and in the list for replying to articles; in OurPlanet, the figure is 66.67% (four out of six); in Transition Towns Forum, the percentage is 57.14% (four out of seven); and in LocalSustUK, the percentage goes down to 50% (three out of six authors).

The above findings suggest a communication process that is very dependent on a few active authors in terms of posting considerable contents and initiating / participating discussions. To further clarify the relationship between these active authors and their communication process, and their interactions and influences on other members in the communication process. Certain characteristics of these active authors are addressed in order to identify their relationships with other fora members. These characteristics include their level of activeness, frequency of their participation in fora communication, and their ability to network with other fora members. Results of the content statistics analyses are listed below:

1. Level of Activeness: The Alpha (α) List of Authors' Activeness

Activeness is measured based on authors' posting and replying activities,

specifically the following measures: AP (Authors' Posts including articles and replies); ATA (Author's Total posted Articles); ATR (Author's Total Replies); and ATW (Authors' Total posting length by words.) These are ranked to generate the Alpha (α) List. Active authors are those who rank among the top 20% in all measures (AP, ATA, ATR, and ATW), a criterion based on the work of Keller and Berry's (2003) work.

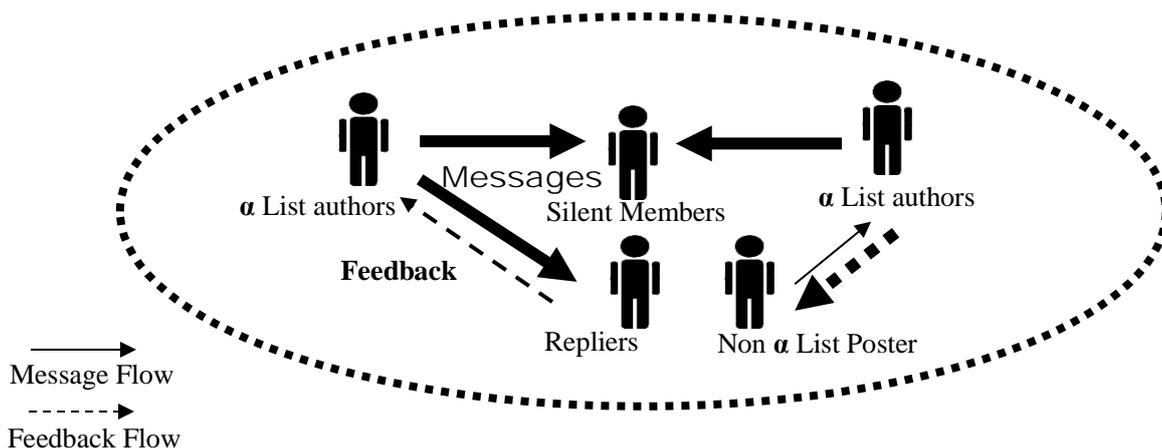
The α -List below (Table 4-8) presents a comparison of general authors, and authors on the α -List. The top 20% of authors are regarded as α -List-authors that have significantly higher levels of activeness as shown in Table 4-8.

Table 4-8. Comparison Statistics of Authors' Activeness (α -List)

	Climate Concern		OurPlanet /EarthDay		Transition Towns		LocalSustUK	
	α -List	General	α -List	General	α -List	General	α -List	General
Total Authors	33	389	44	442	32	489	33	362
Average AP	86.03	10.17	36.66	5.12	35.75	10.41	83.73	10.92
Average ATA	57.03	3.95	5.45	2.06	7.66	3.56	47.09	3.70
Average ATR	29.00	6.88	31.20	6.09	28.09	8.27	36.64	9.17
Average ATW	5181.52	549.26	842.30	208.42	4772.47	441.00	4236.09	479.19

The authors in α -List are suggested as candidates of those authors who contribute significantly and could play key roles in the communication process in fora. The communication flow with α -List authors can be represented by the following illustration (Figure 4-4), which is based on the volume of messages in fora communication.

Figure 4-4. Model 1 of online communication flow



As Figure 4-4 illustrates, the α -List authors post a considerable volume of messages in fora, and these messages flow to members via different routes. According to the content statistics, most members keep silent and simply receive messages; other members offer relatively few replies as feedback to α -List authors (compared with the number of α -List authors' replies). A similar situation appears for α -List authors as non- α -List authors: non- α -List authors post their messages to fora, but most replies come from α -List authors. Thus the communication and its contents are mainly created by the α -List authors, who decide what should be posted online. The depicted communication flow suggests α -List-Authors' role in fora communication; however, it does not consider the frequency of occurrences and their networking with others.

2. Frequency of Communication: The Beta (β) List of Frequency

Model 1 reveals the communication flow in online fora when taking authors' levels of activeness into consideration. However, in order to understand the dynamic nature of the communication in online fora, the frequency of authors' communication should also be considered. The following β -list is used to evaluate whether there exist some authors who frequently participate in fora communication and to identify the frequent authors if they exist. The frequency of authors' posts were ranked on the basis of Authors' total Participation Dates in the forum (APD, measured in days) and their participation "lifetime" (as defined in Chapter 3) in their forum (ALD, measured in days). The top 20% of authors in the ranking of both their ALD and APD are then compared to see if there exist authors who are in the top 20% for both. If so, it is supposed that some frequent authors do exist, and their roles in the communication process should be considered. Table 4-9 shows the results and the comparison of authors' performances in general to that of the β -list.

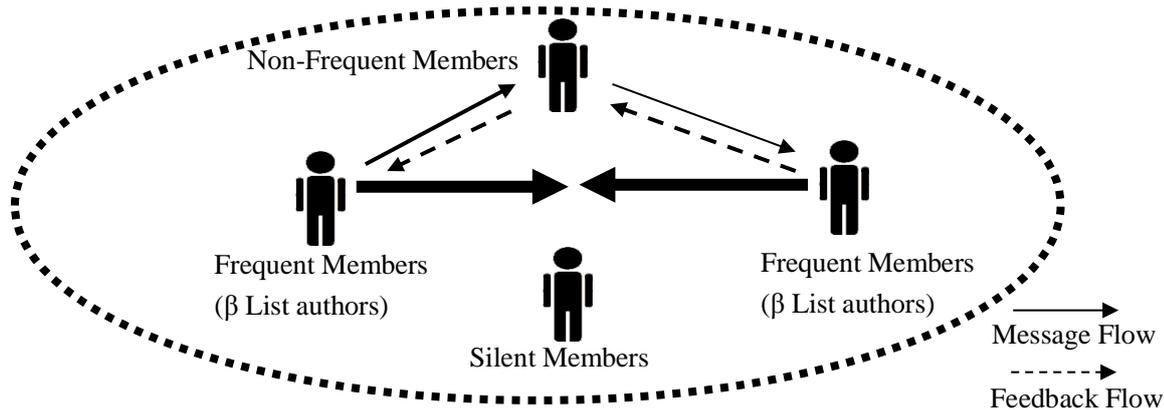
**Table 4-9. Comparison Statistics of Authors' Frequency of Communication
(β -List)**

	Climate Concern		OurPlanet / EarthDay		Transition Towns		LocalSustUK	
	β -List	General	β -List	General	β -List	General	β -List	General
Total Authors	31	389	32	442	28	489	35	362
Average APD	32.64	6.20	10.32	0.60	27.16	4.36	35.09	7.67
Average ALD	143.79	88.78	68.00	2.88	65.36	95.20	189.91	136.21

As Table 4-9 above shows, there are indeed some authors in all four fora who are ranked in the top 20% of both ALD and APD performance. Climate Concern has 31 authors among 389 who qualified as β -List authors, OurPlanet / EarthDay Forum has 32, Transition Towns has 28, and LocalSustUK has 35 qualified authors. This confirms the suggestion that some authors participate more frequently in the posts and discussions of their fora. For instance, in the LocalSustUK forum, Author ID: J*** not only has the longest ALD (729 days), but also has the longest APD (284 days). This author therefore posted 2.14 articles every day they accessed the LocalSustUK forum, and every 3.89 days he/she raised a discussion topic-thread with other members. In this case, the author is qualified as a frequent authors and their influence on the communication model should be considered.

The number of authors who feature on the β -List is similar to the number of authors who are enrolled on the α -List, but the statistics show that only 82 authors are listed on both the α -List and the β -List. Within each group, this corresponds to 17 authors from Climate Concern, 19 from OurPlanet, 25 from the Transition Towns Forum, and 21 from LocalSustUK. It is suggested that these authors' frequent involvement may have impacts on fora members' opinion. The implications of frequent involvement are illustrated below in the Figure 4-5 of Model 2.

Figure 4-5. Model 2 of online communication flow



Model 2 is established on the findings of the β -List analysis, which shows that frequent users exist, and therefore that the online communication model should consider the influence of frequency of communication. Frequent members (β -List authors) are familiar with communicating with other members, and their interactions are frequently seen by fora users. In other words, it is as watching a television show in which the β -List authors play leading actors/actresses and interact with other roles (participants).

3. Authors' Networking with Other Fora Members: The Gamma (γ) List of Networking Ability

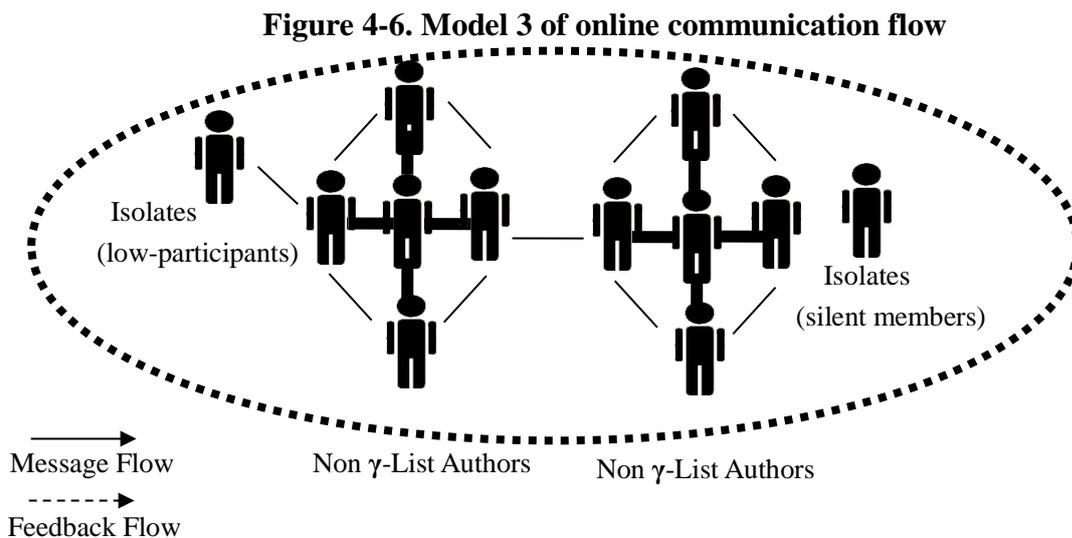
In addition to level of activeness and frequency of communication, the analysis further explored fora members' interactions on the basis of authors' networking ability. The authors' networking ability is measured by ranking both the "author's total triggered topic-threads" (ATT) and the "authors' obtained replies" (AR): authors who trigger more topic-threads and obtain more replies are suggested to be more active and efficient at initiating discussions and networking with other members. Authors with exceptional performance in both ATT and AR are supposed to be significantly capable of networking with other fora members.

Table 4-10. Comparison Statistics of Authors' Networking Ability (γ -List)

	Climate Concern		OurPlanet / EarthDay		Transition Towns		LocalSustUK	
	γ -List	General	γ -List	General	γ -List	General	γ -List	General
Total Authors	29	389	32	442	34	489	29	362
Average ATT	11.72	1.12	3.38	0.60	5.00	0.72	9.38	1.32
Average AR	10.38	1.17	11.21	1.46	14.21	2.22	10.62	1.92

As Table 4-10 indicates, the results of the statistical analysis show that some authors in these fora indeed possess significant networking ability (ranked as the top 20% of authors in both ATT and AR): 29 authors in Climate Concern are qualified as γ -List authors among 389; OurPlanet / EarthDay Forum has 32; Transition Towns Forum has 34; and LocalSustUK has 29. This result indicates the existence of a communication process that has authors with significant networking ability, and where these authors lead dominant interactions with members in the fora.

As a result, the existence of these γ -List authors implies a communication model (Model 3) that includes significant networking ability, and interactions between members as shown in the following Figure 4-6.



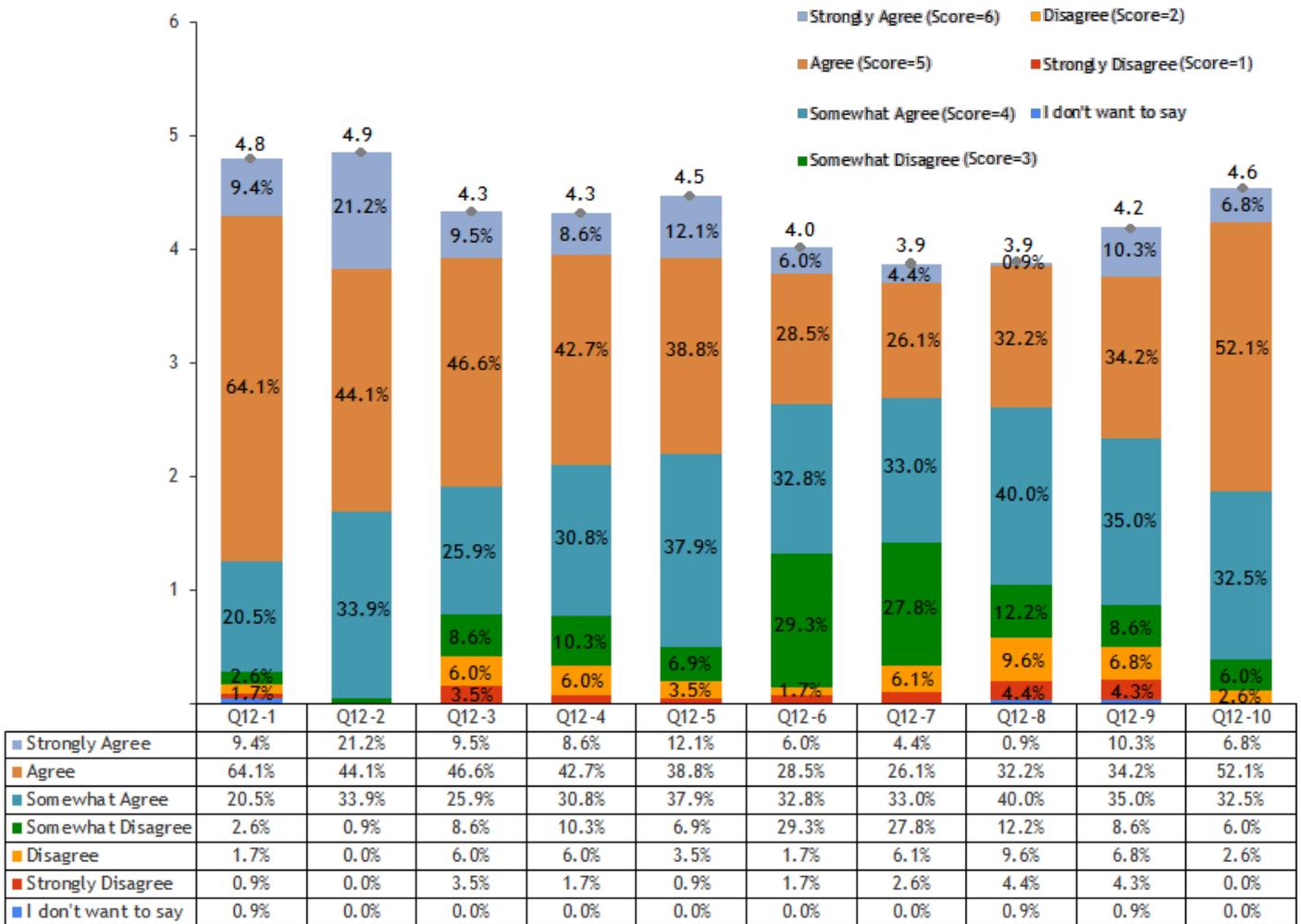
In the illustrated model, communication flow between these γ -List authors and other members is dominant, while interactions among non- γ -List authors are not as significant or frequent. The γ -List authors are major initiators and objects of

interaction among members, and they are surrounded by their repliers as the centre of a social network topology. From the results of the analysis, messages are delivered and discussed by γ -List author-centred social networks, and the fora are formed of these networks, plus isolates (low-participants and silent members).

The models depict above present the communication process on the basis of ranked authors' activeness, frequency, and networking ability, which result in different types of message flow in the online communication process. Nevertheless, in the thesis research, the communication process and roles involved are further studied based on comparing the findings from fora statistics regarding authors' performance and fora users' self-reports of their activities and perceptions of the fora communication process. By deploying questionnaires online, a web survey is conducted in the research to collect fora users' perceptions; during the research period (2007~2009), respondents of the web survey were asked to report their perceptions of the fora communication process. The result should contribute to have further understandings of the communication process.

In the web survey, a series of items in Q12 is specially designed that aims to explore respondents' views on the perspectives and the influences of the forum communication process. Figure 4-7 below shows the responses: respondents tend to agree with some statements describing their communication activities online, including searching for the latest information (Q12-2 Avg. Score = 4.86), seeking out / search for others' opinions or comments (Q12-1 Avg. Score= 4.75), and sharing posts from the forum with non-members (Q12-10 Avg. Score=4.55). However, some activities are not as popular as seeking information and opinion or sharing posts, such as seeking perspectives different from mainstream views (Q12-7 Avg. Score=3.87), persuading others (Q12-8 Avg. Score=3.89) and seeking perspectives different from respondents' own (Q12-6 Avg. Score=4.03). As a result, the respondents' preference according to the survey shows a process of seeking information, as also found in the "use and gratification" theory of mass media communication, which recognized the active roles of audiences in the communication process (Ko *et al.*, 2008; See Chapter 2).

Figure 4-7. Respondents' experiences on seeking opinions



Statement in Q12* Series:

***[Q12]In general, to what extent do you agree or disagree with each of the following statements about your experiences on seeking opinions on this forum:**

- [Q12-1] I tend to seek out or search for others' opinions or comments online generally.
- [Q12-2] I tend to search for the latest information online generally (Average-4.86 Valid Responses=118)
- [Q12-3] I tend to seek advice and comments from my friends specifically on this forum.
- [Q12-4] I tend to consult other users on this forum to form my opinions.
- [Q12-5] I feel more confident about my views or actions when I have learnt from or consulted opinions of others on this forum.
- [Q12-6] I like to seek out perspectives that could be different from mine on this forum.
- [Q12-7] I like to seek out perspectives that could be different from the “mainstream” on this forum.
- [Q12-8] I tend to try to persuade others on this forum to agree with my opinions / views.
- [Q12-9] I tend to urge others on this forum to consider some aspects of particular issues if they are not being discussed.
- [Q12-10] I like sharing posts from this forum with friends who are not members of this forum.

Q12 series identifies respondents' preferences of communication activities in the fora communication process. To analyse their perceptions of the importance of their own views, categories of response for Q12-8 and Q12-9 (See the statement of Q12-8 and Q12-9 in Figure4-7 above) were re-arranged as “Agree” and “Disagree”

and used in a correlation analysis with Q11 (“people’s opinions are relevant, a little relevant, or irrelevant to main views in fora”). The significance of the correlation in the analysis was provided by Pearson’s R (Pearson correlation coefficient). It was found that there is a correlation between the results of Q12-8 and Q12-9 ($r=0.51$, $p = 0.000$ i.e. < 0.05), Q11 (importance of individuals’ opinions) and Q12-8 ($r=0.35$, $p = 0.002$ i.e. < 0.05). This indicates that respondents who tend to persuade others also urge others to consider certain aspects of issues, and they recognize the relevance of individuals’ views to those expressed in the forum tend to agree with persuading others to accept their views. The correlation between Q11 and Q12-8, Q12-8 and Q12-9 reveals respondents’ divided attitudes and activities based on their perceptions of fora communication.

4-4. Members’ Motivation for Participating in Fora Communication Process

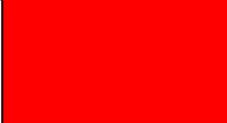
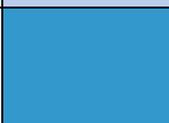
Not just sensing potential of authors’ opinion leadership and networking level in online interactions through the web survey, but also to complete the depiction of forms of the online communication process, it is suggested to ask members’ motivation for participating and initiating communication in the web survey.

4-4-1. Motivation of Participating in Communication

Respondents’ motivation for forum access is firstly probed in Q6¹ of the web survey. By providing several options in the questionnaire, Q6 helps identify the most popular answer (81.51%) for their access motivation, it is to seek information about environmental issues rather than simply climate change issues (See Table 4-11 below).

¹ [Q6] What are the main reasons you visit / have joined this forum?

Table 4-11. [Q6] What are the main reasons you visit / have joined this forum?

Response	Chart	Percentage in Respondents	Count
<i>I'm interested in seeking information about environmental issues (not just climate change issues)</i>		81.51%	97
<i>I'm interested in establishing more dialogue (i.e. leaving comments, posting replies, etc.) with other users in this forum</i>		49.58%	59
<i>I look for opportunities to have discussions with people who have different views to mine</i>		46.22%	55
<i>I like to learn more about opinions of other members of this forum</i>		41.18%	49
<i>I'm interested in seeking information about climate change issues</i>		36.97%	44
<i>I'm interested in sharing information and knowledge with others who visit / access the forum</i>		34.45%	41
<i>I have friends who have joined this forum</i>		31.93%	38
<i>I generally identify with the goal of this forum</i>		24.37%	29
<i>I feel proud of being a member of this forum given its environmental focus</i>		19.33%	23
<i>I generally share the views of other members in this forum</i>		9.24%	11
<i>Other reasons</i>		5.04%	6
<i>I can't remember my specific reasons for joining this forum</i>		0%	0
	Total Responses		119

The “perceiving” mode presented by respondents (information seeking and looking for different voices) may not be the only attitude regarding their discussions or actions about climate change. Some respondents did present a “willing-to-share”

attitude in the survey. Expressing ideas (occupied 49.58%) can be suggested as another key point next to obtaining information for accessing fora, and people tend to access these fora to provide their ideas rather than simply to perceive views from others. Also there are about 34% who said they are willing to share information or knowledge with members in the forum, and regard such willingness as one of their motivations for accessing these fora.

Relatively few respondents claim that their reason for accessing fora is to approve the nature of these fora (focusing on environmental topics) (19.33%). Though the focus of these fora is identified and acknowledged by about a quarter of respondents, they are not necessarily main reason of why these users came to access fora as fora hosts supposed (i.e. enhancing concerns of climate change issues). The result also corresponds to 46.22% respondents' claim that they look for opportunities to have discussions with people who have different views.

Despite the “open-minded” attitude shown above in the respondents’ self-report, a significant tendency of contradiction is also presented: 31.93% respondents suggest they access these fora because “they have friends who have joined this forum”. This tendency links to respondents’ motivation of accessing fora and interacting with their friends who usually did share similar views, and what people recognise as their “real objectives” in communication. Based on the survey results, it is considered that people are reluctant to express the attitude that they still look for supporting groups rather than those opponents with different viewpoints. The influence also links to the importance of ‘real’ group / communities, and later findings suggest online interaction has a high level of overlapping with existing contacts, as shown in topic-thread analysis in the qualitative analysis section (See Chapter 5).

The distribution of these answers are similar across the four forums (See Appendix Table in Appendix III: Record of Qualitative Analysis — Topic-Thread Coding Record, P335-384); the results revealed that most respondents visit their forum for seeking information about environmental issues (not just for climate change issues) (81.51% in total), establishing dialogues (49.58%), and looking for / discussing different viewpoints (46.22%).

4-4-2. Motivation of Initiating Online Discussion

The results of this web survey also provide some insights regarding respondents' motivation for initiating online discussion. Question Q8² directly asked respondents to provide their main reasons through ticking listed options (multiple choices) or writing their own reasons in an open text box (see Table 4-12).

Table 4-12. [Q8] Members' Motivations of Initiating Discussions

Response	Chart	Percentage in Respondents	Count
<i>I'm interested in a topic and keen to know more (i.e. information or opinions) from other users</i>		69.23%	72
<i>I'm interested in a topic and want to share information, ideas, comments, or actions that may contribute to other discussions</i>		60.58%	63
<i>I want to encourage networking among users in this forum</i>		59.62%	62
<i>I can't remember my specific reasons for initiating discussion in this forum</i>		0%	0
<i>Other reasons (please write in the box)</i>		0%	0
Total Responses (respondents)			104

As shown above, there are roughly 70% of respondents who suggested that their motivation for initiating discussions should include seeking more information, 60.58% yearn to share messages and comments with other members and almost an equivalent number of respondents (59.62%) want to encourage networking among users in the forum. As a result, these respondents' answers can be regarded as reflective of their aspirations: they tend to seek information and perceive others' ideas on the climate

² [Q8] If you have initiated a discussion on this forum, please tell me your reasons for doing so.

change issue either via posted articles or networking in discussions (topic-threads in fora) before they can decide and take their actions; many of them are also keen to build social networks through the internet fora.

The answer rate of Q8 was relatively high (87.39%), 104 respondents provided their reasons for posting articles and initiating discussions in fora. This indicates that these respondents could be very active and capable of initiating topic-threads in fora which is different from the composition of fora members revealed by fora statistics.

Based on respondents' motivations of accessing and participating in fora communication, respondents tend to play various roles, such as "silent audiences", "speakers" that express their ideas, or "networkers" that join and initiate fora social networks. Interactions among these roles deserve to have further analyses as they are the foundation of the online communication process in internet fora.

4-5. Conclusions

Overall, some characteristics of online communication process in fora have been revealed through analysing the content statistics in four selected fora and the web survey conducted during the two years' (2007.11 ~ 2009.11) research period. Though the communication technology used in internet forum usually allows fora users to post photos, sounds, and videos online, contents in the four selected fora are still mainly text (articles) (See Section 4-1); only a relatively limited number of users control the posted content in fora, while most registered members kept silent during the research period (See Section 4-2). It is also found that the online communication process in fora does not only depend on members' actively seeking information, but also on members' willingness of expressing ideas and interacting with others (See Section 4-3). Nevertheless, since the distribution of authors by numbers of their postings in four selected fora is not diverse, and these limited authors did post considerable volumes of contents in fora, it is suggested that the information sought

(by fora users) are also limited, and users could only have discussions with quite few populations of members in these fora.

Based on the results revealed, it is argued that fora members access information regarding climate change from limited sources of opinions in fora even though they may not be aware of the confined communication context; information and the interactions are shared and done in a much smaller population of social group in fora, but users may interpret the messages and viewpoints as the public opinion in real society. Since these few authors could play “key roles” in the communication process, several models of fora communication flow are suggested with considerations of authors’ performance in activeness, participation frequency and networking ability that could result in different development of communication flow as shown in the chapter (See Section 4-3).

In the Q12 of web survey for further exploring fora users’ communication activities, it shows that the preference of respondents’ communication activities online can be classified as 1) Seeking information and comments; 2) Consulting others and getting support; 3) Looking for different perspectives.

The evidence of the relationship of authors’ divided confidence level and their communication activities emerged from the correlation analysis of Q11 and Q12-8, Q12-9. With the recognition of their obtained responses, authors who have similar views or share same values are encouraged, and the process forms discussions with inclined preferences of information and interactions. Most respondents claim that they have contributed to discussions. Their usage of, and motivation to, access the fora are mainly on the basis of networking with other members.

The analysis also indicates that Climate Concern and LocalSustUK, which use the same platform (Yahoo! Groups), have similar numbers of authors with similar numbers of posted articles and replies. Hence the platform or communication technology applied by fora users could also affect the process of fora communication, which could lead to reply-oriented topic-thread discussions (OurPlanet / EarthDay group) or post-oriented topic-thread discussions (Climate Concern and LocalSustUK groups).

The study reveals members' online communication models and thus should benefit the understandings of the effectiveness of opinion exchange in fora communication process, which could contribute to climate change communication online. The communication process is a combination of information gathering and in some cases, reading interactive content generated by members, with a focus on finding posts with similar views or values. Some particularly active authors could occupy key roles in fora contents on the basis of the assessment of their activities in terms of joining the forum and posting/replying to articles; as a result, it is argued that some key authors emerged in the fora communication process, and the findings from content statistics are supported by the web survey of fora members. The following chapter therefore discusses how the role of communicators and opinion leaders (if existed) present themselves in the online communication process, as well as the influence of this active authorship and limited discussions (among small populations with inclined views, values and specific repliers) on people's perceptions of climate change issues.

Chapter 5. Roles in Online Communication

5-0. Introduction

Communication in internet fora involves members accessing content and interacting with others, carrying out different roles in this process. In Chapter 4, these roles have been explored following the identification of participants' characteristics in the communication process. The analysis in Chapter 4 showed that fora participants can be portrayed as silent readers, or authors with regards to how they handle online content; as posters, or repliers with regards to asynchronous discussions; and as followers, or active authors in two-step communication. This chapter is dedicated to exploring those roles further in online fora communication, contributing to answer the second research question, which regards the roles of online communicators in Internet fora and how do these roles are developed.

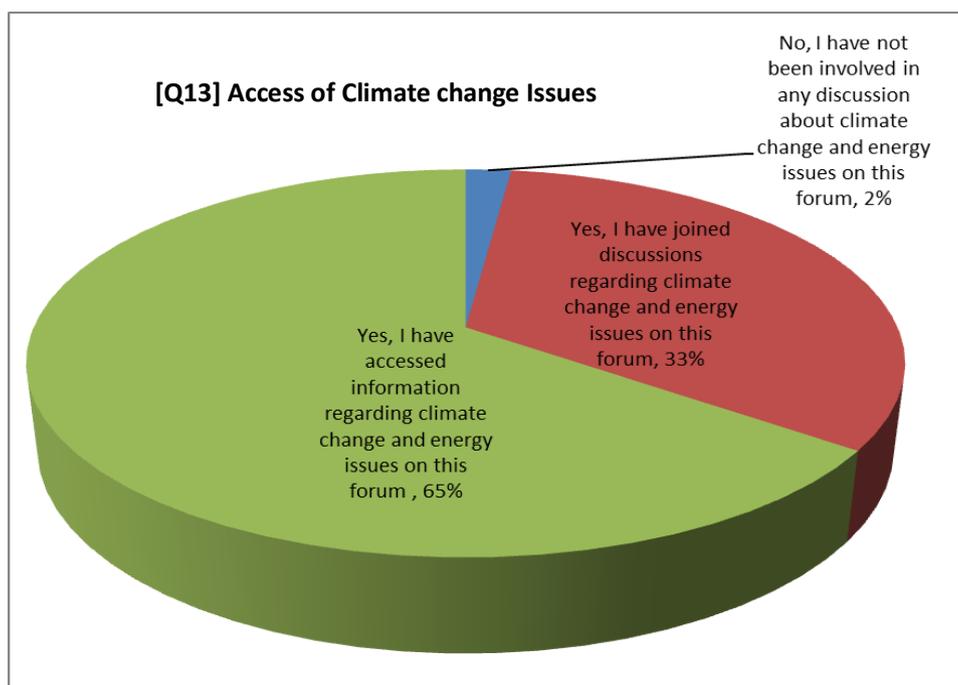
5-1. Observers' Roles in Communication

As was found in Chapter 4, the level of activity differs among fora members. Members who keep silent (i.e. make no posts) are found to be the majority. These silent members (or "lurkers" as described by some scholars (e.g. Ridings, Gefen & Arinze, 2006) not participate in fora discussions, they can be considered as 'observers' who do not interact with others nor present their attitudes (i.e. views and opinions for / against a particular view) in fora communication activities, but exist widely in the four selected fora. The roles that observers play are not directly detectable in online contents, but their functions can be identified. Results of the web survey (Q13¹)

¹ [Q13.] Have you ever accessed information or discussions regarding climate change issues on this

indicate the majority of observers do actively look for information regarding climate change issues (65%) but do not join the discussions (33%), as shown in Figure 5-1 below. If observers can be considered as the equivalent of more traditional readers or audiences, authors and active authors fill the role of writers or reporters in fora, as referring to traditional media.

Figure 5-1. Respondents’ access of climate change information

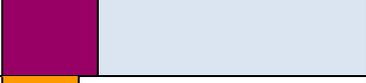


Q14-1² reveals what types of information respondents sought. Table 5-1 shows information that respondents primarily sought was (in order of priority, from most sought after to least): information regarding collective actions or personal behaviours, collective or public opinions, information on technology development, controversial issues, scientific knowledge, sceptical views, information on campaigns, information regarding policy and regulations, and finally other information.

forum?

² [Q14-1] What type of information regarding climate change and energy have you accessed from this forum?

Table 5-1. [Q14-1] Information Sought from the four fora combined

Response	Chart	Percentage in Respondents	Count
<i>Information on collective actions or personal behaviours</i>		78.2%	93
<i>Collective / public opinions</i>		63.9%	76
<i>Information on technology development</i>		54.6%	65
<i>Controversial issues and considerations</i>		51.3%	61
<i>Scientific knowledge</i>		44.5%	53
<i>Sceptical viewpoints</i>		34.5%	41
<i>Campaigns</i>		32.8%	39
<i>Policy and regulations</i>		29.4%	35
<i>Other information</i>		0.8%	1
	Total Responses		119

Overall, members' main purpose in accessing these online fora is to look for people's opinions and comments, in combination with information on individual and collective actions. Some scientific knowledge and sceptical viewpoints are sometimes searched for but these are not respondents' main use of the fora. The results of Q13 and Q14-1 reveal roles of respondents (mainly as observers) and their purposes (accessing information and perceiving others' comments) to access fora, with relatively few interests to participate in discussions. The survey then enquired those respondents who skip accessing information or discussion contents (of climate change), through using an open question (Q14-2³). The most frequently mentioned reasons were 1) they had no time to read around the issue, 2) they regarded fora as a place for networking rather than for discussion, 3) because of "controversial" messages made by a small group that they preferred not to engage with. This analysis

³ [Q14-2.] If you ever skip fora contents regarding climate change issues, could you please tell me why you did not access or become involved in such discussions on this forum

was based on limited responses to Q14-2 (only 6 answers collected) (see Table 5-2).

Table 5-2. [Q14-2] Reasons Why Respondents Do not Access or Get Involved in Discussion

Respondent's Report in Q14-2	Times Given
Lack of time	2
Looking for information and good links to other sources of information	1
Respondents don't see this as a discussion fora, rather it is regarded as a network to exchange information	1
Respondents suggest that the majority of posts are made by a very small group of people who tend to discuss energy issues which are outside the real scope of the focus (i.e. they are not concerned with local SD issues).	1
Respondents don't understand contents of discussions in a fora	1

The limited collection of respondents' reasons of not participating in discussion in fora cannot represent the nature of observers, in that they prefer to keep silent (i.e. not reply/comment). However, observers do not expect others to be observers; quite on the contrary, as introduced in Chapter 4, in the web survey (Q6) it shows that respondents' motivations for accessing fora includes networking with others, and nearly half (49.6%) of respondents present a willingness to establish dialogue with other users in fora (i.e. leaving comments, posting replies, etc.). In fact, 46.2% claim to be looking for opportunities to discuss with someone who has different viewpoints, and 41% like to learn more about other members' opinions. So observers may be lurking silently for most of the time in fora, but they do not wish others to be observers as well. In this way, the observers aim to engage with their views, without however contributing directly. This implies that observers will be silent if views presented in the discussions (both by posters and repliers) differ from theirs. This may be a strategy by observers of avoiding conflicts in online fora, which distract participants' attention and consume their energy, as frequently shown in the qualitative analysis of topic-threads in the following sub-sections (See 5-2-2 – Qualitative Analysis of KAs' Initiated Topic-Threads).

In Chapter 4, the statistics of contents and web survey results suggest that few authors participate in fora discussions, but they contribute considerably in generating discussion content. These correspond to the results in this chapter 5 on observers' roles and their reasons for not joining online discussions. In the next section, the focus is on detecting roles of those members who are authors (i.e. not observers) in the process of online communication.

5-2. Roles of Active Authors and Key Authors

As outlined in Chapter 3, members who post or reply to more than one article are regarded as active authors in fora, and some active authors are further considered "key authors" (see definition in Box 3-1). Chapter 4 have identified the potential existence of these key authors, who are active authors with significantly higher levels of activeness, are frequent participants in fora communications, and are capable networkers in statistics of their participation in fora.

The roles of key authors in fora communication are explored in this section. To further analyse authors' roles in fora communication flow, authors' roles are firstly examined by ranking their performance, and then are further explored via qualitative approach, as summarised below.

5-2-1. The KA List: Ranking Author's Performance

Key authors are selected from those authors who are ranked in the top 20% of level of activeness (i.e. indicate very high activity), participate more frequently in fora communication, and are more capable of networking with others. Based on the α (Activeness), β (Frequency), and γ (Networking) performance lists, authors' performance was ranked. Authors' rankings are weighted and calculated as "scores" (0~100) of performance on the three lists. The authors' scores in the three lists are then summed up (full scores = 300), and those authors whose total scores are ranked

as top 20% in their fora are qualified as “key authors” (KAs) in the research.

As a result, 12 key authors are identified in Climate Concern (3.1% of total authors); the OurPlanet / EarthDay also has 12 key authors (2.7% of total authors); Transition Towns has 7 KAs (1.4% of total authors), and LocalSustUK has 5 KAs (1.4% of total authors), see Table 5-3.

Table 5-3. Total Ranking of Four Fora’ Authors’ Performances

Fora Title	Climate Concern	OurPlanet / EarthDay	Transition Towns	LocalSustUK
Total number of “KA” Authors	12	12	7	5
Average α (ACT) Score (full scores=300)	277.31	277.33	290.41	288.63
Average β (FREQ) Score (full scores=300)	189.68	132.29	157.26	193.35
Average γ (Network) Score (full scores=200)	182.68	179.28	188.46	135.71
Average KA (Total) Score (full scores=300)	281.99	271.91	192.78	282.93

The results reveal that KAs do exist: these authors are not only ranked as top 20% in terms of activeness (α list), frequency of participation (β list), and networking capability (γ list), but also have overall highest performance in each forum (their total scores ranked as top 20%). Climate Concern Forum and OurPlanet / EarthDay have the most KAs while the LocalSustUK has the least numbers of KAs. Nevertheless, LocalSustUK’s KAs have obtained the highest average total scores, indicating KAs in the LocalSustUK forum are the most notable authors in the three aspects of performance. Comparisons of the KAs’ performance in the three aspects of activeness, frequently participation and networking capability in the four fora are further illustrated in Tables 5-4, 5-5, and 5-6.

Table 5-4. Performance Comparison of Key Authors (KA) and Total Authors (Activeness)

Fora Title	Climate Concern	OurPlanet / EarthDay	Transition Towns	LocalSustUK
Numbers (%) of KAs' posted articles (ATP)	1675 (61.40%)	95 (23.63%)	201(32.21%)	985(47.70%)
	KAs' AVG=139.58	KAs' AVG=7.92	KAs' AVG=12.56	KAs' AVG=197.00
Numbers (%) of KAs' posted replies (ATR)	469(38.19%)	869(46.65%)	627(38.56%)	232(13.41%)
	KAs' AVG=39.08	KAs' AVG=72.42	KAs' AVG=39.19	KAs' AVG=46.40
Numbers of Words (%) in KAs' Postings (ATW)	1311964 (58.68%)	141549(29.98%)	102246(32.20%)	91114(30.75%)
	KAs' AVG=109330.33	KAs' AVG=11795.75	KAs' AVG=14606.57	KAs' AVG=18222.8
Total Numbers of Articles Average ATP of All Authors	2728	402	635	2072
	AVG=7.01	AVG=0.91	AVG=1.30	AVG=5.72
Total Numbers of Replies Average ATR of All Authors	1228	1863	1582	1730
	AVG=3.16	AVG=4.21	AVG=3.24	AVG=4.78
Average ATW of All Authors	2235642	472073	317501	1821478
	AVG=5747.15	AVG=1068.04	AVG=649.29	AVG=5031.71

Though the number of qualified key authors is relatively few in the four fora (as a result only 2.14% of total authors are qualified the above criteria in four fora), their contributions to the contents of the fora are very large, as shown in the KAs' activeness table (Table 5-4). On the Climate Concern Fora, 61.40% of contents are generated by KAs, while more than half of posted contents (58.68%) in terms of word count are contributed by these KAs. Key authors' contribution to the OurPlanet / EarthDay forum is more limited than in the other three fora (in numbers of postings and word count of written content) but their performance in terms of responding to others is the strongest among the four fora. The finding corresponds to the observation of content statistics in Chapter 4 (See Table 4-1), which suggests that responding to others' posts is a major method (52.31%) of communication in the OurPlanet / EarthDay Forum. Fewer KAs are found on the Transition Towns Forum, but their contribution is also considerable in KAs' posted articles (ATA) (32.21%), KAs' posted replies (ATR) (38.56%), and Words (%) in KAs' Postings (ATW) (32.20%). Similarly, on the LocalSustUK Forum, only 5 KAs are found, but they contribute to a total 47.7% of ATA, 30.755 of ATW. However, a relatively low percentage of KAs' ATR (13.47%)

is found in the LocalSustUK Forum, implying that in this forum these KAs focus more on posting articles and less on responding to others.

Table 5-5. Performance Comparison of Key Authors (KA) and Total Authors (Participation Frequency)

Index of Participation Frequency	Climate Concern	OurPlanet / EarthDay	Transition Towns	LocalSustUK
Average APD (Day) of KAs	71.08	49.92	49.18	147.80
Average ALD (Day) of KAs	337.50	221.17	137.76	693.40
Average APD (Day) of All Authors	6.20	2.87	2.51	7.67
Average ALD (Day) of All Authors	88.78	25.55	14.77	136.20

The calculation of access statistics in Table 5-5 indicates the comparison of KAs’ performance and all authors’ performance in average in participation frequency. KAs in Climate Concern have 71.08 participation days in average over the two-year period, and the average lifetime span (i.e. from the day the KA first communicated on the forum by posting articles or replies, to the day the KA posted the last article / reply, during the research period) in this forum is more than 337.5 days. On the other hand, KAs from the OurPlanet / Earth Day Fora on average have relatively fewer specific participation days (49.92 days), and the lifetime of these fora is only about 221 days. KAs in the Transition Towns forum have 49.18 participation days in average during the two-year research period, and their lifetime spent on the forum averages 137.76 days. KAs in the LocalSustUK Forum have the longest participation days (147.8 days in average) during the two-year research period, and their lifetime span is also the longest – more than 693.4 days in average. The statistics indicate that KAs in the LocalSustUK forum are the most permanent of the four fora. This forum is therefore suggested to be more “sticky” to key authors, who are willing to spend more time in the forum.

Table 5-6. Networking Capability of KA

Index of Networking Capability	Climate Concern	OurPlanet / EarthDay	Transition Towns	LocalSustUK
Numbers (%) of KA initiated topic-threads(ATT)	272(62.67%)	82(30.83%)	126(35.69%)	194(40.50%)
	KAs' AVG=22.67	KAs' AVG=6.83	KAs' AVG=7.88	KAs' AVG=38.80
Numbers (%) of KA obtained repliers (AR)	203(44.52%)	208(32.15%)	318(29.28%)	207(29.74%)
	KAs' AVG=16.92	KAs' AVG=17.33	KAs' AVG=19.88	KAs' AVG=41.40
Total No. of topic-threads Average ATT of Fora Authors	434	266	353	480
	AVG=1.12	AVG=0.60	AVG=0.72	AVG=1.33
Total No. of obtained repliers Average AR of Fora Authors	456	647	1086	697
	AVG=1.17	AVG=1.46	AVG=2.22	AVG=1.93

Moving on to networking ability, Table 5-6 shows that KAs' ability to initiate discussions online and respond to them, is considerable. On Climate Concern, KAs initiated more than 62% topic-threads and earned about 44% of individual repliers; on OurPlanet / EarthDay (32.15%), Transition Towns (29.28%), and LocalSustUK (29.74%) fora, KAs obtained around the same percentage of individual repliers. The considerable number of initiated topic-threads and obtained repliers from KAs demonstrates their capability of initiating discussions among members. This should help to form virtual social networks in fora.

The results in Tables 5-4, 5-5, and 5-6 present a clearer understanding of the characteristics of the roles of key authors in fora: overall only 36 (2.14%) authors are recognised as key authors but they are significant content contributors, posting 51.71% of articles and 34.6% of replies in the four fora; they are also frequent participants in accessing fora, whereby members could frequently see their comments or get in contact via posting and replying to articles; and finally they are important online social network builders who not only initiated 41.51% of topic-threads, but are also recognised by other members and obtained 32.44% of responses in these fora. These KAs appear to have boundless energy in terms of getting involved and being active in the fora, suggesting their roles are crucial in online fora discussions and the generation of fora contents, which should be accessed by all fora users and decisive to these users' impressions of online discussions in these fora.

Since key authors fill active roles in building fora contents, in accessing and participating in fora communication and in initiating discussion among fora members, a further examination of their postings and initiated discussions is useful in order to understand their roles in online interactions in more detail. Qualitative analyses of their posts which have initiated discussions (from records during the research period) are used, as outlined in the following sub-section.

5-2-2. Qualitative Analysis of Key Authors' Initiated Topic-Threads

In order to analyse key authors' roles in online communication more deeply, a qualitative content analysis of topic-threads initiated by key authors was conducted. Like other members' postings, key authors' messages are well recorded in the archives of the four internet fora sampled. Thus key authors' topic-threads are regarded as raw data for analysing roles in the interactions between KAs and other authors. From each fora two topic-threads initiated by KAs are selected (eight topic-threads in total) and labelled as topic-threads SN1 to SN8. The selection of sampled topic-threads is described in Chapter 3. KAs who initiated these sampled topic-threads (as initial topic key author) are listed but their original IDs have been omitted to protect their identity; see Table 5-7.

Table 5-7. Topic-Threads Chosen from Four Fora

Sampling Topic-Thread (initiated by KA)(Fora of “Climate Concern”)				
Topic SN	Topic-Thread	Unique Replier	Reply Number	Initial Topic Key Author
SN1	Global Warming - a century of warming or not? http://groups.yahoo.com/group/Climate Concern/message/14428	8	26	J***
SN2	tropical tropospheric warming...today's IPCC scientist report http://groups.fyadoo.com/group/Climate Concern/message/15678	5	26	A***
SN3	What are you doing to be green? http://fora.myspace.com/index.cfm?fuseaction=messageboard.viewThread&entryID=665385&categoryID=0&type=friendFora&friendID=26544757&IsSticky=0&Mytoken=6B2B1053-800D-40E6-971F53BE0A39425E407711410	26	57	C***
SN4	Go NUCLEAR!!!!!! http://fora.myspace.com/index.cfm?fuseaction=messageboard.viewThread&entryID=557274&categoryID=0&type=friendFora&friendID=26544757&IsSticky=0&Mytoken=FA09DBC2-19F4-4024-9F0316905BF44419100287100	23	75	H***
SN5	Hopenhagen to Brokenhagen at Copenhagen - "Where do we go from here?" http://2011.archive.transitionnetwork.org/forum/topic/hopenhagen-to-brokenhagen-at-copenhagen-where-do-we-go-from-here	5	10	S***
SN6	Collaborative approach: comments invited http://transitiontowns.org/fora/topic/collaborative-approach-comments-invited	14	30	B***
SN7	Home owners Are Not Ready For ZeroCarbon Homes, Research Shows http://groups.yahoo.com/group/LocalSustUK/message/9575	10	17	J***
SN8	EU forms algae group, plans first conference http://groups.yahoo.com/group/LocalSustUK/message/11552	9	19	F***

To explore key authors’ roles and their interactions with other members in the eight topic-threads, the initial posts of key authors who initiated the topic-threads are first coded and analysed. As shown in Table 5-8 below, these initial postings can be divided into several categories: 1) postings that seek to inform (i.e. provide information); 2) postings that express authors’ comments and ideas; 3) postings that aim to stimulate members’ interest and to join discussions (i.e. by raising questions or posting events). Key authors’ attitudes in their initial postings can also be categorised as: 1) a supporting attitude towards actions for climate change (coded as S); 2) neutral

including open questions or open-minded comments (coded as N1), or where no specific attitudes or preference can be detected (coded as N2); and 3) negative towards, or raising challenges regarding actions for climate change issues (coded as D). These initial postings on selected topic-threads SN1~SN8 therefore can be sorted as following Table 5-8.

Table 5-8. Initial Postings' Content of SN1 ~ SN8

Topic Thread	OKA's Content Type	Attitude to Behaviour Change for Tackling Climate Change
SN1	“Information Resource”; “Idea / Comment”	Decline
SN2	“Information Resource”	Decline
SN3	“Chatting / Networking”	Open Mind
SN4	“Chatting / Networking”	Support
SN5	“Idea / Comment”	Support
SN6	“Sharing Experiences”, “Chatting / Networking”	Open Mind
SN7	“Information Resource”	Support
SN8	“Information Resource”	Support
Total	“Information Resource”: 4 (50%) “Idea/Comment”: 2 (25%) “Sharing Experiences”: 1 (12.5%) “Chatting / Networking”: 2 (25%)	S: 4 (50%) D: 2: (25%) N1: 2 (25%) N2: 0 (0%)

As shown in Table 5-8, the initial posts of the eight topic-threads key authors present different perspectives on climate change issues. Four of these topic-threads favour discussions about actions in response to climate change (50%), whilst a quarter criticised (25%) current claims on climate change and the rest held a neutral attitude (25%) while chatting and networking with other members. Content provided by authors' initial posts included information (50%), individual comments (25%), experiences (12.5%), and some networking activities (37.5%).

The various attitudes presented in initial postings triggered different types of responses on the fora. For instance, in SN1, the initial topic key author declined actions for climate change, and concluded that “*We frequently hear about a century of global warming ...now that we have are in a decade without warming after only 2 decades of warming, but that simply is not what the science says*” (J***, 2008). As a result, the assertion actually initiated debates in SN1, which involved 25 replies with seven unique repliers arguing with each other. On the other hand, some participants in

the discussions asked questions that were irrelevant to the topic discussed.

In the following analysis of KAs' initiated topic-threads, content generated by repliers to initial postings are also coded and categorised. Firstly, it is found that these replies can be divided into similar categories as KAs' initial postings, such as: information resources, ideas or comments, sharing experiences, and chatting or networking activities. However, repliers' attitudes are more complex. Table 5-9 below shows the coding system for these replies, which is used to categorise repliers' attitudes in terms of a supporting / challenging attitude in their postings.

Table 5-9. Coding of Attitudes in Repliers' Postings

Types of Attitude		Code
Express Support for OP*		SO
Express Support for Actions of Tackling Climate Change Issue		SB
Communicate with others (not directly respond to OP*)	Agree Viewpoints in Other Replies	C1
	Disagree / Challenge Viewpoints in Other Replies	C2
	Raise Questions to Other Replies	C3
	Reply Questions to Other Replies	C4
	Presenting Strong Opinions or Clear Leadership of the Development of Discussions	C5
	Other Communication Activities	C6
Neutral Activities	Raise Non-Challenging Questions to OP*	N1
	Answer Questions from OP*	N2
	Change to Other Subjects	N3
Neutral Activities toward Action for CC issue	Open Questions	NB1
	Not showing preference	NB2
Challenging OP or Questioning OP* (D)	Decline OP*	D1
	Raising Questions to Challenge OP*	D2
Challenging OP toward Actions for CC		DB

*OP: Initial Posting

As shown in Table 5-9, repliers' attitudes can be categorised as supporting, neutral or opposing actions for climate change, and some repliers' posts present can be categorized in more detail, including agreeing / disagreeing with viewpoints in others replies (coded as C1 and C2), raising more questions and replying questions to other replies (coded as C3 and C4), presenting strong opinion or "leadership" of discussion development (coded as C5), and other miscellaneous communication activities that cannot be directly categorised (coded as C6). The supporting attitudes can also be further divided into supporting the initial topic the KA raised (coded as SO), and supporting actions for climate change (coded as SB). The negative attitudes can be further divided as being opposed to initial postings (coded as D1), raising challenging questions to initial postings (coded as D2), and opposing actions or questioning actions for tackling climate change (coded as DB). As a result, SO, D1 and D2 are relevant to supporting or declining the initial topic of the KAs' postings, SB and DB are direct attitudes that support or oppose actions towards climate change issues, and C1~C6 can be regarded as communication activities in the online fora topic-threads discussion.

Based on the analyses of repliers' content type and attitudes presented, the types of repliers' responses in these topic-threads are summarised in Table 5-10 below.

Table 5-10. Repliers' Content Types in Selected Topic-Threads

Topic Thread	Information Resource (%)*	Idea / Comment (%)*	Sharing Experience (%)*	Chatting / Networking (%)*	Total
SN1	4 (11.76%)	24 (70.59%)	1 (2.94%)	5 (14.71%)	34
SN2	15 (29.41%)	23 (45.10%)	6 (11.76%)	7 (13.73%)	51
SN3	8 (11.43%)	38 (54.29%)	19 (27.14%)	5 (7.14%)	70
SN4	25 (27.17%)	56 (60.87%)	2 (2.17%)	9 (9.78%)	92
SN5	0 (0%)	9 (90.00%)	0 (0%)	1 (10.00%)	10
SN6	8 (16.67%)	16 (33.33%)	11 (22.92%)	13 (27.08%)	48
SN7	5 (29.41%)	12 (70.59%)	0 (0%)	0 (0%)	17
SN8	8 (33.33%)	11 (45.83%)	1 (4.17%)	4 (16.67%)	24
Total (%)**	73 (21.10%)	189 (54.62%)	40 (11.56%)	44 (12.72%)	346*** (100%)

*Percentage of content type in each topic-thread;

**Percentage in total content-types;

*** Some replies have multi-types of content in SN1 ~ SN8.

As shown in the Table 5-10, the analysis of content posted by repliers clearly indicates that "ideas / comments" (AVG=54.62%) are more common than other types of content. In some topic-threads (e.g. SN5), almost all discussions in recorded topic-threads were constituted by repliers' own comments. From a communications perspective, internet fora provide a platform for sharing thoughts among members. However, in the selected topic-threads, the main focus of the repliers is not to respond to the opinions presented in the initial posting; rather in most cases repliers express their own opinions which implicitly support or critique the initial postings or arguments. In other words, whilst the responses are initiated by the initial posts, repliers actually use the discussion and interactions (with initial posters or other members) as an opportunity to present their own perspectives and comments. As a result, some viewpoints in replies are even irrelevant to other posts.

In summary, although repliers could share information or have exchanges with initial posters and other group members, their prevailing interest is to post their own views. They are not simply passive receivers of KAs' postings and attitudes (toward climate change), but are active presenters of their ideas through replying to KAs' initial posts. Moreover, some irrelevant information or opinions are also found during the discussions, and these communication activities enable these participants (authors of posts in discussions) to act as networkers among members in discussion. To reveal their roles in these interaction processes, the following analysis includes an assessment of records of key authors' interactive activities with other members (as repliers) in the eight selected topic-threads.

5-3. Supporters, Challengers, and Communicators: Repliers' Roles in Topic-Threads

The roles of fora authors are highly different in terms of their interactions with each other. When KAs initiate discussions in fora, they become initial posters of

topic-threads. Other authors then intervene, and can take on different roles according to the content of KAs' initial postings. In the last section, supporters and challengers are found as two major roles in topic-threads initiated by KAs, according to authors' level of support or opposition in the discussion threads. Roles of communicators are specifically found via analysing repliers' attitudes and interactions with others. Though all fora authors involved in a topic-thread discussion can be regarded as communicators, those who are carrying out C1~C6 communication activities are specifically considered as communicators who present their attitudes, as described in the previous section. The interactions between key authors, supporters, challengers, and communicators in topic-threads play a significant part and initiate considerable amounts of discussions on fora. It becomes relevant to explore whose interactions with other authors in order to understand the development of fora communication.

In this section, more focus is applied to repliers' roles and their activities in online discussions by conducting analysis of online discussions via qualitative approach. The content of the discussions are coded and analysed in order to present these repliers' information, such as absolute numbers of repliers and their interactions in selected topic-thread discussions in each selected forum.

5-3-1. Repliers' Roles in Climate Concern Forum's Topic-Threads

By analysing the topic-threads selected in the Climate Concern Forum, repliers' roles are explored by revealing their interactions in the discussion thread, which mainly regards to the discussion of climate change issues.

1. Topic-Thread SN1 (Climate Concern Forum)

The SN1 topic-thread was initiated by one of the forum's key authors, J***, who posted an article regarding the fact that global warming issues have become especially topical in the 20th century. J*** raises the question of whether we are really witnessing global warming, or whether it is the excessive attention devoted to it and the concern of scientists that make people think about global warming, while there is

no real additional risk as compared to the state of affairs in the 20th century, as well as the centuries before. Repliers' responses and roles are presented in Table 5-11 below.

Table 5-11. Classification of Repliers' Roles of SN1

Replier SN	Author ID	Count (by numbers of replies) (%)	Presented Attitude in Replies	Role (in Thread)
1	A***	7 (26.92%)	C4-N3;C6-D1;D1;C6-C1; C2-N1-N3;N1-N3;C2	Challenger (15.38%)
				Communicator (84.62%)
2	R***	6 (23.08%)	D2-C3-N3; C4; C2; C2; C4-N3; C2	Communicator (88.89%)
				Challenger (11.11%)
3	J*** (OKA)	5 (19.23%)	S-C2; S-C2; C2; C2-C4; C6-C4-C2	OKA (20%)
				Communicator (80%)
4	e***	3 (11.54%)	D1; D1-C2; C4	Challenger (50%)
				Communicator (50%)
5	R***	2 (7.69%)	C1-N3 C3-S	Communicator (75%)
				Supporter (25%)
6	L***	1 (3.85%)	C4-N3	Communicator (100%)
7	r***	1 (3.85%)	C1	Communicator (100%)
8	w***	1 (3.85%)	C6-N3	Communicator (100%)
Total Count		26	(OKA=Original Key Author)	

As shown in Table 5-11, 26 replies were received on the topic-thread, but these replies came from only eight unique repliers, including the key author who originally initiated the first post of the topic-thread. Among these repliers (OKA included),

Replier 1 (ID: “A * **”) posted the most replies (seven posts, accounting for 26.92% of the total) in the topic-thread, and presented his dissent of the original postings (15.38% of his replies). However, it also revealed that Replier 1 had significantly more postings (84.62%) for answering others’ articles in the topic-thread, and their discussions led to the thread shifting to other topics. Similarly, Replier 2 (ID: “r * **”) and Replier 4 (ID: “e * **”) also presented their opposition to the original postings in an article, but spent significant time communicating with others rather than discussing the original postings.

The original key author (OKA) did not actively respond to other repliers’ dissensions and challenges, but posted more replies (80%) communicating with others. In the topic-thread, only one replier (Replier 5) presented a direct supporting attitude towards OKA’s comment, but in most of the postings (75%) the Replier 5 also actively communicated with others involved in the discussion rather than express his / her attitude (25%) to OKA’s post. Repliers 6, 7, and 8 only posted one reply in the topic-thread respectively, and all their postings do not directly reveal their attitude to OKA’s initial posting, but instead communicate with others in the topic-thread. Some repliers directly oppose the original post’s argument by pointing out the misinterpretation of the information presented by the KA (see the summary of repliers’ responses in Appendix III).

In summary, all repliers in the SN1 topic-thread are more like communicators who actively connect with each other, and some of them act in the “challenger” role that challenges the OKA’s comments in the initial posting. Only one replier played a limited “supporter” role and recognised OKA’s initial posting. Repliers’ attitudes to this initial topic post can be categorised as in Table 5-12 below.

Table 5-12. Classification of Repliers' Attitude to the Original Post of SN1

Attitude to OKA's Posting	Count	Percentage
C2	11	24.44%
N3	8	17.78%
C4	7	15.56%
C6	4	8.89%
D1	4	8.89%
C1	3	6.67%
S	3	6.67%
C3	2	4.44%
N1	2	4.44%
D2	1	2.22%
Total	45	100%

Among the replies to the SN1 Topic-Thread, many authors (37.5%) present attitudes (D1 and D2, occupied total 11.11% in coding counts) that directly disagree with the initial argument of the KA, by pointing out the misinterpretation of the information forwarded. These repliers took an active opposing position towards the statement of the KA, and started asking questions that challenge the KA's argument in the initial article. In this case, repliers became challengers of the KA's opinion, and the KA had to defend his statement for his intention of leading collective opinion. Nevertheless, it is also found that all these replies in the topic-thread also include communication activities with other participants that are not directly relevant to the discussion of original posts. Repliers' attitudes in these activities are coded as C1, C2, C3, C4, and C6 which occupied 60% in the total coding counts. As a result the repliers in the SN1 topic-thread are more like communicators who actively form dialogues and have connections with each other.

It appears that the KA's statement did not get much support from the repliers overall. Most of them were more focused on communicating and clarifying the meaning of certain facts than in discussing those facts in detail.

2. Topic-Thread SN2 (Climate Concern Forum)

Similarities exist between SN1 and the SN2 topic-thread which was initiated by the key author A*** who posted an article regarding tropical tropospheric warming

and its long term effects. The focus of the first article of SN2 was to identify the key cause of the tropical tropospheric warming, to discuss the genuine role of global warming in this issue, and to consider the scientific approach taken to the issue so far. The KA challenges the model of environmental science utilised in modern times, and encourages people to take action on climate change by posting a set of strong arguments. It received responses from several participants almost immediately.

As shown below in Table 5-13, the SN2 posting generated diverse reactions from the participants; only 44% of the 52 replies (from 26 unique respondents) provided comments, while 13.46% provided networking opportunities, and roughly one-third of messages (30.77%) provided additional information on the issue. The percentage of people sharing experiences (11.54%) was much higher in comparison with SN1. This indicates intensive discussion by relatively few participants, all communicators (with different roles) in the discussion.

Table 5-13 also shows that only five unique repliers participated in the discussion, though there were 26 replies in total, including the key author who generated this topic-thread. The original posted by the KA received the responses from several participants at once: Replier 5 contesting the argument of the KA and offering evidence to the contrary by referring to the current temperature record, while Replier 4 supported the KA and challenged the opinions voiced by Replier 5. A large portion of the topic-thread was an actual dialogue between KA and Replier 2 (ID: P****w). Both participants were involved in an active discussion on the true role of long-term data in the estimates of climate change, as well as the effect of greenhouse gases on the overall climate. This dialogue is interrupted and turned another direction by Replier 3 who introduces the AGW model for discussion of the warming trend. The topic-thread concludes with a discussion of the bias that some researchers may have in their publications (by Replier 5), and Replier 2 attacking the KA about the fake science he is protecting.

Table 5-13. Classification of Repliers' Roles of SN2

Replier SN	Author ID	Count (by numbers of replies) (%)	Presented Attitude in Replies	Role (in Thread)
1	A*** (OKA)	9 (34.62%)	S;C2-C4;C2-C3;C2;C5;C6;C3; C4-C5-N3;C2-C4	Supporter (7.14%)
				Communicator (85.71%) C2:28.57% C3:14.29% C4:21.43% C5:14.29% C6:7.14%
2	P***	9 (34.62%)	C2-C3;C2-C3-D2;D-C2;C1; C6;C2;C1-D;C4;C2	Communicator (78.57%) C1:14.29% C2:35.71% C3:14.29% C4:7.14% C6:7.14%
				Challenger (21.43%) D1:14.29% D2:7.14%
3	R***	4 (15.38%)	C6;C4-S;C4;C4	Supporter (20%)
				Communicator (80%) C4:60% C6:20%
4	H***	2 (7.69%)	S;C3-N1	Communicator (C3:33.33%)
				Supporter (33.33%)
5	R***	2 (7.69%)	D2;C2-D-N3	Challenger (50%) D:25% D2:25%
				Communicator (C2:25%)
Total Count		26	(OKA: Original Key Author)	

The KA (ID: A***) posted nine replies (34.62%) and Replier 2 (ID: P***) also posted nine replies, acting as a communicator and sharing new information (78.57%),

and opposing the opinion of the KA (21.43%). Replier 2 and Replier 5 challenged the KA's views and had debates with other participants. On the other hand, Replier 3 (ID: R***) and Replier 4 showed clear support of the KA as shown in Table 5-13, but it seems that they also prefer communication activities with other participants in the discussion, such as replying other authors' questions (C4).

Table 5-14. Classification of Repliers' Attitude to the Original Post of SN2

Attitude to OKA's Posting	Count	Percentage
C2	10	25.00%
C4	7	17.50%
C3	5	12.50%
C6	3	7.50%
D1	3	7.50%
S	3	7.50%
C1	2	5.00%
C5	2	5.00%
D2	2	5.00%
N3	2	5.00%
N1	1	2.50%
Total	40	100%

Table 5-14 above shows repliers' attitudes in the discussion of topic-thread SN2. While the challengers were highly active, they did not present any unified opinion on the topic they challenged, only critiqued the KA's arguments. Moreover, the role of communicator and information disseminator was successfully undertaken by the thread creator, the KA (A***) who gathered information from other blogs, articles and supplementary sources to expand the participants' views on the issue. The KA managed to provide comprehensive information for supporting his ideas such as Lindzen's article and the IPCC report findings. As a result, climate science was disputed, and the attitudes of mainstream scientists were challenged during the online discussion; an intensive debate was initiated between the initial topic KA and repliers. As the debate was interrupted and turned to another topic by Replier3, 7.5% of the discussion supported KA opinions, while the portion challenging / disagreeing with the initial post was limited to 12.5%; other uses of the discussion were

communicating with others (77.5%) and neutral (7.5%). In other words, most of the repliers' posts reveal that they were more interested in communicating other information, challenging the viewpoints of all the other participants and networking.

5-3-2. Repliers' roles in the OurPlanet / EarthDay Forum Topic-Threads

1. Topic-Thread SN3

Topic-thread SN3 was initiated by one of the OurPlanet key authors, C***, who raises the question of what it means to live a green life, and asks people to share opinions on what people do to protect nature and the environment. It was an open question raised by the KA for collecting ideas on "how to live green". This can be considered quite a neutral posting. A number of repliers voiced their opinions and shared their experiences (Table 5-15).

Table 5-15. Classification of Repliers' Roles in SN3

Replier SN	Author ID	% of replies	Attitude in Replies	Role (in Thread)
1	J***	9	C2;C2;C2-C6;C2-C6;C2-C4;C2-N3; C2-N3;C2-N3;C2-N3	Communicator (100%) C2: 100.00%; C4: 11.11% C6: 22.22%; N3: 44.44%
2	A***	8	D1;C2-D1;C2-C6;C3-D2 D1;D1;D1;D1	Challenger (87.5%) D1: 75%; D2: 12.5%
				Communicator (37.5%) C2: 25.00%; C3: 12.50%; C6: 12.50%
3	A***	7	N2;N2;C4-C2;S-C2; C2-N3;C2;C2	Communicator (71.43%) C2: 71.43%; C4: 14.29%
				Supporter (14.29%)
4	F***	4	N2;S-C2;S-C2;C2	Communicator (C2: 75%)
				Supporter (50%)
5	D***	3	C2-N3;C2-N3;C1	Communicator (100%) C2:66.67%; C1:33.33%
6	G***	3	N3;C2-C4-N3;D1	Challenger (D1: 33.33%)
				Communicator (33.33%) C2: 33.33% C4: 33.33%
7	S***	3	D1;N2-N3;C2-D1	Challenger (D1:66.67%)
				Communicator (C2: 33.33%)
8	W***	2	D1;C2-N3	Challenger (D1: 50%)
				Communicator (C2: 50%)
9	A***	1	N2	
10	A***	1	N2	
11	A***	1	N2	
12	A***	1	N2	
13	A***	1	N2	
14	A***	1	N3	
15	A***	1	N2	
16	D***	1	N2	
17	I***	1	N2	
18	K***	1	N2	
19	M***	1	N2	
20	S***	1	N2	
21	S***	1	N2	
22	S***	1	N2	
23	T***	1	N2	
24	U***	1	N2	
25	V***	1	D1	Challenger (D1: 100%)
26	V***	1	N3	
Total Count		57	No OKA involved in replies	

The Table 5-15 shows that the total number of replies was 57, which is high compared to the other selected topic-threads. However, the number of unique repliers is low (26 individuals). The majority of the repliers (n=18) posted only one comment, so they cannot be regarded as active participants. although a large portion of the one-time comments (Repliers 9 ~ Replier 26; 79 counts in total) were experience-sharing (e.g. turning the lights off, recycling, driving a hybrid, using water filters instead of buying water in plastic bottles).

Three participants acted as communicators (100%); Replier 2 was both a communicator (37.5%) and challenger (87.5%), and Replier 3 a communicator (71.43%) and supporter (14.29%). Replier 2 was involved in a lively discussion regarding greener life, and gave strong opinions that incited more debates among members over the necessity of green behaviour. When the debate began heating up, participants took part in selected discussions where they could put forward their views; they became dominant participants. Repliers' attitudes to the initial KA posting are illustrated in Table 5-16.

Table 5-16. Classification of Repliers' Attitude to the Original Post of SN3

Attitude to OKA's Posting	Count	Percentage
C2	24	30.38%
N2	19	24.05%
N3	13	16.46%
D1	11	13.92%
C4	3	3.80%
C6	3	3.80%
S	3	3.80%
C1	1	1.27%
C3	1	1.27%
D2	1	1.27%
Total	79	100%

As the initial post is an open question, most replies can be classed as communication (40.52% in total counts) or neutral (N2 and N3, count as 40.51%). The discussion attracted disagreeing / challenging attitudes which account for 15.19% of coded attitude counts (D1 and D2).

2. Topic-Thread SN4 (OurPlanet / EarthDay Forum)

In topic-thread SN4 in the OurPlanet / EarthDay Forum, the KA's post is to support the claims of anthropogenic climate change and to argue that the use of nuclear energy will save the planet from emissions resulting from oil and coal. The KA mentions nuclear waste storage examples and dismisses the threats of cancer and nuclear pollution, stating that this option is more economically sustainable for the USA. The discussion attracts many more replies than topic-thread SN3 (see Table 5-17).

Table 5-17. Classification of Repliers' Roles of SN4

Replier SN	Author ID	% of replies	Presented Attitude in Replies	Role (in Thread)
1	H*** (OKA)	33 (44%)	S;S;C4;C2;C4-C6;C2;C1; C2;C1-C2;C2;C2;C6;C4;C6 ;C4-C3;C6-C5;C4;C1-C2; C2;C6-C1;C2-C5; C1;C4;C2;C1-C2;S;S;C5; C2-C6;C1;C3;C1;C2-N3	Defender (12.12%)
				Communicator (87.88%) C1: 24.24%; C2: 39.39% C3: 6.06%; C4: 18.18% C5: 9.09%; C6: 18.18%
2	A***	11	S-C5;S;C2;C4-C5;N3-C6; C2;D1-C5;C4-C5;C4-C5; C4-C5;C5	Supporter (18.18%)
				Challenger (9.09%)
				Communicator (100%) C2: 18.18%; C4: 36.36% C5: 63.64%; C6: 9.09%
3	D***	9	D1;C2-D1;D1;D1;D2;C2-D; D1-N3;D1-C2;C2-D1	Challenger (D1: 88.89%)
				Communicator (C2: 44.44%)
4	T***	2	C2;S	Communicator (C2: 50%)
				Supporter (50%)
5	T***	2	D1;C1	Challenger (D1: 50%)
				Communicator (C1: 50%)
6	A***	1	D1	Challenger (D1: 100%)
7	C***	1	D1-C2	Challenger (D1: 100%)
				Communicator (C2: 100%)
8	E***	1	D1	Challenger (D1: 100%)
9	E***	1	C3	Communicator (C3: 100%)
10	J***	1	D1	Challenger (D1: 100%)
11	J***	1	D2-D1	Challenger (100%) D1: 100%; D2: 100%
12	J***	1	S	Supporter (100%)
13	L***	1	C4	Communicator (C4: 100%)
14	M***	1	S	Supporter (100%)
15	P***	1	D1	Challenger (D1: 100%)
16	R***	1	D1	Challenger (D1: 100%)
17	R***	1	S-N3	Supporter (100%)
18	S***	1	D1	Challenger (D1: 100%)
19	S***	1	D1	Challenger (D1: 100%)
20	S***	1	N	
21	T***	1	D1-D2	Challenger (100%) D1: 100%; D2: 100%
22	V***	1	D1	Challenger (D1: 100%)
23	W***	1	S	Supporter (100%)
Total Count		75	(OKA: Original Key Author)	

As Table 5-17 shows, the total number of replies was 75 from 23 participants, including the KA, which is higher than for topic-thread SN3 (57 replies).

In this post, the KA is not just the initial poster, but also an active replier (Replier 1) who posted 33 replies (44% of total replies). He / she performed mainly as a communicator (87.88%), but also took on the role of the defender (12.12%). Supporters and challengers of the KA's post are found in the discussion. Replier14, Replier17, Replier23 appeared to be supporters of the KA, but posted only one comment, so did not actively manage the discussion. On the other hand, the main opponents of the KA were Replier2 (a***) and Replier3 (D***) who turned out to be serious challengers and disputed the need to use nuclear energy throughout the whole discussion. Replier3 engaged in the discussion earlier, and was more active at first. However, Replier 3 only challenged the KA's argument, while Replier 2 showed clear "leadership" in the discussion by dismissing the claims about meaninglessness of the nuclear energy discussion, providing economic data on the uranium supply, and giving the KA further assistance via information for him to further explore the issue and formulate a sound attitude towards nuclear energy (see Table 5-18).

Table 5-18. Classification of Repliers' Attitude to the Original Post of SN4

Attitude to OKA's Posting	Count	Percentage
D1	21	20.79%
C2	21	20.79%
C4	11	10.89%
S	11	10.89%
C5	10	9.90%
C1	9	8.91%
C6	7	6.93%
N3	4	3.96%
C3	3	2.97%
D2	3	2.97%
N	1	0.99%
Total	101	100%

As shown above, the KA presented a strong opinion in the initial topic post. The KA faced challenging attitudes (D1 and D2, counted as 23.76% in total) at the

beginning of discussion. However, then the KA posted a reply and managed to regain ground by producing information on waste produced by coal and oil consumption, and stating that the indisputably higher comparative advantage of nuclear energy. The KA even indicated the place in which the nuclear waste could be stored (Yukka Mountain) stating that storage would be totally secure there. KA also provided much more information, many links and financial information on the economic advantage of nuclear energy. These efforts gained support for the opinions of the KA (10.89%). In this discussion, rather than directly supporting / opposing the initial views of the KA, , repliers prefer and are willing to communicate with others (counted as 60.39%), including disagreeing with others' viewpoints (coded as C2 and accounting for 20.79%) and replying to questions in other replies (coded as C4, 10.89%).

5-3-3. Repliers' roles in Transition Towns Forum Topic-Threads

1. Topic-Thread SN5

The SN5 topic-thread was initiated by one of Transition Towns' key authors, S***, who posted an article regarding the climate change Copenhagen meeting. The author's intention was to provide some comments and information on the issue for further discussion and to encourage networking. The author showed a neutral position in his original posting (proving the topic and some data). On networking, a relatively short discussion ensued (compared with selected topic-threads in other fora) of 10 replies from 5 participants (See Table 5-19).

Table 5-19. Classification of Repliers' Roles in SN5

Replier SN	Author ID	Count (by numbers of replies) (%)	Presented Attitude in Replies	Role (in Thread)
1	D***	3 (30%)	S-C2;S-C2;S-C2	Supporter (100%)
				Communicator (100%) C2: 100%
2	J***	2 (20%)	S-C2;S-C2	Supporter (100%)
				Communicator (100%) C2: 100%
3	N***	2 (20%)	S-C3;S-C2	Supporter (100%)
				Communicator (100%) C2: 50% C3: 50%
4	S*** (OKA)	2 (20%)	C6;C2-C5	Communicator (100%) C2: 50% C5: 50% C6: 50%
5	T***	1 (10%)	S	Supporter (100%)
Total Count		10	(OKA: Original Key Author)	

As shown in Table 5-19, repliers contributed almost equally: three of the five repliers posted two replies each, one posted three replies and the other replier (Replier 5) contributed one reply. The analysis of content of this topic-thread shows that the majority of repliers turned out to be supporters of the KA's opinions, and there were no challengers who disputed the KA's original point so no argumentation developed. Replier 2 is the coordinator of a campaign that aims to assemble people and have procession for pro-actions of tackling climate change during COP15 in Copenhagen, as a result it encourages other members to join their activities in the discussion, which could lead the online discussion to the offline activities. Other repliers also seemed to know each other already. Repliers' attitudes towards SN5 are listed in Table 5-20.

Table 5-20. Classification of Repliers' Attitude to the Original Post of SN5

Attitude to OKA's Posting	Count	Percentage
S	8	44.44%
C2	7	38.89%
C3	1	5.56%
C5	1	5.56%
C6	1	5.56%
Total	18	100%

The substantial agreement with / support of (44.44% in total coded attitude counts) the KA's post was expressed by repliers interacting directly with the KA; some repliers presented disagreeing / challenging views to another replier (Replier 1). The "debate" was soon finished by the KA, arguing some controversial views from Replier 1 were "wrong" and suggesting no further discussion. No new posts were added throughout the research period.

2. Topic-Thread SN6

SN6 was initiated by an article regarding the establishment of a new IT software platform to enhance communication within the forum, therefore relating to climate change only in an indirect way. Nevertheless, it represents the process of creating a collaborative approach in a social group aiming to tackle climate change by changing their own living contexts. The SN6 topic-thread also advocates closer networking ties (as does the SN5 topic-thread), and the networking information provided by the KA created great interest in the Transition Towns Forum. Repliers' responses are recorded in Table 5-21:

Table 5-21. Classification of Repliers' Roles in SN6

Replier SN	Author ID	Count (by numbers of replies) (%)	Presented Attitude in Replies	Role (in Thread)
1	J***	5 (16.67%)	C6; C6; S-C6; C2; C4	Supporter (20%) Communicator (100%) C2: 20% C4: 20% C6: 60%
2	B*** (OKA)	4 (13.33%)	C5; C5; C1; C1-C4-C5	Communicator (100%) C1: 50% C4: 25% C5: 75%
3	G***	4 (13.33%)	C5; C1; C5; C6	Communicator (100%) C1: 25% C5: 50% C6: 25%
4	T***	4 (13.33%)	S; S; N1; S	Supporter (75%)
5	D***	2 (6.67%)	C2;C4	Communicator (100%) C2: 50% C4: 50%
6	M***	2 (6.67%)	S; C1-C6	Supporter (50%) Communicator (50%) C1: 50% C6: 50%
7	C***	1 (3.33%)	D	Challenger (100%)
8	J***	1 (3.33%)	C1	Communicator (C1: 100%)
9	J***	1 (3.33%)	C1-N1	Communicator (C1: 100%)
10	L***	1 (3.33%)	C6	Communicator (C6: 100%)
11	P***	1 (3.33%)	S	Supporter (100%)
12	P***	1 (3.33%)	N1	
13	R***	1(3.33%)	N1	
14	S***	1 (3.33%)	S	Supporter (100%)
15	S***	1 (3.33%)	S	Supporter (100%)
Total Count		30	*OKA: Original Key Author	

As shown in Table 5-21, the KA and Replier 2 (B***) posted a comment inviting for the discussion of a new IT platform – the Transition Software Platform that was planned for launch on the site. The activity of participants to the topic-thread was divided, with the first six repliers (KA included) being highly active, and nine repliers posting only one response, showing little active interest in the discussion.

Despite the fact that there were 30 replies, only 15 unique repliers participated in the discussion. The KA as a replier (Replier 2) was quite active in the discussion, but the percentage of his replies was 13.33% of total replies; “Replier1” was a bit more active (five replies posted, which occupied about 16.66% of the overall debate). Replier 1 spent most of their time communicating with other members involved in the debate (80%), and posted a supporting comment for the KA (20%). Replier1 and the KA (Replier 2) were the most active individuals and communicators in this discussion.

Other participants mostly showed an inclination to either communicate with others (Repliers 8, 9, 10 – 100%) or to support the KA (Repliers 11, 14, 15 – 100%). The discussion developed mainly amongst active repliers (others only contributed some individual comments). It appears that active the users knew each; other contributors were new to the debate. Repliers’ attitudes towards the topic are coded in Table 5-22.

Table 5-22. Classification of Repliers’ Attitude to the Original Post of SN6

Attitude to OKA’s Posting	Count	Percentage
S	8	22.86%
C1	6	17.14%
C6	6	17.14%
C5	5	14.29%
N1	4	11.43%
C4	3	8.57%
C2	2	5.71%
D	1	2.86%
Total	35	100%

Table 5-22 shows that the discussion over the IT platform topic was extensive. A supporting attitude was found eight times (22.86% of the total counts); neutral opinions / attitudes (N1) were also present (11.43%), and only one post declined the idea of developing a new IT platform for discussion (2.86%). These statistics clearly indicate support for the initial topic post. Other communication activities were minor: discussing other repliers’ views (C1 and C2, 25.71%), providing comments (C4 and C5, 22.86%), and other communication activities (C6, 17.14%). Overall, the KA’s

action of inviting comments was supported by repliers' discussing the platform and suggesting new ideas about more convenient forum communication in the future.

5-3-4. Repliers' roles in the LocalSustUK Forum Topic-Threads

1. Topic-Thread SN7

SN7 was initiated by a post regarding the transition to zero-carbon homes. The KA forwarded a news report about the current attitude of home owners and builders towards the coming regulations about zero-carbon homes; the KA asks whether the zero-carbon schemes are generally implementable, and whether people will be able to live up to the newly established standards. The KA supports anthropogenic climate change and provides some information for users to consult on the issues of zero-carbon homes. The post attracted 17 replies (Table 5-23).

Table 5-23. Classification of Repliers' Roles of SN7

Replier SN	Author ID	Count (by numbers of replies) (%)	Presented Attitude in Replies	Role (in Thread)
1	C***	4	S-N1;C3;C1-C3; C3	Supporter (25%) Communicator (75%) C1: 25%; C3: 75%
2	P***	4	S-C4;S-C4;C1;S- C5	Supporter (75%) Communicator (100%) C1: 25%; C4: 50%; C5: 25%
3	C***	2	C3;C2-C4	Communicator (100%) C2: 50%; C3: 50%; C4: 50%
4	A***	1	C1	Communicator (C1: 100%)
5	B***	1	S-C4	Supporter (100%) Communicator (C4: 100%)
6	C***	1	S-C4	Supporter (100%) Communicator (C4: 100%)
7	F***	1	C4-C3	Communicator (100%) C3: 100%; C4: 100%
8	J*** (OKA)	1	C4	Communicator (C4: 100%)
9	L***	1	C4	Communicator (C4: 100%)
10	R***	1	D1	Challenger (D1: 100%)
Total Count		17	*OKA: Original Key Author	

Ten unique repliers took part in the discussion, including the KA who provided some more sources. As shown above, Replier1 and Replier2 were the most active, posting four replies each. Others acted more like communicators who asked questions and receive responses. Replier1 (C***) asked most questions which others (Replier2, 5, 6, 7) answered and offered more explanations. These were almost collective consultants to specific members and shared ideas online. Some repliers (i.e. Replier3) raised further questions. This made the topic-thread a collective information sharing and discussion event. Repliers' views /attitudes are listed in Table 5-24.

Table 5-24. Classification of Repliers' Attitude to the Original Post of SN7

Attitude to OKA's Posting	Count	Percentage
C4	8	30.77%
S	6	23.08%
C3	5	19.23%
C1	3	11.54%
C2	1	3.85%
C5	1	3.85%
D1	1	3.85%
N1	1	3.85%
Total	26	100%

Repliers in SN7 clearly prefer communicating with others about the topic rather than directly discussing it with the key author. In other words, though the initial topic KA initiated the topic-thread, the communication activities are mainly conducted by repliers, including providing information and comments. As a result, communication activities such as raising and replying to questions in other replies (C3 and C4, 50% of total coding counts) occupied a major proportion of the discussion; debates also frequently appeared in the topic-thread (C1 and C2). Only one reply disagreed with the KA's ideas and did not join the rest of the discussion.

2. Topic-Thread SN8

The KA of SN8 introduced updated information on the creation of a new algae

group by the EU, and showed a clear attitude in favour of this proposed group and the environmental improvement it would lead to. He provides messages regarding the UN algae group progress to other members and solicits others' comments. This post attracted 17 replies (Table 5-25).

Table 5-25. Classification of Repliers' Roles of SN8

Replier SN	Author ID	% replies	Presented Attitude in Replies	Role (in Thread)
1	F**** (OKA)	5	C2-C4; C2; C2; C1; S	Supporter (20%) Communicator (80%) C1: 20%; C2: 60%; C4: 20%
2	C****	4	C2-N3; C1-C6; D1-C2; C2-N3-D1	Challenger (D1: 50%) Communicator (100%) C1: 25%; C2: 75% C6: 25%
3	D****	2	C1-C6; C1	Communicator (100%) C1: 100%; C6: 50%
4	P****	2	S; C2-C5	Supporter (50%) Communicator (50%) C2:50%; C5:50%
5	T****	2	C2-D1; C2	Challenger (50%) Communicator (C2:100%)
6	B****	1	C3	Supporter Communicator (C3: 100%)
7	D****	1	C2	Supporter Communicator (C2:100%)
8	F****	1	D1	Challenger (D1: 100%)
9	S****	1	C1	Communicator (C1: 100%)
Total Count		17	*OKA: Original Key Author	

As shown above, replies in topic-thread SN8 were posted by nine authors: most replies were by Replier 1 (f****) who actually was the KA of the topic-thread (29.4%); among these repliers four were casual participants who only posted once.

The KA initiated the topic-thread and supported it throughout the whole discussion. As the KA actively participated in the discussion and interacted with

some of the repliers (e.g. Replier8) , he / she can reasonably be described as an opinion leader here. On the other hand, though Replier2 and Replier8 showed support for the KA’s argument, they both posted alternative approaches to solving the fuel crisis besides algae use. They can be regarded as challengers. The rest of the Repliers (3-9) communicated with each other, while the KA responded to their comments and kept the discussion going. As a result, the position / views of the KA remained stable, and the discussion was focused. Further analysis of repliers’ views is in Table 5-26.

Table 5-26. Classification of Repliers’ Attitude to the Original Post of SN8

Attitude to OKA’s Posting	Count	Percentage
C2	10	35.71%
C1	5	17.86%
D1	4	14.29%
C6	2	7.14%
N3	2	7.14%
S	2	7.14%
C3	1	3.57%
C4	1	3.57%
C5	1	3.57%
Total	28	100%

By agreeing and disagreeing with each other (C1 and C2, 53.57% in total), these repliers formed their own debates within the discussion, that moved away from the theme of the initial topic post. Therefore whether they are supporting / disagreeing with the idea in the KA’s post is not clear. Moreover, repliers’ comments occupied a large portion (45.83%) of all replies. Repliers also used information to support their views / disagreeing with others’ views; thus the portion of information-sharing content inSN8 was quite high (33.33%).

Based on the above analyses of selected KA-initiated topic-threads in the four fora, it can be seen that:

- There is a tendency for some active key authors to lead discussions in their topic-threads fora;

- this leadership is not to support their opinions / views of other, but rather consists of their ability to initiate discussions and stimulate active participation in discussions (sometimes to voice out opinions of others) and providing information;
- other members (not the KAs) can also assume a leadership role by responding to others' opinions or questions in the threads.

The analyses suggest that not only the KAs' participation matters in online discussion, but also repliers' roles can affect the development of communication. Various roles have been identified from the topic-thread discussions, and these roles evolve with the development of topic-threads. For instance, the role of supporters and challengers of initial posts can reverse as the topic-threads develop; some repliers ask questions rather than directly responding to the initial post, and thus affecting the development of the discussion. Many repliers act as communicators and coordinate online social networking in internet fora; they share or exchange their experiences, but do not always lead to the development of discussion. Moreover, it was observed that "leadership competition" can occur among repliers who actively talk to other members and form / shape the "online ideology", or "climate of opinion" in the discussion. Active key authors' roles are diverse and dynamic: they can be information providers, debate and comment initiators, or even bystanders overlooked by members who are involved in discussions (e.g. SN8). Repliers' views and attitudes relate to whether they recognise the activity of authors (i.e. authors' roles) frequently participate in discussions, and network/ communicate with others. This is further explored in the following section.

5-4. Competition for Opinion Leadership in the Topic-Threads

The analyses of fora contents have so far revealed significant active participation in online communication from a limited number of authors and repliers. Since these authors contribute the majority of online content, their opinions and interactions are important components of and contributions to collective discussions. The authors who initiate conversations put forward an idea or issue to be discussed, but it is mainly the repliers, with some intervention from the authors, that shape the consequent discussions. Therefore, whether their opinions influence (or ‘lead’) other members’ views deserves attention. This varies among discussions, of course, and is analysed with regards to particular fora topic threads below. In this thesis, the existence of opinion leadership is explored by analysing topic-threads (in this section) and views of internet fora members (through a web survey, see Chapter 6).

Here, the purpose is to examine the support (or otherwise) for views expressed in online discussions (i.e. the topic threads explored in the previous section) by key authors and others (e.g. repliers), to determine if certain members’ views are considered influential and therefore to be regarded as leading opinion. As mentioned in Katz and Lazarsfield’s research (1948) in Chapter 2, an opinion leader is a person whose information and ideas could noticeably steer or affect individuals. Since key authors seem to influence fora by posting articles and encouraging responses, and since they frequently participate in fora communication and are capable of networking and initiating discussions, they are ideal candidates for “opinion leaders”. However, they cannot automatically be assumed to be such. The sections below outline the analyses of the eight selected topic-threads in the four fora to identify opinion leaders and their relationships with other discussants within each topic thread.

5-4-1. Opinion Leadership in Climate Concern Topic-Threads

1. Topic-Thread SN1

In this topic-thread, the key author does not play a leading role. Instead, Replier1 seems to perform better as a candidate for opinion leader in this topic-thread due to his posted replies (n=7) and agile participation in the debate. Replier1 grasped the line of argument practically from the very beginning of the discussion, when he/she started to attack the KA's statement and provided proofs that were provided. The first message he sent in response to the KA's topic included the citation of an IPCC report from 2007 disputing the statement made by the KA, a graph in Excel and the ENSO cycle to compare with the Hadley Centre's temperature estimates, and a discussion of El Niño's effect on the temperatures of the past decade.–

Critical responses in SN1 towards the KA's opinions were evident: Repliers 1, 4, and 7 attacked the position of the KA very actively, and they managed to shift the discussion in a very different direction, with Replier1 actually focusing on the attitude people should adopt regarding their contributions to global warming. The situation with Repliers 4 and 7 is not clear: the KA mentioned in one of the posts that they were actually one person, and it was 'foul play' by one person to create massive opposition to the KA's initial statement. In general, one may state that the KA's statement did not get much support from repliers since they were more focused on clarifying the meaning of certain facts than in discussing those facts in detail. The discussion finally focused on the debate of man-made climate change, so it did not conclude discussing the topic initially proposed by the KA. Overall, it appears that the credibility and consistency of the replies and data provided by Replier1 lead to some leadership (of opinions) in the topic-thread discussion.

2. Topic-Thread SN2

The purpose of this post was to identify the key cause of the tropical tropospheric warming and to discuss this. The KA aimed to initiate discussion regarding the scientific approach taken so far and his communication with other participants (repliers) was dominant (85%), as the KA conducted a very active discussion of the topic he/she introduced, and defended his/her position effectively by using the IPCC report data, and data from other sources. There were only five participants in total in

SN2 (including the KA), two of which supported the KA, and two who opposed him. Supporters appeared quite weak in the discussion, offering some new data but not defending their position actively. While the challengers were highly active, they did not propose any unified view, they only critiqued the KA's arguments. Thus, it is possible to suggest that the KA is an opinion leader in this discussion, if we consider this being a communicator and information disseminator: the KA gathered information from other blogs, other articles, and supplementary sources to maintain his / her views and contribute to the discussion, without deviating from the initial discussion point. However, repliers were limited in number, so it is difficult to assess whether the KA was truly (as defined in Table xxx previously) a leader of opinion.

5-4-2. Opinion Leadership in the OurPlanet / EarthDay Topic-Threads

1. Topic-Thread SN3

In SN3, the KA posted an article to discuss what it means to be green, and how a green environmentalist should live in accord with his/her claims and philosophy. The KA in this topic thread cannot be considered an opinion leader as his/her initial posting was the only message contributed (i.e. the KA did not participate in the ensuing discussion, and did not guide it). The major portion of the discussion was between Replier 1 and Replier 2 who argued about the seriousness of the issue. Overall Replier 1 can be regarded as the opinion leader in this discussion, due to the number of comments he / she posted (n=9) and the general support he /she obtained in the argument. Replier 1 (J***) resisted the attempts of Replier 2 (A***) (who was the dominant challenger of the initial posting, his / her contribution was about 87% of the discussion) to negate the seriousness of claims for green behaviour. Replier 1 also effectively responded to the arguments of Replier 3 and Replier 4, provided them with additional data on the discussed issue, and returned the discussion toward the original argument as soon as other repliers tried to deviate to other topics not connected with

the main issue. On the other hand, Replier 2 contributed to the discussions of SN3 since its inception, and started to question the need and value of green behaviours. Replier 2 voices the opinion that there is no need to take care of future generations as they will take care of themselves, and states that wind turbines proposed by Replier 4 are very expensive, thus being an unrealistic option. Repliers 8 and 25 also post negative comments in which they proclaim being opposed to green behaviours, and denigrate their value. By Replier 1 and Replier 2 developed opinion leadership. Both of them managed to keep the discussion true to the topic originally proposed by the KA, to encourage people to share their opinions further, and deflected all sarcastic opinions and mocking phrases successfully 1. As discussed by Gladwell (2000) and Kotler (2006) (See Chapter 2, Section 2-3), one function of an opinion leader is to provide and to interpret information for group members, which was done by Replier 1 here. It is irrelevant here to discuss support for / against the opinion of the initial topic since the KA did not participate in this topic-thread at all, apart from initiating it. Other repliers such as Repliers 9-26 (except Replier 25) generally supported Replier 1, mostly to share their experiences of living a green life, they do not participate in other parts of the discussion. In the later stages of the discussion, Replier 1 asserts:

“It is surely important for all environmentally aware people to sustain environmentally friendly behaviours, and educate each other on the positive ways to introduce green behaviours in their lives...” (Replier 1).

This revealed his intention of communicating on fora which earned him/her support from other repliers (i.e. Replier 3, Replier 4).

2. Topic-Thread SN4

This topic-thread was a discussion regarding the necessity to move towards nuclear power in the USA, and initiated a debate on the issues of safety, sustainability, and comparative advantage of nuclear power and other forms of energy generation. Despite the KA's opinion and his/her constant guidance of the discussion throughout

the topic-thread, the KA found relatively little support from participants and did not appear as the opinion leader of the discussion. Over the entire topic-thread, there were many more challengers than supporters (six repliers expressed their support while the other 13 repliers disagreed). On the other hand, Replier2 was supported by 12 unique repliers. Though the KA tried to regain ground and attacked all claims against nuclear energy use by comparing waste produced by coal and oil consumption, Replier 2 managed to communicate and meet respond to the arguments made by the supporters of the KA's views very effectively (including the KA, whose opinion even changed at the end of the discussion). Evidence and pressure from Replier 2 made even the KA reject his/her original claim. As a result, Replier 2 can be regarded as the opinion leader in this topic-thread; Replier 2 clearly demonstrated opinion leadership by offering information and affecting others' views and discussions: he/she replied to the proposal to store nuclear waste in space through logical arguments, advised the KA writing letters to the legislative authorities rather than only posting messages online, attacked claims about meaninglessness of the discussion, provided the KA with information (to further explore the issue, e.g. data on the economics of uranium supplies and to formulate a more balanced view on nuclear energy exploration).

5-4-3. Opinion Leadership in the Transition Towns Topic-Threads

1. Topic-Thread SN5

SN5 is a relatively short topic-thread, only five repliers took part, including the KA who posted the initial article and joined the discussions. SN5 focuses on the possible effect of COP15: in the initial post, KA supposes the world politics is "looking unlikely to act together in time" and wondering what the roles of NGO (including Transition Towns) could have in tackling climate change actions and if it is "too little too late". He raised a question "Where do you (members in Transition Towns Forum) think we need to go from here?" It was very complicated in the

development of this topic-thread to understand if opinion leadership was manifest, as the topic prompted a lot of debate. In this discussion, the KA was supported by three repliers. On the other hand, Replier 1 indirectly challenged the KA by dismissing supporters' arguments. The KA was the initiator of the debate and also the individual with the final word, who brought the debate to a close by declining of the challenger's arguments. Replier 1 was the most active person in the debate, but he/she only dismissed other participants' arguments and did not offer much constructive criticism. Therefore, it is possible to state that the KA is not the opinion leader within this group, but lead the direction of the discussion; as soon as they saw there was no constructive debate they closed the discussion declining to engage with the challenger's arguments. The topic-thread showed a lack of recognition and support for the KA's opinion, which led to the closure of the topic-thread by the KA himself. There was no agreement among contributors on the Copenhagen negotiations, and the majority of active participants seemed interested mainly in the networking details posted by other members (e.g. Replier 3), and the details given by Repliers 4 and 5.

2. Topic-Thread SN6

As the purpose of the topic-thread SN6 was to invite comments about the Transition Software Platform, it encouraged forum members to participate (it was an open question so kept receiving responses for six months and beyond the end of the research period). Among the 30 replies in the topic-thread, the first six repliers (initial KA poster included) being highly active; nine repliers posted only one response, showing very limited active interest in the discussion. The KA listened to the opinions and suggestions of repliers who also participated actively in other discussions in this forum, but he/she reserved the right to agree with or to decline their opinions. It seems that the KA's task was to launch the platform, from the attention that the KA gives to the only challenger, and their agreement to revise the objectives of the platform concerning networking, groups, and duplication of group membership needs (incidentally, the KA seems also to be a manager or coordinator of the project). The end of the discussion came naturally; it was not induced by the KA as all repliers

showed support for the general idea of the new platform and discussed only specific features, not its necessity. In other words, support for the ideas of the KA was presented throughout the debate; discussion was based on improvements and amendments proposed by the KA. Moreover, the opinion of the KA is strongly supported by all but two repliers, one of which (Replier 4) actually disputes the need of the new IT platform, and the other one (Replier 7) adds many reasonable suggestions: the KA agrees promises to revise the objectives of the platform (to fit networking needs and those of the groups, and for ways of representing group belonging) but stands firm regarding the necessity of the new platform. In all other instances the discussion rotates around the new platform and its features, and the KA manages to retain the leading position, and even the authoritative leadership throughout the topic-thread. As a result, the KA can be regarded as the opinion leader who determines which aspects of the platform should go ahead and which stopped.

5-4-4. Opinion Leadership in the LocalSustUK Topic-Threads

1. Topic-Thread SN7

In this Topic-Thread, the initial topic key author posted a news report about the attitude of home owners and builders towards the coming regulations about zero-carbon homes, and suggested that the homeowners would not be able to deal with the new regulations; neither would the builders be able to respond to new legislative constraints. Though the KA did initiate the discussion, he/she maintained distance from discussions in the topic-thread. In the KA's only reply (as Replier 8) in the discussion, he/she simply clarified some terms in the initial post. On the other hand, some repliers had strong views. There was strong support for the KA's opinion from Repliers 1 and 3, although the support cannot be classified as 'full' because the repliers lacked information and wanted to enrich their understanding by asking for more data. Therefore, the line of argument actually developed around whether zero-carbon homes are green and sustainable or not, and whether one form of

regulation can be applied to manage homes and their uses. The discussions were generally in favour of the introduction of zero-carbon regulations, which deviated from the KA's original posting. It is evident that the opinion leadership of Replier 2 developed very quickly through responses to other topic participants. Replier 2 stimulated the discussion, offered new information, and clarified data for other members. He/ She clarified terms for Replier 1, and were supported by Repliers 5, 6, and 7. Replier 2 managed to communicate with all participants (including answering queries by Repliers 1 and 3), gave data from the NHBC report, compared it with BRE data, and provided Replier 1 with some practical approaches to fixing the problems with zero-carbon homes in practice.

2. Topic-Thread SN8

This topic-Thread reveals the subtle relationship between key authors and repliers. In this topic-thread, the KA posted a message and comment regarding the UN algae group progress. The KA actively participated in all stages of the discussion, and responded to both support and criticism effectively. The provision of data from outside sources (such as on the first conference of the UN algae group, the industrial report about the proven sustainability of using microorganisms as a solution to the fuel crisis, the provision of a visible connection between application of algae and GHG reduction, assistance in understanding the practical examples of algae application) – and the immense support received from several repliers who attacked the major challenger of the KA suggests that the KA can reasonably be called an opinion leader in the present case. The support for the KA was not revealed immediately, as the first post of the KA met the opposition of Replier 8 who doubted the application of algae and provided data on its non-profitability and non-sustainability. However, as soon as Replier 2 got involved and focused on completely different issues, and doubted the position of the KA, several other participants became involved and critiqued Replier 2's opinion, thus strengthening the position of KA. Even the support for Replier 2 provided by Repliers 8 and 3 was not helpful since these changes and by the end of the discussion general opinion was convincingly not in favour of Replier 2, which meant that the position of the KA remained particularly strong throughout the topic-thread.

In sum, opinion leadership in the eight topic-thread discussions considered cannot automatically be attributed to key authors who initiated these topic-threads; rather it emerges through a process of discussion and ‘competition’ with other authors. Opinion leadership in the topic-threads is summarised in Table 5-27 below.

Table 5-27. Tendency of Opinion Leadership in Topic-Threads

	Supporter	Challenger	OL Tendency	KA as OL?
SN1	1	3	Yes, Replier1	No
SN2	3	2	N/A*	N/A*
SN3	2	4	Yes, Replier1	No
SN4	6	13	Yes, Replier2	No
SN5	4	0	N/A*	N/A*
SN6	6	1	Yes	Yes
SN7	4	1	Yes, Replier2	No
SN8	4	3	Yes	Yes

As shown above, only in SN6 and SN8 was opinion leadership secured for KAs. Individuals had to gain their leadership through debating with challengers, communicating with other members, providing information, and networking via interactions. Key authors may have devoted considerable time and effort in gaining leadership, but sometimes their efforts only result in the delivery of information / comments and raising discussions, whilst opinion leadership is not guaranteed. Nevertheless, the processes examined above indicate that opinion leadership is shaped and at times reformed by members in discussion threads. As a result, opinion leadership is established in the fora to stimulate the expression of potentially latent views and / or attitudes.

5-5. Conclusions

For those who want to understand the evolution of online communication, identifying roles in online communication and evaluating how they relate to formation of opinion is relevant. This study hypothesised, based on media literature, the existence of opinion leaders in internet fora. The analyses presented in this and previous chapters have supported their existence (and evidence is also presented in the next chapter). However, “opinion leadership” was more difficult to detect than originally thought. Qualitative analysis of topic-threads reveals that participants do not take part to support or disagree with authors’ comments, but more often offer their views as supporters / challengers of someone's opinions; sometimes they simply express their own opinions in topic-threads, and many of them are "one-time" repliers.

As pointed out in this chapter, article posters and repliers actually play various roles in discussions depending on the context of communication. Some authors aim to gain opinion leadership based on significant participation in discussion; some compete to uphold their own viewpoints by supporting or challenging key authors (and others); some earn their leadership by communicating and networking with group members. Based on the qualitative analysis of topic-threads, it was found that KAs do not necessarily have an advantage in becoming opinion leaders. An opinion leader is not just an active poster or communicator (which key authors are), but he/she has to steer the discussion that supports his/her views, interpret new information with regards to his / her arguments, clarify his / her ideas and interact with/ respond to other members to gain their support. However, the topic-threads analysed indicate that trends of opinion do manifest in discussions, and opinion leadership can emerge from the opinions expressed by the collective group of participants rather than some individual alone. Thus the next Chapter explores influences of fora communication through fora members’ responses to the web survey.

Chapter 6. Communication in Internet Fora: Influences on Views

6-0. Introduction

In this chapter, influences of online fora communication on fora users' perceptions are explored through results from a web survey conducted amongst the participants of the four selected fora. The results in this chapter, alongside those in the previous Chapter 5, aim to answer research question 3 raised in the thesis study. The findings here are in addition to the results of the web survey already presented in last two chapters.

6-1. Influence of Fora Climate Change Communication on Users' Perception

In the online survey, individuals were asked to provide their opinions on the issues of access to the internet forums, their interest in the climate change groups, their posting activities, their perceptions about opinion leadership in forum postings, and their motivation to participate in the discussions relating to climate change. The purpose of these questions was to understand about their participation in communication activities, the formation of opinion in fora, the potential influences on members' ideas and attitudes about climate change, and how their views may have been influenced by the online communication activities.

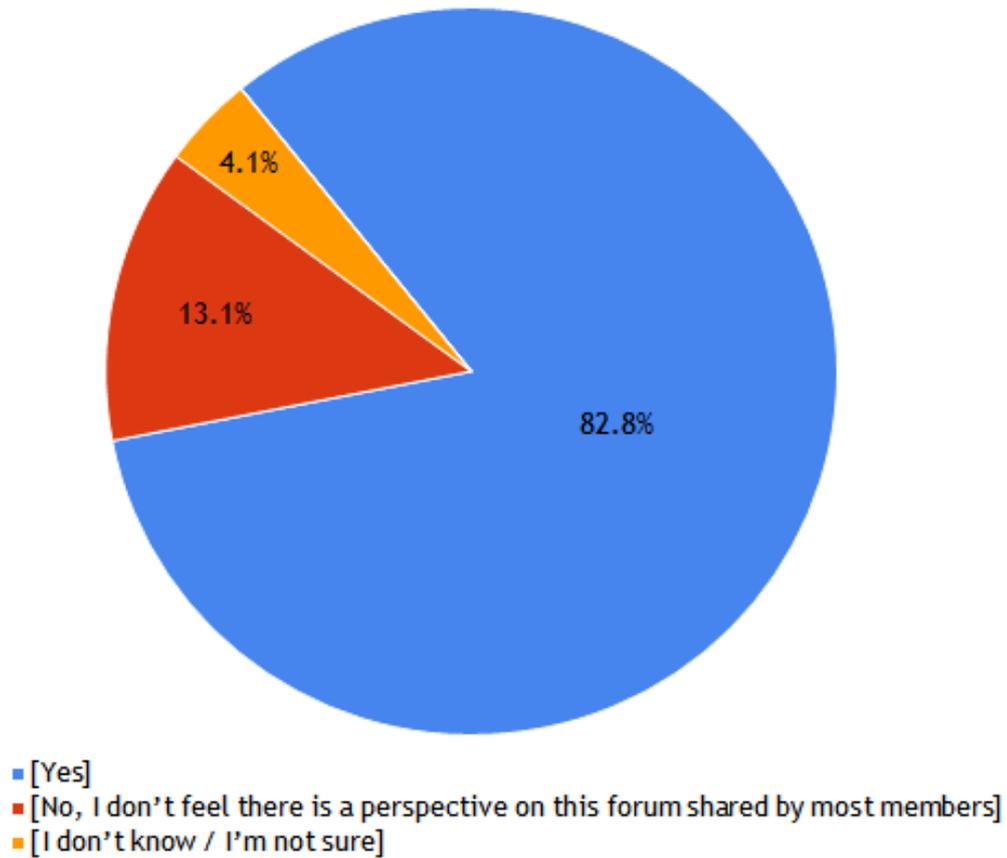
The web survey indicates that individuals perceive the presence of "prevalent viewpoints" and collective opinions on climate change-relevant issues in each forum, but their influence varies, as will be discussed in this section" Several questions were designed and used in the web survey for exploring fora users' perceptions of climate change issues: the "Q10 series" are about the "prevalent view" and the sources of such view; Q11 is to clarify users' perceived relationship between their own and the opinions in the forum; Q15 series are evaluation of users' forum experiences regarding their networking with other .

6-1-1. Perceiving Opinion Leadership: Prevalent Views in Communication Process

As discussed in Chapter 4 and Chapter 5, findings of fora communication processes, models of communication flow and roles of key authors in these processes suggest that opinion leadership could be obvious in fora discussions. In particular, considerable asymmetry in the contributions of fora authors indicate the need of evaluating whether fora opinions and the communication process could be driven by specific authors as discussed in literature of two-step communication flow research.

In the studies of two-step communication flow, some individuals are regarded as “opinion leaders” within their social groups, and these individuals are information providers, interpreters and influentials in the process of forming people’s perceptions and opinions. In the thesis research, the opinion leadership is defined as influences of strong opinions in fora discussions, and the influences are generated, disseminate through the fora communication process. As revealed above, some specific authors in fora could have such influences by dominating fora contents, and they may be “opinion leaders” in their fora. Nevertheless, the supposition requires further examination of fora users’ perceptions on prevalent views (or prevalent viewpoints, which are viewpoints that are dominant in discussions, which can be regarded as explicit expressions of strong opinions in fora discussions), including its mechanism and potential sources in the fora communication process. The web survey is thus conducted to reveal if the prevalent views existed and what the influences could be. As a result, the majority of respondents did perceive some “prevalent views” in fora. A specific question (Q10-1) in the web survey aims to identify if respondents feel that there are specific viewpoints that are dominant in fora. Figure 6-1 (See below) shows that 82.8% of respondents overall agree that viewpoints are prevalent in each forum (79.4% of Climate Concern, 83.3% of LocalSustUK, 70% of Transition Towns, and 90.9% of OurPlanet / EarthDay respondents).

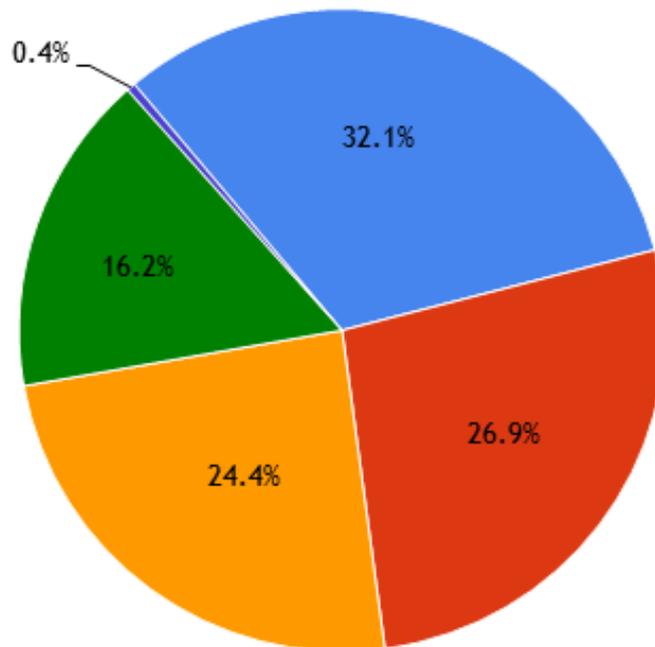
Figure 6-1. Percentage responses from Q10-1: “Overall, do you feel there could be any prevalent view / viewpoint shared by members of this forum?”



As shown above in Figure 6-1, the perception is commonly reported by respondents from all four fora, which corresponds to the observation of content statistics that major body of fora discussions and contents could come from some specific authors and thus present “prevalent views” in the discussions. In other words, the phenomenon of widely perceived prevalent views does not come from the consensus of fora users, but from the limited numbers of authors who actively contribute to the discussions.

The result as shown reveals that respondents of the web survey acknowledge some prevalent viewpoints indeed are perceived. Further, respondents were asked (in Q10-2) to state how they felt prevalent opinions in the forum were communicated. Options are given to reveal channels of prevalent views in fora, including discussions of collective actions/campaigns (32.1%), posts that presented information (29.6%), posts about individual attitudes and behaviours (24.4%). The percentage is presented as Figure 6-2 (see below).

Figure 6-2. Percentage of responses from Q10-2: “If you answered “Yes” in Q10-1, would you please indicate how the forum’s main views are communicated?”



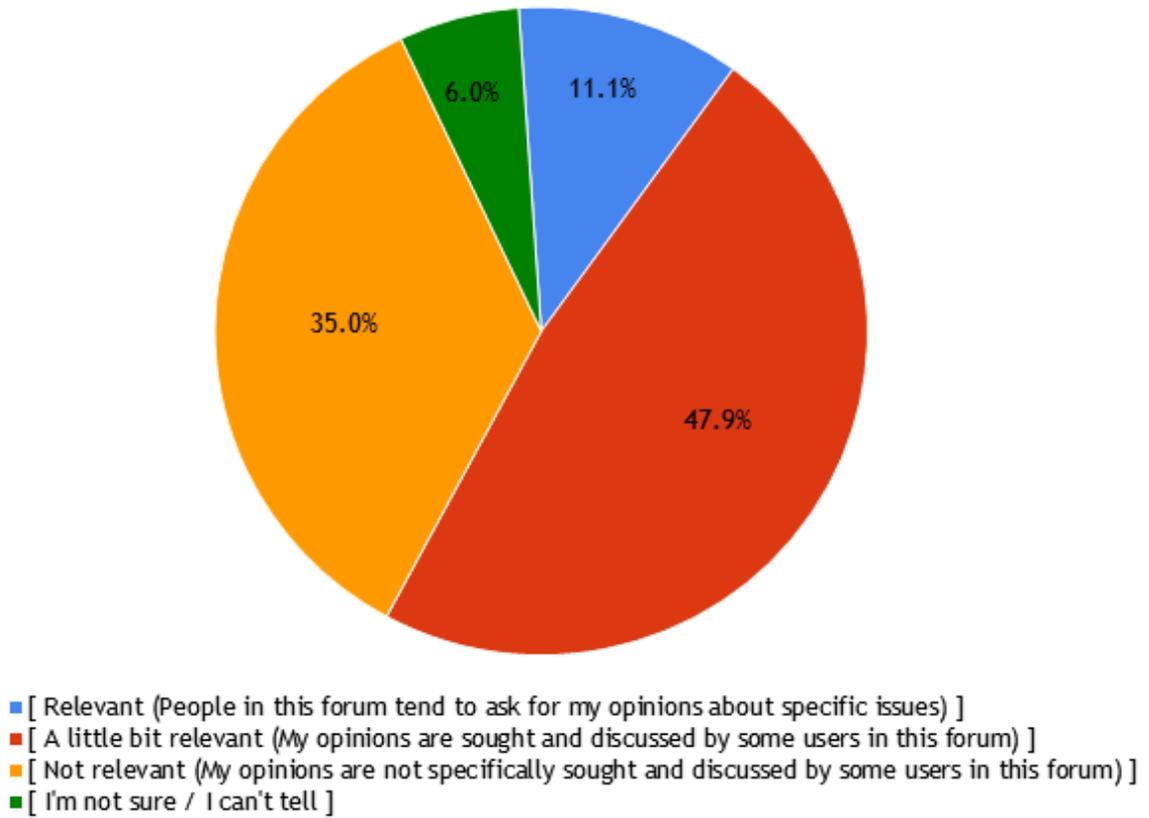
- [Discussions / postings regarding collective actions / campaigns (eg Transition Town movement)]
- [Discussions / postings presenting information (eg climate change science)]
- [Discussions / postings regarding individual attitudes or behaviours (eg switching off lights)]
- [Discussions / postings regarding internal communication and interaction on the forum]
- [Others]

6-1-2. Self-Evaluation of Members' Own Leadership

Q10-2 reveals no specific sources of perceived prevalent views in fora despite the significant respondents' acknowledgment of the existence of prevalent views in previous Q10-1. On the other hand, respondents are asked to self-evaluate the importance of their own opinions within these fora (Q11¹). The result of Q11 (See Figure 6-3 below) indicates that more than half (59%) respondents suppose their opinions contribute to some degree, but a considerable portion of respondents (35%) also think their opinions are not specifically sought or noticed by other users of the forum.

¹ [Q11] Overall, how do you feel other forum users regard your opinion?

Figure 6-3. Percentage of responses from Q11: “Overall, how do you feel other forum users regard your opinion?”



Based on the results of Q11, it is found that the majority of respondents among four fora suggest their viewpoints could affect the views of other members in the forum. The difference highlights respondents’ distinguished confidence levels, and perhaps entirely different views of how communication processes in fora operate. The divided suggestions could be the reason that some authors passionately participate in fora communication (and suppose they can affect the formation of public opinion), while some others feel distant to the fora discussions and less important in the communication process. The former should create more active roles of authors; the later should in time suppress people’s participations in fora communication. Moreover, there are notably differences between the four fora in how forum users self-evaluate how their opinions are viewed. In the Table 6-1 shown below, it is further identified that responses from OurPlanet / EarthDay Group (81.9%) and Transition Towns Group (70%) show much higher proportions of users acknowledging the importance of their own posts, compared with the other two fora (See Table 6-1).

Table 6-1 [Q11] Self Evaluation of Respondents' Opinion in Fora

Forum Group Evaluation of Relevance	Climate Concern	LocalSustUK	OurPlanet (EarthDay)	Transition Towns
Relevant – People in this forum tend to ask for my opinions about specific issues. (n=13, 11.1%)	2 (5.9%)	3 (5.8%)	5 (45.5%)	3 (15.0%)
A little bit relevant – My opinions are sought and discussed by some users in this forum. (n=56, 47.9%)	16 (47.1%)	25 (48.1%)	4 (36.4%)	11 (55.0%)
Not relevant – My opinions are not specifically sought or noticed by other users on this forum. (n=41, 35.0%)	14 (41.2%)	19 (36.5%)	2 (18.2%)	6 (30.0%)
I'm not sure / I can't tell. (n=7, 6.0%)	2 (5.9%)	5 (9.6%)	0 (0%)	0 (0%)
Total=117	34	52	11	20

6-1-3. Influences of Fora Communication on Users' Networking

In another series of questions (Q15), the Q15-1², Q15-2³, Q15-3⁴, and Q15-6⁵ of the web survey, respondents were asked to generally evaluate the value and the influences of accessing fora to see if they are satisfied in the fora communication process, as shown in Table 6-2 below. Q15-1 firstly probes the idea of a “virtual existence”, where the respondent feels closer to others that “share the same interests and attitudes on the forum”. Q15-2 and Q15-3 aim to probe the relationship between respondents' existing social networks in their offline world and the online fora interactions.

In response to Q15-1, 90.8 % tend to agree that they “share same interests and attitudes on the forum”; in Q15-2, 79% of respondents acknowledge they feel closer

² [Q15-1] Being a member of this forum has made me feel much closer to people who share my same interests and attitudes on this forum.

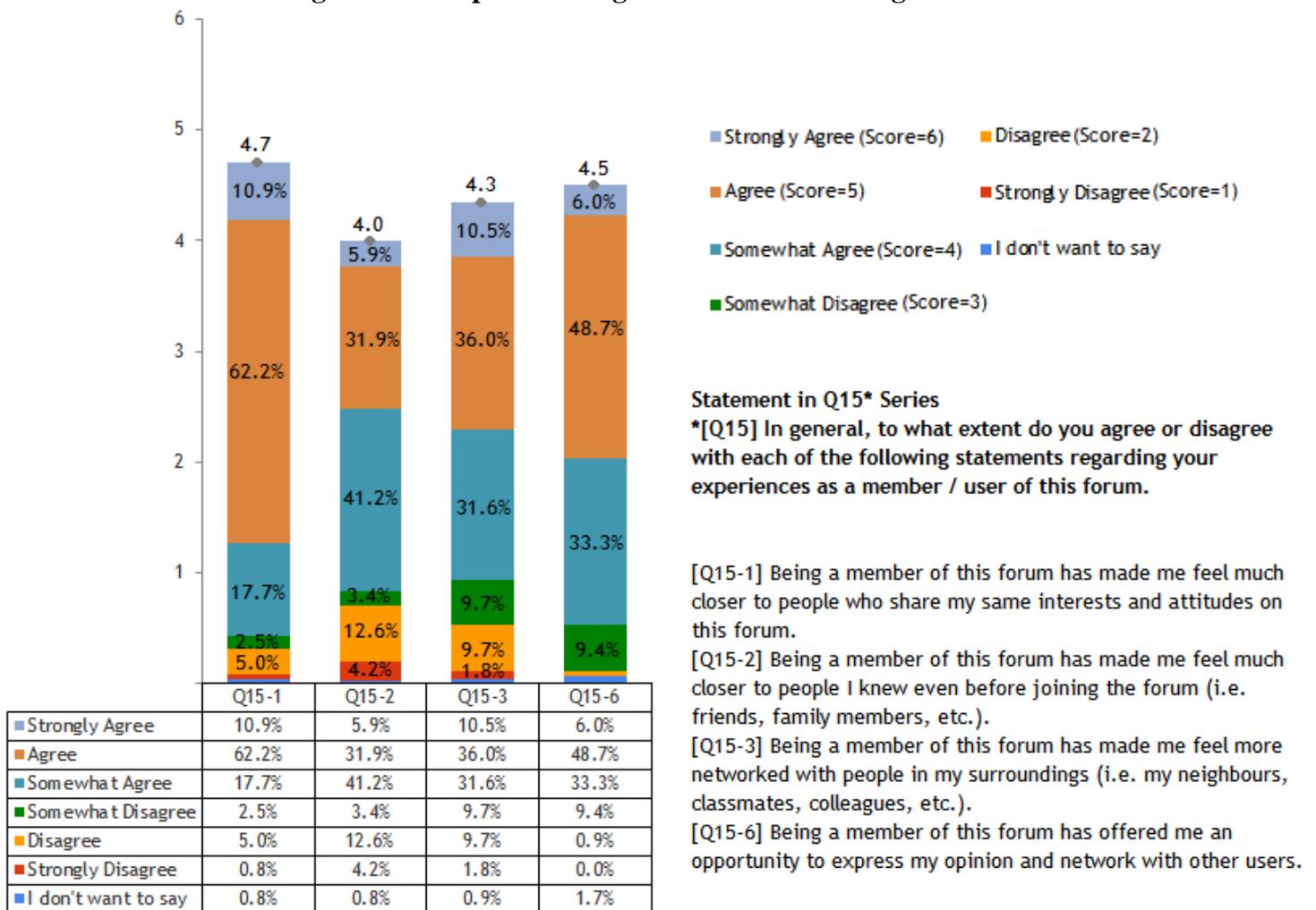
³ [Q15-2] Being a member of this forum has made me feel much closer to people I knew even before joining the forum (i.e. friends, family members, etc.).

⁴ [Q15-3] Being a member of this forum has made me feel more networked with people in my surroundings (i.e. my neighbours, classmates, colleagues, etc.).

⁵ [Q15-6] Being a member of this forum has offered me an opportunity to express my opinion and network with other users.

with people they knew before; in Q15-3, 74.8% acknowledge they feel more networked with people in their surroundings, as a consequence of being a member of the forum. As to Q15-6, 88.1% respondents tend to agree the statement that their forum could offer more opportunities to network with others. The results are presented below (See Figure 6-4).

Figure 6-4. Respondents' agreement of networking statement



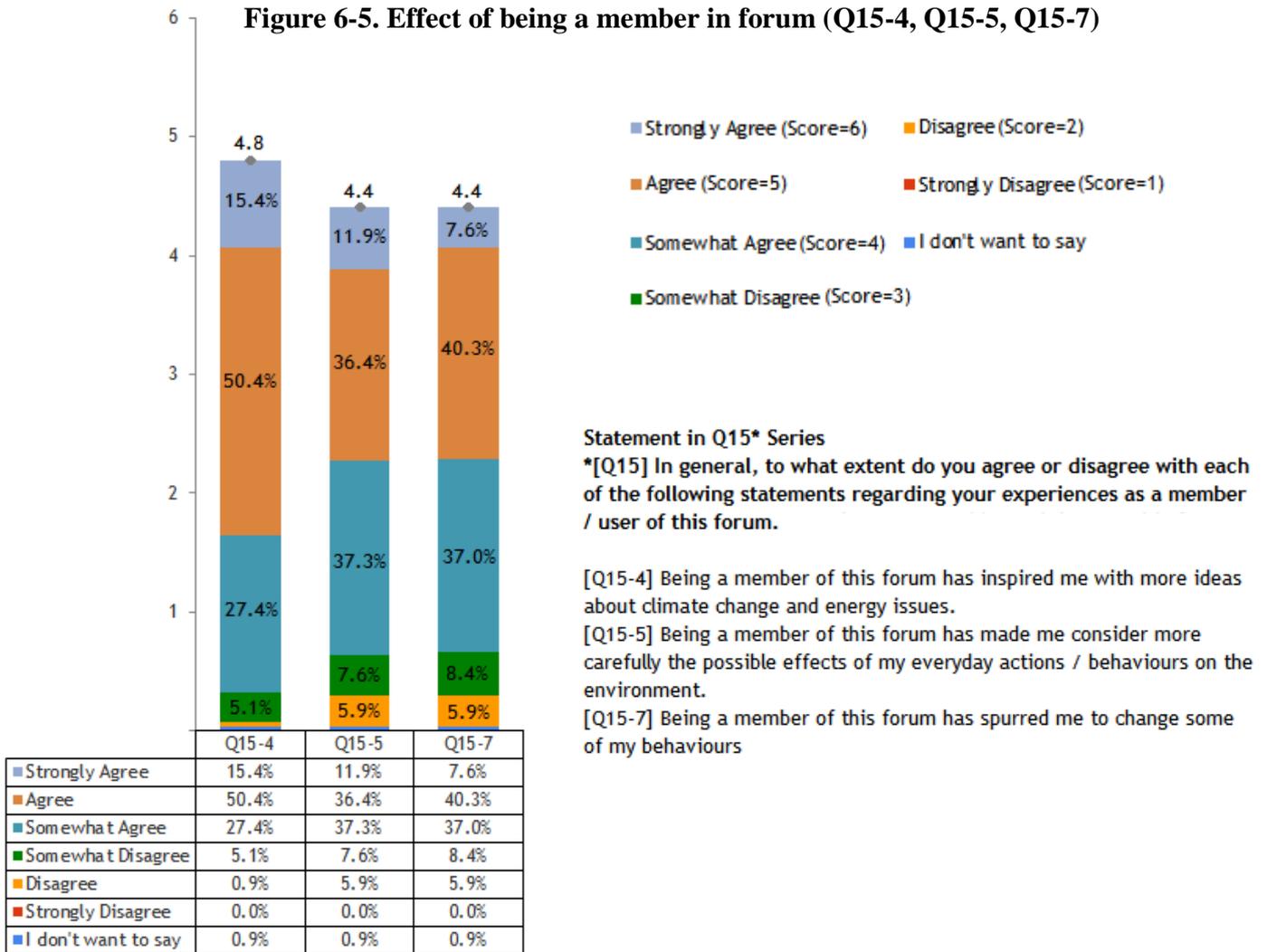
The Figure 6-4 indicates that for many respondents the fora help to strengthen their existing social ties (either in virtual or physical forms) and to create new ones; respondents also offered their evaluation of their networking experiences, and it seems that they tend to acknowledge that they feel better connected with their social groups through participating in fora. Respondents recognize that accessing these fora help strengthen their existing social ties (either in virtual or physical forms), but not necessarily expanding their social networks to others who could have unfamiliar interests or attitudes. Indeed, as also stated in Chapter 4, over 59% respondents in web

survey (Q6) stated that their major motivation of joining fora communication process is to encourage networking among users in the forum (See Chapter 4, Section 4-4).

As a result, some activities are much more preferred by respondents (i.e. seeking advice from other members, seeking out perspectives that could be different; urging others to consider some aspects of particular issues) even though they are not as frequent joining forums for accessing and searching for information. Members also seem interested in seeking perspectives different from their own and about "mainstream" opinion in the forum. A big proportion of respondents claim that they would feel more confident about their views or actions if they could consult others' views before taking action.

Furthermore, respondents were asked about their networking experiences in general and as a forum member / user in the rest statements in Q15 series (Q15-4, Q15-5 and Q15-7; see Figure 6-5 below). As shown in Figure 6-5, respondents mainly agreed that (statement of Q15-4) "being a member of this forum has inspired me with more ideas about climate change and energy issues" (average score=4.75). In particular, more than half of respondents (65.8 %) "Agreed" (50.4%) or "Strongly agreed" (15.4 %) with the statement. Respondents also claim that they become more aware of the possible effects of their everyday actions / behaviours on the environment by being a member of the forum in the result of Q15-5 (Avg. Score=4.4 ; 48% of respondents agree; 37.3 % tend to somewhat agree). And Q15-7 directly asks respondent to evaluate if the forum encourages behaviour change: 48 % of respondents agree, 37 % also somewhat agree with the statement. These results revealed that respondents tend to recognize the influence of the forum on their ideas, considering issues based on information provided, and on their daily actions.

Figure 6-5. Effect of being a member in forum (Q15-4, Q15-5, Q15-7)



Overall, the survey reveals that online communication is interactive and networked: members actively seek and share information or opinions however, the online communication process does not always offer the diversity of discussions that were originally expected, and people tend to have discussions with “their own” groups, and do not always exchange opinions with others outside the group, although they indicate they would like more networking; this could contribute to further exchange of views and debate on climate change.

6-2. Influence of Fora Communication on Users' Attitudes and Behaviours

Findings from respondents' self-report in web survey also indicate that respondents could form, change, or defend their own views in the fora communication process. In Q12-series, Q12-1 to Q12-7 explored respondents' perspectives of fora communication and the influence of the online communication on people's everyday lives. Result of Q12 series as shown in Figure 4-7 (See Chapter 4, Section 4-3), it is clear that major respondents tend to agree that they seek information and others' opinions (Q12-1 ~ Q12-7). In particular, in Q12-4 and Q12-5, yet a considerable portion of respondents also tend to prefer the argument (Q12-4 Avg. Score = 4.3; Q12-5 Avg. Score = 4.5) that they feel even more confident of their views or actions if they consulted or learnt more other members' opinions before they take actions. In other words, people's experiences of seeking opinions, seeking perspectives similar with their own and the mainstream seem to be welcome.

Respondents desired "being recognized" by others, especially by members of fora they accessed or even posted contents: while seeking information and others' comments are scored as top 2 preferred activities, seeking perspectives different from mainstream views is the last preferred, and seeking perspectives different from respondents' own is the last 3 preferred communication activities. Thus the result of the series (Q12-1 ~ Q12-7) in web survey presented not only respondents' communication activities but also their influences, which further reflects previous findings of motivations for joining the forum in Q6 (See Chapter 4, Section 4-4).

The research also examined the influence of fora communication on fora users' perceptions of climate change. In the online questionnaire, a series of questions have been designed that aims to explore the influence of online communication on fora users' attitudes and behaviours in their everyday life. Here we explore these, considering some of the limitations of self-evaluation (outlined already in Chapter 3).

In Q16, respondents are asked to provide their own assessment of how the online discussion could have changed their perception, attitude, and behaviours (See results in the following Table 6-2).

Table 6-2. Respondents' Assessment of the Internet Fora Influence on Themselves

Percentage in each groups' respondents	Changed views on CC (Q16-A1)	Changed views on env issues (Q16-A4)	Aware of effects of behaviour (Q16-A2)	Change behaviours (Q16-A3)	Total affected in groups
Climate Concern	18 (51.4%)	1 (2.9%)	25 (71.4%)	14 (40.0%)	32 (91.4%)
LocalSustUK	19 (35.9%)	5 (9.4%)	28 (52.8%)	18 (34.0%)	44 (83.0%)
OurPlanet /EarthDay	8 (72.7%)	0 (0%)	10 (90.9%)	4 (36.4%)	11 (100%)
Transition Towns	8 (40.0%)	1 (5.0%)	16 (80.0%)	12 (60.0%)	17 (85.0%)
Total Respondents	53 (44.5%)	7 (5.8%)	79 (66.4%)	48 (40.3%)	104 (87.4%)

Most respondents (87.4 %) report that they have been affected in different ways after accessing the online discussion: 66.4 % respondents claim they have been more aware of the effects of behaviour while 40.34% claim they have changed their behaviours. In particular, nearly half of respondents in these four fora (44.5 %) claim that they changed their views on climate change (despite the different focus of the fora), and only 5.88% respondents said that their views about broader environmental issues were affected. As one respondent explained:

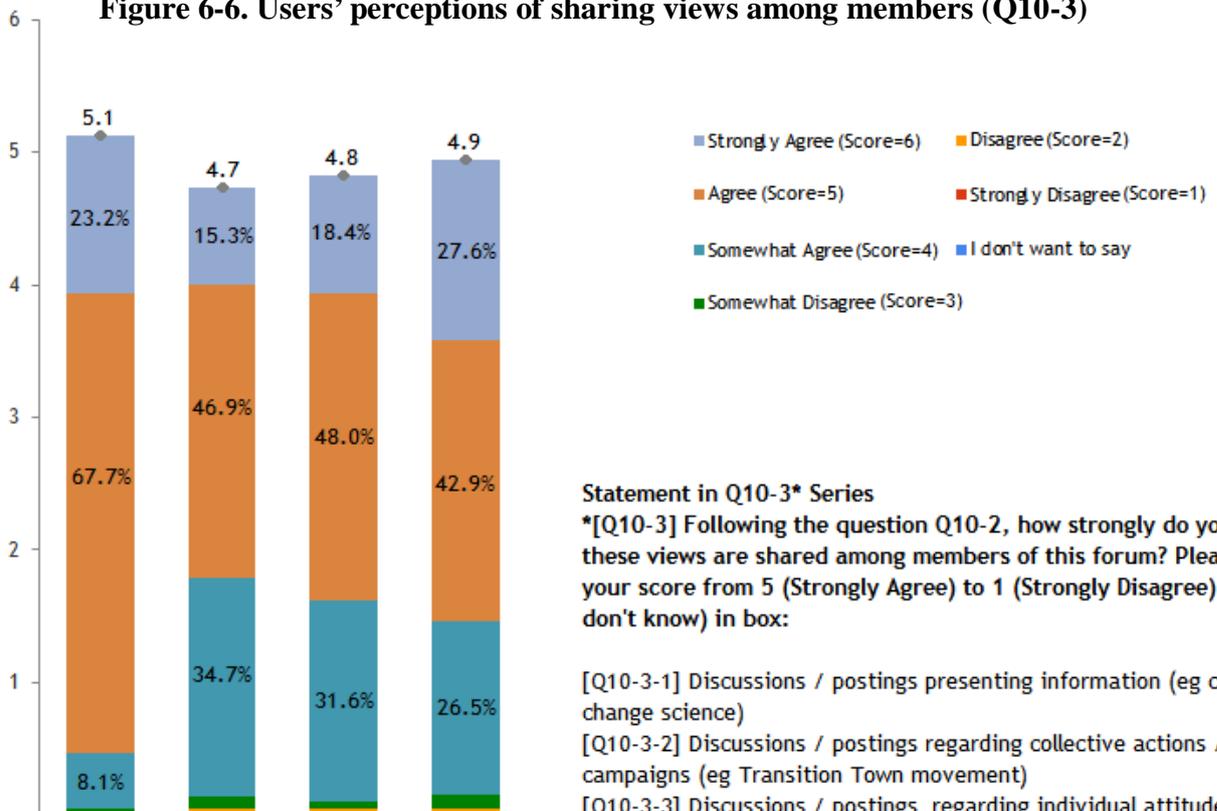
“[this is] a (useful) network to exchange information.....function as a network more focused on local agenda 21 and sharing of those involved in local agenda 21 processes”
 (Respondent from LocalSustUK Group).

Some respondents indicate they have changed their definition of sustainability (in LocalSustUK Group), their understanding about nuclear energy (in Our Planet Group) and their perceptions about governmental action (respondents from ClimateConcern Group). Their reports correspond to findings of Q6 in identifying their motivation to participate in fora communication activities.

6-3. Sources of Influence

This Chapter has so far examined the influence of fora communication on users' perceptions and attitudes, now it explores sources of these effects. Responses to several questions in the web survey indicate that the manner in which information and debate occurs has some influence. In response to Q10-3, (see Figure 6-6 below) individuals tend to agree that prevalent views are shared among members of the forum in different ways, including through discussions / postings that present information (average score=5.1), postings regarding collective actions / campaigns (average score=4.7), postings regarding presentation of individual attitudes and behaviours (average score=4.8), and postings regarding internal communication and interaction on fora (average score=4.9). The result shows that no specific types of discussions are identified as main sources; it seems that respondents feel the prevalent views are expressed in a variety of ways and contents within fora.

Figure 6-6. Users' perceptions of sharing views among members (Q10-3)



Statement in Q10-3* Series

*[Q10-3] Following the question Q10-2, how strongly do you feel these views are shared among members of this forum? Please tick your score from 5 (Strongly Agree) to 1 (Strongly Disagree) or 0 (I don't know) in box:

[Q10-3-1] Discussions / postings presenting information (eg climate change science)

[Q10-3-2] Discussions / postings regarding collective actions / campaigns (eg Transition Town movement)

[Q10-3-3] Discussions / postings regarding individual attitudes or behaviours (eg switching off lights)

[Q10-3-4] Discussions / postings regarding internal communication and interaction on the forum (eg responses to particular postings)

	Q10-3-1	Q10-3-2	Q10-3-3	Q10-3-4
Strongly Agree	23.2%	15.3%	18.4%	27.6%
Agree	67.7%	46.9%	48.0%	42.9%
Somewhat Agree	8.1%	34.7%	31.6%	26.5%
Somewhat Disagree	1.0%	2.0%	1.0%	2.0%
Disagree	0.0%	1.0%	1.0%	1.0%
Strongly Disagree	0.0%	0.0%	0.0%	0.0%
I don't want to say	0.0%	0.0%	0.0%	0.0%

Figure 6-6 shows that no specific types of discussions are identified as main sources; it seems that respondents feel the prevalent views are expressed in a variety of ways and contents within fora. Furthermore, the survey also asked respondents to nominate individuals who might communicate prevalent / dominant views, maintaining their privacy (Q9 series). The aim was to explore if these nominated individuals have the characteristics of opinion leaders (from information provision, frequent communication, or networking ability). Respondents were asked to refer to individuals by identity numbers ((IDs) which were used only for this research.

As indicated in Table 6-3 below, only 46 (38.7%) respondents answered Q19-1, nominating 17 IDs as 1st-ranked individuals⁶ (who were authors of posts considered by respondents to provide most useful information), 13 IDs were nominated as 2nd-ranked authors, and 5 IDs were nominated as 3rd-ranked authors. The relatively low response rate may be due to privacy issues (revealing opinion leaders' IDs) and the semi-open structure of the question.

⁶ In the web survey of this research, respondents are encouraged to nominate authors who should provide most useful information. Respondents are asked to fill in boxes (up to three) to give the nominated authors' IDs that they recognised in fora and rank these authors' performance (as 1st-ranked, 2nd-ranked, and 3rd-ranked authors of providing useful information). The nomination is not compulsory in the web survey, and there is no minimal number of authors required in the nomination. The design of the nomination process in web survey is to protect fora users' anonymity and their principles of privacy, and their willingness to give the private information (regarding users' IDs). As a result, the majority of respondents (61.3 %) choose not to provide the nomination and skipped the question.

Table 6-3. Nominated Authors in Four Fora

Forum Title	Q9-1 ⁷	Q9-2 ⁸	Q9-3 ⁹	Q9-4 ¹⁰
ClimateConcern	NA-C**1 10 (38.5%)	NA-A**1 7(38.9%)	NA-J**1 10(27.8%)	NA-C**1 5(7.1%)
	NA-A**1 4(15.4%)	NA-C**1 7(38.9%)	NA-A**1 5(5.6%)	NA-F**1 4(35.7%)
	NA-M**1 3(11.5%)	NA-M**1 2(11.1%)	NA-C**1 1(5.6%)	NA-H**1 2(28.6%)
	NA-R**1 3(11.5%)	NA-J**1 1(5.6%)	NA-f**1 1(5.6%)	NA-A**1 1(14.3%)
	NA-H**1 1(3.9%)	NA-H**1 1(5.6%)	NA-H**1 1(55.6%)	NA-L**1 1(7.2%)
OurPlanet / EarthDay	NA-C**2 13(30.3%)	NA-J**2 13(37.1%)	NA-F**1 8(36.6%)	NA-J**2 8(47.1%)
	NA-J**2 10(23.3%)	NA-N**2 9(25.7%)	NA-H**2 5(22.7%)	NA-N**2 4(23.5%)
	NA-H**2 7(16.3%)	NA-C**2 8(22.9%)	NA-C**2 4(18.2%)	NA-F**1 3(17.7%)
	NA-N**2 7(16.3%)	NA-F**1 3(8.6%)	NA-J**2 3(13.6%)	NA-C**2 2(11.7%)
	NA-F**1 3(7.00%)	NA-H**2 2(5.7%)	NA-D**2 (4.6%)	
Transition Towns	NA-C**2 2(33.3%)	NA-C**2 4(44.4%)	NA-C**2 4(44.4%)	NA-A**2 5(71.4%)
	NA-A**2 2(33.3%)	NA-A**2 2(22.2%)	NA-H**4 2(22.2%)	NA-C**2 2(28.6%)
	NA-C**3 1(16.7%)	NA-C**3 1(11.1%)	NA-A**2 2(22.2%)	
	NA-H**3 1(16.7%)	NA-H**3 1(11.1%)	NA-C**3 1(11.1%)	
		NA-S**1 1(11.1%)	NA-H**3 1(11.1%)	
LocalSustUK	NA-B**1 2(50.0%)	NA-C**4 4(80.0%)	NA-C**4 2(100%)	NA-C**4 3(75.0%)
	NA-C**4 2(50.0%)	NA-M**2 1(20.0%)		NA-B**1 1(25.0%)
Total Ranking	NA-C**1 15(32.6%)	NA-J**1 13(29.6%)	NAF1 9 (23.1%)	NAJ1 8(21.1%)
	NA-C**2 10(21.7%)	NA-C**1 12(27.3%)	NAJ2 9 (23.1%)	NAF1 7(18.4%)
	NA-J**1 10(21.7%)	NA-N**1 9(20.5%)	NAA1 5 (12.8%)	NAA2 5(13.2%)
	NA-H**1 7(15.2%)	NA-A**1 7(15.9%)	NAH1 5(12.8%)	NAC1 5(13.2%)
	NA-N**1 7(15.2%)	NA-C2 7(15.9%)	NAC1 3 (7.7%)	NAC2 3(7.9%)

⁷ [Q9-1] Referring to this forum, who do you think most frequently provides useful information or comments to you?

⁸ [Q9-2]Referring to this forum, who do you think most frequently communicates (e.g. through initiating discussions, posting articles or replies) with members?

⁹ [Q9-3] Referring to this forum, whose posts (including articles and replies) do you think initiate most discussions among the members of the forum?

¹⁰ [Q9-4] Referring to this forum, whose opinions (in their articles and replies) receive most agreement and support from other forum members?

Among those nominated authors (total are 23 nominated) in Table 6-3, the highest number (15) ranked as “authors who provide useful information” were from LocalSustUK, some of which were found to have the same ID in different fora. This suggests that members may have more than one forum membership, and therefore authors may not only read postings in different fora but also share their information with different groups. On the other hand, when respondents were directly asked to nominate authors who most frequently communicate with others in Q9-2, 16 authors by 44 respondents (37%) were nominated. Of these total 16, those most frequently ranked were also among the top 5 authors in previous Q9-1 (nominated list). The findings suggest that respondents tend to consider opinion leadership as an overall characteristic, perhaps making it difficult to distinguish between those authors who provide useful information from those who actively communicate with others. Respondents were asked to nominate authors who initiate the most discussions (Q9-3): surprisingly respondents indicated authors that express opinions quite different to those of the group, for example J** in Climate Concern was sceptical about climate change. Finally respondents were asked to nominate authors whose opinions receive most agreement and support from forum members in Q9-4: only 12 authors were nominated.

Interestingly, the results of this Q9 series were slightly different from each question: some of the authors who were ranked higher in delivering information and communicating with others were not the authors who initiate most discussions. Thus there seems to be a difference among those who initiate most discussions (they cannot directly be considered as those opinion leaders) and those who provide more information / networking opportunities (opinion leaders). Further understanding about the context in which members operate and their characteristics (e.g. activeness, communication activity, and initiated discussions) is needed to fully explain the nature and relationship with the opinion leadership in fora.

As numbers of nominated authors are few, comparison is undertaken with caution. It is found that some nominated authors could participated in more than one of the four fora (i.e. NA-C**2), for some special IDs are nominated by members in different fora. Though no evidence can be found to prove these IDs represent same authors, it is still possible that some nominated authors could participate in different fora and being recognized by respondents of the selected four fora.

Besides the Q9 in questionnaire, respondents are also asked to evaluate their own importance in fora as discussed in previous chapters and sections in Q12 series in questionnaire as shown in Figure 4-7 (See Chapter 4, Section 4-3). According to the results, it is found that in Q12-8 and Q12-9, respondents generally tend to agree the statements of Q12-8 ~ Q12-10: Q12-10 (sharing posts from forum with friends outside forum) (Avg. Score= 4.6) is ranked top among three of the questions, which means most respondents tend to strongly agree or agree the statement; Q12-9 follows (urge others in forum to consider particular issues if these issues are not discussed) (Avg. Score= 4.2); and Q12-8 (persuade others in forum to agree with my views) had the least of respondents' agreement (AVG. Score= 3.9) as also shown in Figure 4-7 (See Chapter 4, Section 4-3). In total, 79 (66.4 %) out of all 119 respondents generally agree with these three statements; this suggests that some respondents tend to regard themselves as individuals who are willing to communicate opinions and affect others' views. In other words, they put themselves as candidates who are also looking for "opinion leadership" in fora.

Overall, the web survey does not uncover main sources or formats of opinions that influence members' views. Respondents report that they perceived prevalent views in various types of content, and some specific authors were nominated as "opinion leaders"; however, respondents did not clearly identify specific types of contents as sources of influence, and numbers of nominated authors were also quite limited in. The findings may indicate a limited ability by respondents of recalling details about sources of opinions, or unwillingness to share information (IDs) about specific individuals. Maybe more fundamentally, it may be hard for respondents to admit that their own views are "affected" by specific sources or people.

6-4. Conclusions

Though challenges have been encountered in identifying influences on fora members' views, three main findings are noteworthy: 1.) fora members, as indicated in the survey responses, indicate they perceive prevalent views in online discussions; 2.) Most nominated IDs of opinion leaders correspond to the IDs of "key authors"

identified previously in this research (see Chapter 5), though few IDs were provided by survey respondents; 3.) Some nominated IDs (opinion leaders) are “trans-fora”, implying some authors could be particularly passionate about discussions on climate change or broader environmental issues and participate in debates across various fora.

The survey shows respondents tend to undertake communication online for specific reasons (i.e. surf fora for information access, interact with others to sense climate of opinions, post messages to probe more understandings); in other words, such “planned communication”, similar to that described by Windahl and Signitzer (2008), is evident from respondents’ own assessments.

As a result, more analyses are required on the social implications of recent developments of internet fora. For instance, how people’s roles, their social relations, and the online contexts can affect people’s ideas and attitudes, and how these prevalent views are formed. These are discussed in the following chapters.

Chapter 7. Discussion

7-0. Introduction

This thesis examines mechanisms and processes in the communication of climate change in internet-based fora, including members' roles and the influences on fora users' views and behaviours. It is found the internet fora provide a 'place' that is invaluable for fora users, where they contribute to discussions, exchange opinions, network and share information. Much effort in this thesis has been dedicated to exploring several aspects of online communication among fora members through their topic-thread discussions. The findings of this research are discussed in this chapter regarding insights on existing studies of climate change, new media, and communication models.

7-1. Who Is Communicating Climate Change Online?

The results of this study indicate that users of the selected four fora – on the basis of their access to fora and participation in fora discussions – are characterised by different roles. Initially two broad categorisations can be defined, detailed below.

7-1-1. Keep Quiet: “Observers” in Internet Fora Communication

The research indicates that a considerable amount of fora members have never directly participated in online discussions (no post or reply) during the two-year research period; they are not directly active but rather indirectly active, as they view forum posts. Often inactive members are defined as “lurkers” in literature (Kollock & Smith, 1999), but

this term refers to silent fora members. In this research, the indirectly active fora members can be more suitably considered as “observers”, as they are registered as fora members but only access circulating information and observe communication activities online. These members silently observe people’s interactions (based on posts / replies) and read about opinions from online posts. They may of course have their own views, but it is difficult to examine these through analyses of online discussions because these are not directly accessible, given that the ‘observers’ do not contribute to discussions online.

7-1-2. Let’s Talk: Online Communicators

While most members keep silent, a few members, described as “communicators” in this research, do post articles or reply others’ postings in online discussions. These members are the major fora content builders, and thus are important contributors to understanding processes of communicating climate change online.

Communicators assume specific roles such as initiators of discussions, repliers or both. These characteristics have been detected in the analysis of fora discussion contents, as shown in chapter 5. However, since any participant can change roles in different contexts, the roles identified relate specifically to their functions in the online topic-thread discussions analysed. These roles may become insignificant, if they are replaced by other roles, and their opinion may be lost, not manifest or expressed differently, if they chose to observe or take part in discussions of a different form or in a diverse environment.

Analyses have provided some understanding about communicators’ activities in the internet fora discussions: information searches are dominant; networking interests follow. Consequently, it can be argued that communicators are “learners” as they are accessing information within topic-threads, and they become networkers establishing personal

relationships within online groups. Individuals in discussions also assume other roles such as information providers, and supporters and challengers are also found (see Chapter 5).

Communicators contribute to discussions by initiating discussions and replying. These can be performed as a duplex role, in that it was found that some individuals were both initiators and repliers, although the majority of participants in the discussions were repliers. (as seen from the results of web survey and the statistics of fora authors' performance), unlike findings in other studies which show that people actively participate in online discussions (i.e. Sun *et al.*, 2006; Mankoff *et al.*, 2007). As shown in analyses of the sampled topic-threads, fora communicators replying to posts initiated by others rather than the original posters was widely witnessed in the selected topic-thread discussion cases; users contribute to online discussions based on the information they have when they feel like it, and their focus on certain topics frequently turns the communication to topics different from the original one. As also shown in the qualitative analyses of topic-threads, most discussions were quite aggressive (as the case in the discussion of living "a green life", where initial posting author was faced with sceptical, mocking abusive remarks from one of the participants and had to fight back) (see Appendix II). Comparing with face-to-face discussions in interpersonal communications, it is hard to imagine that friends, acquaintances or colleagues would have similar discussions in person, which suggests the mitigating effect of the computer-mediated communication, enabling a release from the social constraints and ethical boundaries of voicing opinions thanks to the illusion of anonymity and secrecy of their identity awarded by internet communication.

7-2. Building Opinion Leadership Online

This thesis also asked who could “affect” people’s attitudes regarding climate change and how. It was found that **opinion leaders** have a significant role in online fora discussion to this effect, as their name indicates. Opinion leadership is generated throughout the course of communication in a particular topic-thread, and it generally but not only involves support from other participants (see Table 7-1).

Table 7-1. Activities of Opinion Leaders in Online Communication

Information	Communication	Networking
Introduction to data / sources	Interpretation	Initiating Discussion
Reviewing Data	Addressing Dispute	Offering Responses
Providing Expert Comments	Presenting Public Views	Member of Group(s)
Identifying Challenges	Leading Opinions	
Leading Inquiries		

In terms of gaining opinion leadership, even key authors are no more than candidates, and all communicators who participate in the discussion can become opinion leaders. In other words, the analyses in this thesis indicate that whether opinions expressed in online discussions are to become “prevalent views” or not depends on collective recognition and the turn of the discussions. With supporters and challengers, the discussion becomes a collective engineering by both key authors and communicators that provide resources to fora members interested in the topics discussed; active members can be transformed to opinion leaders accredited by group if they have extensive support for the contributions to the discussions.

It was also found in the qualitative analysis of topic-threads that some authors tend to choose to share content that will guarantee success of the desired development direction of

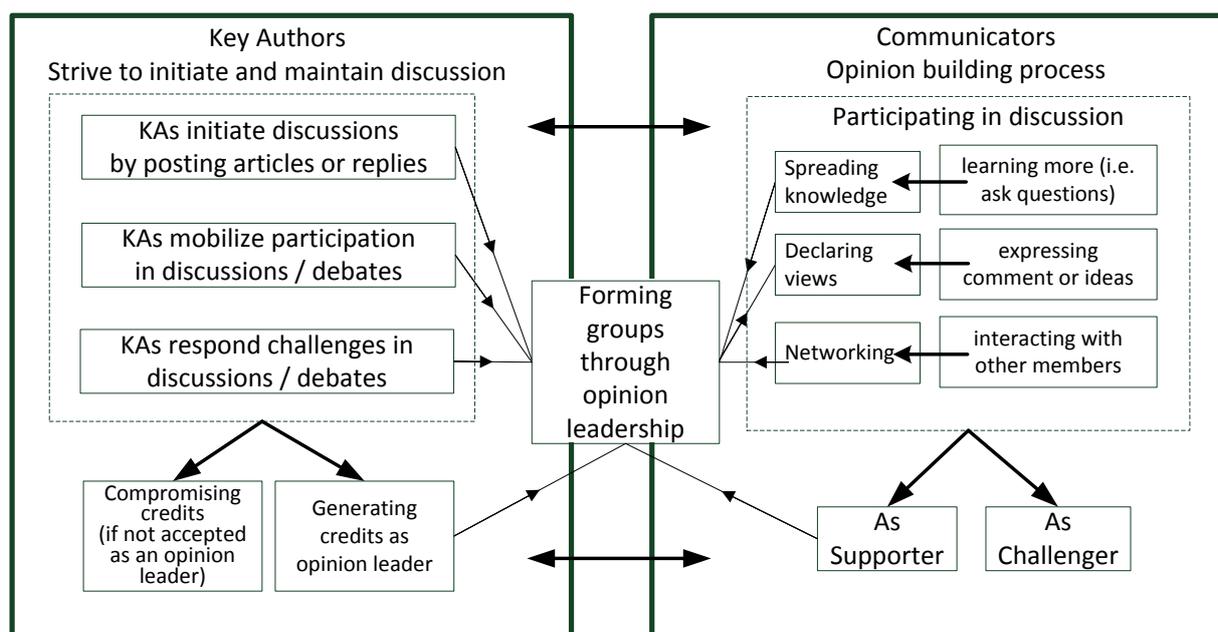
opinion climate in discussion. The topics and themes for discussion are chosen carefully (and instrumentally) in order to raise interest and initiate a discussion; and in some cases the members who behave in this way also manage to sustain the interest in the topic. Therefore, proposing topics, how to formulate them, and what information to provide should be the prime concerns for authors wishing to gain support in a forum discussion and support from participants. The content statistics and topic-thread analyses indicated that members will not support the views of authors unless they are regarded as an “expert” presenting views more credible than their own. Thus in the anonymous context of online communication, expertise is critical for establishing credibility, and the “expertise” that was found in several topic-threads analysed (see 5-3 in Chapter 5) was conveyed by authors through provision of scientific evidence, clear arguments, and their own personal background (i.e. engineer or researcher). These findings correspond to previous research in psychology on communicators’ credibility and the “Elaboration Likelihood Model (ELM)” (Petty & Cacioppo, 1981) related to audiences’ and consumers’ decision pathways. In their discussion of the ELM model, Petty and Cacioppo suggested that individuals’ information-processing capability and the manner in which consumers’ involvement is targeted will determine how individuals deal with various persuasive appeals. In the research in this thesis, it was found that some authors score highly in activeness, participation frequency and capability of networking with others, and thus they are considered key authors. The key authors in fora communication can be deemed as individuals who are in the “central route” of the communication process as described by Petty & Cacioppo, for they actively and frequently are involved in fora communication processes. In other words, individuals who are interested in a topic and participate actively in debates are at the “central route” of the ELM model. On the contrary, others who involved in topic-threads at the margins (or with less interest or expertise) appear to be on “peripheral” route described in Petty & Cacioppo’s ELM model: these members are distant from the topic

of discussion, have lower motivation to be involved, prefer to follow the views of someone who seems trustworthy and take these into account when making their own decisions.

In the context of online communication (the focus of the research in this thesis), persuasion can be regarded as a process of communicating intended messages by authors online. The findings in this thesis may uphold the ELM model proposed by Petty & Cacioppo, but apparently not include the “targeted communication of information” that the model originally supposed. Fora discussion participants acquire information and develop knowledge by listening and interacting with people they deem experts or those that appear trustworthy. These do not necessarily overlap (the experts may not always be trustworthy).

As shown in Figure 7-1 below, opinion leadership has been found in topic-threads, emerging from specific individuals or a group’s interactions; opinion leadership can be shaped, reinforced and reflected in online fora. It is communicators that help shape opinion leadership, as they express ideas and interact with others. Doing so, they manifest preferences for particular opinions (i.e. becoming supporters or challengers to certain posts or individuals) and contribute to shape the opinions of those who are taking part in the discussion (interacting with the group).

Figure 7-1 Interaction of KAs and communicators in forming opinion leadership



The research findings indicate that the multi-stage, user-selected routes of communication as occur in the fora analysed can be illustrated by a combination of the “Two-Step” flow and ELM Model: groups form among opinion leaders and supporters around communication activities online.

The benefits of gaining opinion leadership drive individuals (who are frequently also key authors) “to do more” i.e. post a large volume of messages. Opinion leadership can be strengthened or compromised depending on the performance of authors and their ability to network and convince others of their views, generating supporters. There is also evidence that assuming an authoritative position in the discussion can shape the opinions of others, for example in SN4 where the efficient and relevant information provided by the KA contributed to altering repliers’ perceptions of nuclear power. Ultimately the support for particular opinions is down to the people’s choice in these cyber public spheres.

7-2-1. Competition of Opinion Leadership

The mechanisms of communication in internet fora are quite different to those in traditional mass media, e.g. no editors as employed by traditional mass media (i.e. editors as “gatekeepers”) (Vos & Reese, 2008). However, the editing of contents and opinions still occurs but led by anyone who participates in a discussion and wants to present certain data or opinions.

Though a considerable portion of fora members seem willing to learn from others regarding climate change - as shown by the web survey, online discussions can become transformed into a process of building consensus when diverse opinions are exchanged, disputed and finally re-invented as collective ideas through competition for opinion leadership. It was found that authors can only partly control the channels and forms in which information, views and opinions are communicated, and they do not have the privilege of posting contents. Even though particular authors contribute a large portion of contents to the discussions, their performance is the result of strategies they apply especially when facing ‘competition’ for opinion leadership. Two-way communication and the interaction mechanisms in fora allow intense discussion, debate and sometimes even reconciliation of opinions, as seen from the analyses of topic threads in this thesis.

This is made possible by the mechanisms particular to internet fora. Actively or reluctantly, authors’ posts can be immediately reviewed, supported or challenged by other fora members. As one can see from topic-thread analyses and the results of the web survey, the ‘competition’ of opinions in the discussions does not always weaken the influence of opinion leadership, but makes internet fora more ‘sticky’, more attractive and more convincing to some people. In the survey, a high percentage of respondents indicated their opinions were influenced and affected by the online communication process, including ‘prevalent views’. Therefore, competition of opinion leadership online does add a dynamic to communication flow; thus the findings of the study in this thesis are consistent with the opinion of scholars such as Wellman (2001; 2007), Foth (2003), Dale and Onyx (2005) and others

who point to the multi-dimensional interactivity and dynamics of computer mediated communication media.

7-2-2. Reinforcing Opinion Diversity

The work contained in this thesis shows that communication processes examined in the four fora can also generate or reinforce opinion diversity. Opinions are generated, information is shared, debated, explained and contradicted. However, discussion in fora is also open to anyone who is interested, and can attract new participants (even though there were some occasions in discussion when ‘activists’ entered a debate in a topic-thread only to voice some separate, non-related opinions). There is much work about the non-intrusive character of online communication in providing information for consumers and Internet users. Here the role of the traditional information resources such as TV news, newspapers, radio etc. is clearly reversed – it is not the information source that has to reach the consumer in a targeted and directed way, but the information consumer is the active agent searching for the interest group in which he or she will want to contribute, and / or find the information he or she is interested in.

The findings in this thesis (opinion leadership, diversity of interests taking part in discussions) are consistent with the idea of dynamic communication flow as introduced by Dance (1967) and scholars such as Thurlow *et al.* (2004) in CMC research literature. As well as “active participation” in the interactive discussions online, the analyses of the fora suggest that the concept of ‘active audience’ proposed by scholars such as Morley (1993) is also applicable to the fora discussions. The evolution of topics and fora discussions is led by people who join discussion groups online in which their interests are shared or supported, even in case where the opinions within a group may vary. From selective accessing news channels to selective participating discussion groups, it is opportunities of communicating

climate change in different ways do arise in fora. The topic-threads analysed show that discussions can evolve in directions that some people may not have initially intended as such.

Findings of web survey suggest that these fora members may be willing to hear ideas different from theirs, but their tendency is to prefer discussion with groups which share similar views. The qualitative analyses reveal that relatively few users want to be challengers in topic-threads. When challengers do appear, their views attract responses that defend the prevalent views. This may help explain why people sensed a “climate of opinion” in the discussions.

7-2-3. Being Recognized: Gaining Opinion Leadership

One of the hypotheses of the present study was that key authors will become opinion leaders; this was assessed and confirmed through analyses of discussions and of the survey approaches; but the research also identified that considerable effort needs to be made by authors pursuing opinion leadership. It is not enough to actively post and reply, intensively participate in the forum’s activities, and be socially accessible (i.e. networking for the benefit of oneself and others). To become an opinion leader, the interested individual has to take part in several discussions, and his / her impact on the public opinion has to be sustainable, which means that he/she should be a member of a certain interest group for a considerably long period of time.

7-2-4. Key Authors and Roles of Supporters

The research indicates that, in the topic-threads analysed, the activities of key authors are frequent. In many cases, as shown in the research, there is usually more than one KA in each forum. Sometimes, in a discussion, a KA will compete for opinion leadership with repliers. KAs are not invincible in competition for opinion leadership; in some topic-threads

(i.e. Topic-thread 4 from OurPlanet / EarthDay Forum) they change their views following other information provided in discussion. In other words, in some cases the two-way communication process has the potential to reduce an individual's leadership position.

Key authors require supporters who approve their views in the competition for opinion leadership; key authors seem to need supporters of their views to counteract those of the challengers. These two main types of interactions between key authors and others are discussed in more detail below.

Type A. Supporter of Key Author

Supporters of key authors' perspectives are frequently observed in the sampled topic-threads. In the KAs' initiated topic-threads, the supporter role is not only important to KAs, but also to the entire forum communication activities. A supporter may voice supporting comments for the initiator (but not only), thus strengthening his/her position in the pursuit of opinion leadership. In addition, supporters stabilize the communication flow throughout the discussion in topic-threads, since the support of an opinion means keeping to it, discussing in detail, and not moving to other topics. Thus, the presence of a large number of supporters in one forum tends to guarantee the smooth flow of the discussion and the stability of the topic being discussed.

Type B. Challenger to Key Author

The analyses of topic threads also indicates that a discussion risks failing at the very start if there are only supporters and no challengers to the arguments presented. The role of a challenger therefore should not be underestimated. In the topic-thread analysis, challengers add variability to the discussion of any topic and enable the participants to have a look at the situation or concept from various angles, which the challengers present by responding to the key author and his / her supporters. Challengers can also distract the communicators from the

main arguments of their discussion and try to change the subject by offering various alternatives to the topics being discussed. As a result, the challengers can strengthen their advantage by undermining someone else's pursuit of opinion leadership. If an effective challenger is participating in the discussion, there is a high probability that he/she will not dismiss the arguments of the opinion leader, but will stimulate him/her to support his/her opinion with more data and argumentation, which will make the point clearer and more valuable for other communicators, as well as transparent and thus more accessible and interesting for those not taking part directly in the conversation (e.g. observers).

7-3. Revisions to the Two-Step Flow Model

As explained in the previous sections, leadership and prevalent views are formed in the discussion, often through competition, and these are manifest through the discussion and more widely based on the connectedness and networking that the forum members have. This suggests that, on the basis of the communication processes observed in online internet fora, a modified version of the two-step flow model can be proposed. Rather than focussing on an individual opinion leader and his / her relationship with his / her interpersonal social network, the research suggests that communication occurs between an opinion leader and his / her supporters (communicators) with networked forum members who access the discussions or with observers who access the forum.

This revised model is based on observations and analysis of online communication undertaken in this thesis. Its main characteristics are:

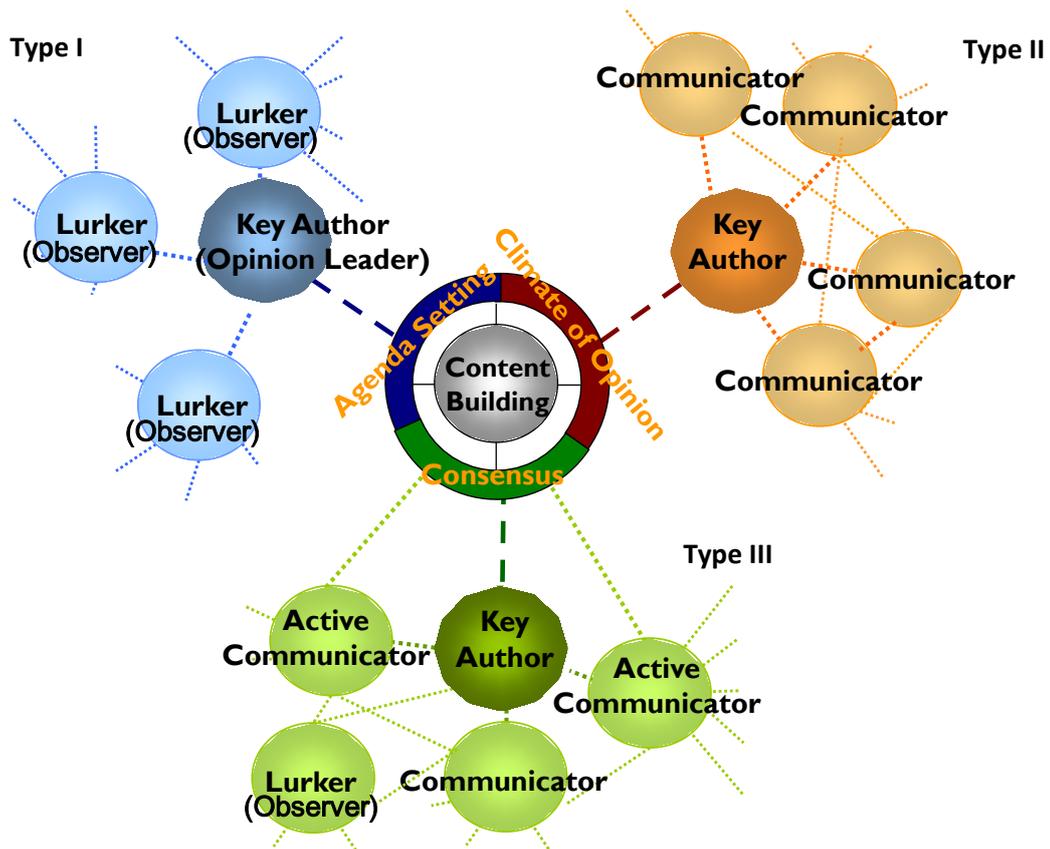
- the interactions between authors and active communicators create communication groups;
- authors compete for opinion leadership and supporters;

- opinion leaders may emerge from the interaction process with other communicators;
- views of the opinion leaders become “mainstream”, “prevalent” views in fora.

As a result, other communicators in the discussion can either become part of the communicator group (by agreeing with the prevalent views), or do not actively participate (keep silent as observers). The former enables fora members to become “networked” with the communicator group; the latter allows fora members as observers in to interact with others at any time, when they wish. The relationship between communicator group and individuals shapes information flow from interactive sharing to audience-based access. Just like walking into a virtual club, people who are not belonging to a communicator group are isolated. In internet fora they still get information through dialogues among others, but they are no more than media audiences. More than 88% of members on average in four fora were observers (perhaps indicating an isolating mechanism).

The revised model showing relationships among observers, communicators, authors, and opinion leaders is in Figure 7-2 below.

Figure 7-2. Revised Two-Step Flow in Online Fora Communication



As shown in this revised two-step model, it is suggested that there are three ways in which discussion content is generated and communicated, as described below.

Type I: Classic Two-Step Style Flow (Opinion Leaders – Observers)

In this type of interaction, observers are regarded as fora audiences who never actively express their ideas and comments through online discussions. For them, the content in fora mainly contributes to “agenda setting”: the opinion leaders provide contents and set the agenda. Observers prefer to rely on key authors as opinion leaders rather than participate in discussions directly. Here, key authors are agents who not only provide information online but also discuss with other communicators and express comments ‘for’ these observers. The access to contents for the observers reflects the classic two-step flow model in mass communication by Katz & Lazarsfeld (1955), the only difference being that here it is referred

to an internet fora context where the key authors replace media editors by posting or proposing considerable quantities of articles to others. In this study, the considerable percentage of observers and very limited number of key authors present in the discussions supports the evidence for this classic two-step communication flow model.

Type II. Communicators' Two-Step Flow (Key Authors – Communicators / Observers)

With increasing levels of interaction, the relationship between key authors and others changes (it is no longer defined by traditional communication models). Key authors still actively deliver information and express their ideas online, but their roles are not simply as traditional media editors, nor opinion leaders who deliver one-way content. They act as a 'trigger' which brings together responses and encourages discussion. In this type of model, key authors are irreplaceable: discussions and communication occur through the efforts of key authors. In this model, opinion is not really 'led' by key authors but develops through the discussions between key authors and other communicators (who form a leader-centred communicator group). There is evidence from the work presented in this thesis that opinion leadership may not be attributed to specific individuals (i.e. key authors), but this does not mean the influence of opinion leadership is weakened. This model could also explain why in the web survey, 82.76% of total respondents from the four fora indicated they felt there were prevalent views expressed online.

Type III: Networked Two-Step Flow (Active Communicators' Group -- Observers)

In this research, a third model of networked two-step communication flow is proposed. In some cases of topic-thread discussions, some communicators are found also very active and have intensive interactions with each other and key authors. Moreover, key authors are considered simply another "one of active communicators" and unable to control neither the agenda nor opinions in these cases. As a result, though it is found that pursuing opinion

leadership is major motivation of the active participation in the fora communication, as shown in web survey asking respondents' motivations of joining discussions, the opinion leadership does not belong to a specific communicator in these cases of topic-thread discussions. However, the intensive discussions (or debates) did form interactions among these active communicators and could generate more contents that are relevant more to communication activities than the discussions of initial topics; a "sense of belonging" could be generated in the discussion process. The outcomes of pursuing opinion leadership all the better improve these active communicators' networking, and an obvious role of communicators' group has been observed in this type of interaction model, as observed in several cases of topic-thread discussions in Chapter 5.

In other words, communicators are active in this model, but their pursuits of opinion leadership lead to a process of building the active communicator group's views, which should be considered these active communicators' "consensus" or at least their similar experiences and values networked in discussion topics. A two-step flow still exists in the model, but it is between the active communicator group and lurkers (observers): specific views or some common ideas of the active communicators' groups in discussions emerge while other members (as observers) learn that these active communicators could know each other and share some similar values through accessing the discussion contents in topic-threads in this type of interaction model. Either these members accept the ideas of the active communicators' group in topic-thread discussion OR simply go away (leave zero or few posts to challenge or question the group's ideas as a phenomenon found in several topic-threads in the study), the two-step communication flow (of active communicators' group – observers) stands, and it could also be the start point of consensus building for the members who involve the groups. Interestingly, the finding also corresponds to the "the spiral of silence" suggested by Noelle-Neumann (1984) (See Section 2-2-1 in Chapter 2). As a result, the process of "consensus"

building excludes observers while active communicators' group could share the outcomes of communication. This could also explain why respondents in web survey considerably report they feel prevalent views in fora but difficult to figure out the specific sources of the prevalent views.

As shown in the types of models of the revised two-step communication flow in Internet fora, the pursuit of opinion leadership would require not only active participation but also other factors such as good networking ability through asynchronous interactions, and sometimes the pursuit of opinion leadership could instead stimulate the formation of networking among groups of active communicators by posting / replying posts and generating considerable discussions. The revised two-step flow also displays how interactions between active communicators and others could affect major topics and issues discussed in fora.

7-4. Implications for Practice on Climate Change Communication

The findings of this research indicate multiple modes of information searching and sharing, opinion and leadership formation online. On this basis, approaches for enhancing online communication regarding climate change issues can be devised. These are detailed below.

One can conclude that the two-step climate change communication flow in internet fora emerges when key authors actively share, interpret and disseminate selective information and knowledge. Since the innovation represented by internet forum communication is that it provides the users with an opportunity to become the 'active communicators' and to make conscious selections of information sources according to personal interests and preferences,

mobilizing users to participate in online discussion with the awareness of the potential biases in information shared in fora could be a very helpful contribution to the communication process.

Internet-based communication flow in fora offers comparatively larger freedom of expression and range of opportunities for active communicators than in traditional media, with access to opinion leadership, but the information flow is still limited by interactions limited to active communicators' groups, and the selective (framed) information accessed by observers and other members. It can be imaged as a separate living organism consisting of the fabric created by each contributor, though at the same time it is mostly guided by the central figure of the brain — the leader-centred communicator group.

To enhance the communication flow of climate change issues, encouraging wider, active participation in discussion of the relevant issues will be required. Establishing opinion leadership and consensus building will be important elements to achieve better communication and understanding of particular issues, while animated discussions and debates about issues should not be relinquished, especially in-depth discussion of controversial climate issues. In the research, it has shown that opinion leadership results from active interaction within communicators' groups. Moreover, roles of key authors and their contributions are found critical in fora, and their motivations of earning opinion leadership could also lead to the formation of active communicators' group. In other words, the key to enhance climate change communication in Internet fora could lie on enabling and improving the 'quality' of opinion leadership, which leads to enhanced knowledge of the issue (by having well-informed key authors) and better networking among members (by having active communicators and forming communication groups). Strategies could include making it easier for some experts to interact in a space where they feel comfortable, for instance the IT

platform created for Transition Towns, encouraging them to network with fora members and earning supporters as seeds for offering knowledge and involving debates online.

7-5. Conclusions

In all, the journey of examining communication flow in process of online communication shows that the establishment of leadership is usually an accumulated result of earning recognition, presence of stimulating supporter groups and convincing challenger groups, and communicators' views. All these together form the explicit, interactive communication process of online discussion in fora. Findings of this research could correspond to some previous studies of communication (e.g. two-step flow), but require some revisions for the attribution of the new media. Understanding the processes involving people in online interactions is vital for drawing conclusions from the data explored in this study. It stands to reason that calculations of user activity, the intricacies of communicators' opinion competition in fora, and the specificity of topics they discuss are governed by the unspoken rules deeply welded in the communication flow of internet fora and users' perceptions of their own roles.

Based on the research presented here from the research, one can argue that directing research towards the identification of key social contexts and experiences that may help participants in online discussions benefit from improved communication, including improved interpretation of data received online, awareness and understanding of information framing are of strategic importance in the context of exponential increase of new media interactions. Future avenues of research are outlined in the final chapter.

Chapter 8. Conclusions and Future Research

8-0. Introduction

This thesis offers new insights into the internet communication of climate change, specifically within internet fora. This chapter draws upon these reflect on implications for future work and suggestions for building successful, effective communication within the framework of internet media.

The research set out to investigate (1) characteristics of climate change communication processes in internet fora, (2) interactions among fora users and their roles in online discussion processes, (3) and the influence of online communication on people's views and attitudes. Three research questions were developed to reflect these:

1. How do individuals communicate climate change issues and interact with others through online discussions in Internet fora?
2. What are the roles of online communicators in Internet fora and how do these develop?
3. Does communication around climate change in online fora change individuals' perceptions and motivate them to consider changing behaviours?

The thesis explores these questions using a multi-method approach, including analyses of fora statistics, analyses of fora discussion contents and online questionnaires of fora members' views, resulting in a combination of quantitative and qualitative methods. The four fora were selected on the basis of their focus on climate change and environmental issues (see Chapter3).

8-1. Major Findings

The discussions in all four social networks (fora) examined in this thesis reveals the complexity of internet-mediated communication. The statistics of contents archived indicated that the fora communication activities are not equivalent between some specific authors and most fora members. In particular, some authors are qualified as key authors who contribute considerable contents, frequently participate, and be capable of networking with others in all four fora. According to the findings, key authors contribute almost half (41%) of posted forum articles, a third (34%) of posted replies and a third (38%) of words on average in each forum (see Table 5-4). Qualitative analysis of the topic-threads initiated by these key authors indicate the varied processes that take place during discussions of opinions and the potential for establishment of opinion leadership (Chapters 4 and 5).

The study also explored roles of fora users in online communication. Key authors of four fora were identified based on their level of activity, frequency of communication, and networking based on a novel approach derived from existing literature (see section 8-2-2 below). Despite the dominant contribution of key authors in the generation of fora contents, the presence of key authors (KAs) in fora, their number (less than 12 KAs in each forum) is far fewer than the number of other communicators (more than 2000 recorded in each forum): It is only a small proportion of fora members that communicates actively initiate discussions and share information, experiences, and views with others, who respond and can become supporters or challengers of the opinions expressed in the discussions). Questionnaire responses indicated that the majority of respondents visit fora to learn (over 90%), share experiences and information (over 80%). Most of these access discussions as

observers or relatively passive participants (they respond to a few postings perhaps and watch the conversation unfold). This research reveals that only few of the key authors correspond with individuals who respondents in the survey indicated as ‘opinion leaders’. This suggests that not all key authors are opinion leaders (and the discussion statistics as well as analysis of discussion contents support this), and that survey respondents may perceive leadership in opinions deriving from individuals other than key authors.

In fact, for investigating influences of fora communication on users, the web survey conducted in the study suggests that fora members perceive there to be ‘prevalent’ opinions within the fora discussions and that these influence their perceptions and views. Survey respondents indicated they felt less inclined to and engage in debates with people who challenge their opinions strongly. However, this contrasts with the findings from the qualitative topic-thread analysis which suggest that communicators join and contribute to the discussions greatly, by fuelling the debate. Statistics of online communication activities indicate that the discussions which host both supporters and challengers have much more fruitful, lengthy, and informative discussions.

8-2. Contributions of the Study

The contributions of the present study to the understanding on online communication processes are considered in relation to theory and practice, as outlined in the two subsections below.

8-2-1 Original Contribution to Research

There is a large research literature that has drawn upon to formulate a sound theoretical basis of the present study. Some of the hypotheses and assumptions voiced in communication flow research and internet communication modes (i.e. Brosius & Weimann, 1996; Couldry, 2008; Nisbet & Kotcher, 2009) have been tested and further expanded in this study. As Weiman (1991), McKenna and Green (2002), Watts and Dodd (2007), and Nisbet and Kotcher (2009) emphasise, the two-step model of communication has been considered useful to explain interactions between individuals in internet communication. Nevertheless, the manner in which the discussions analysed in this thesis take place reflects a revised two-step model of communication where fora users have different levels of participation and interaction with each other. This implies that there is scope for reconsidering the two-step communication model. Here three types of a revised two-step model of fora communication are proposed in which messages are generated and communicated by opinion leaders to observers (Type I), by key authors to communicators (Type II), and by active communicators' groups to observers (Type III). It is suggested that the role of key authors in Type II and role of active communicators' group in Type III could be added to the classic two-step communication model (Type I) for a more complete understanding of online fora communication.

All authors and communicators to the discussions substantiated their opinions with the help of data found in reports or publications related to the discussion, and they responded with information to the initial posts. They managed to address the varying inquiries, protests, and contradictions from other participants, having micro-dialogues with each of them within the larger framework of the overall

topic-thread. The multimodality of the communication processes identified in the online discussions analysed informs our understanding of the ways in which communication actually occurs as outlined in Figure 7-1.

The close attention to opinion leadership was given in the thesis. This concept has been widely discussed in the literature, for example, Lyons and Henderson (2005) emphasized the exceptional influence of opinion leaders in new media as compared to traditional media. The nature of opinion leadership has become the prime point of interest for researchers since then, and scholars such as Kotler (1998), Keller and Berry (2003), Baker, Coaffee, and Sheriff (2007) have dedicated their efforts to identifying the reasons for which opinion leaders are needed for the communication process, the features of opinion leaders for grasping public attention and to engaging the public. Nevertheless, according to the study, opinion leadership in internet fora is in the competition of key authors and other communicators, for two reasons: 1) fora members can express their ideas as communicators by posting or replying posts and earn opinion leadership in discussions; 2) key authors are found in the study who post considerable contents, frequently participate in and networking with other members in all four fora. These authors are also found being motivated by pursuing opinion leadership and being recognized. As a result, key authors' significant contributions, and communicators' interactions in topic-thread discussions thus can be considered strategies of earning the opinion leadership in fora.

The findings of this study also reinforce and the significant effect of the Internet on society. As shown by other studies, the number of Internet users has grown rapidly within a couple of past years, and the number of people reporting participation in social networks and communication fora is also increasing. Previous research on the role of the Internet in public life has also shown that people use it as a source of

information and networking (Bauer et al., 2002; Hampton & Wellman, 2003; Mankoff et al., 2007). The present study shows results quite consistent with these findings, but it introduces some new dimensions about the motivations of Internet use. The questionnaire results indicate people access online discussions driven by a desire for learning, experience sharing and networking. This suggests that the majority of people are often not passive consumers of Internet resources, but rather they want to draw upon contents and engage with others, either to a limited extent or more widely (i.e. those who want to educate, to enlighten, to show the difference, to recommend and to warn against problems, etc. The concept of the Internet as an information resource and reference has evolved into a medium of active search for collective meaning.

8-2-2 Original Contribution to Practice

There are several contributions by this thesis to research practice. The first relates to internet-based communication models. It has been shown there is much value in modelling communication by classifying communicators' roles, their interaction intensity, and interest of others to engage with them. Such understanding is relevant for communicators working new media to understand how communication happens and how it could be improved depending on the format and who is involved.

The research also developed methods for identifying authors among the communicators. On the basis of the performance index and levels of activity (α -lists), participation frequency (β -lists), and networking ability (γ -lists), authors were ranked and scored to identify those who could be considered as active authors in online fora and potential opinion leaders, as outlined in Chapter 3. The development of these methods enables a better understanding on how opinion leadership develops and the

role of authors in online discussions. This could help improve the design of practical strategies for enhancing climate communication online.

The study also has practical value in showing how public awareness of climate change is developed through Internet communication. The discussions demonstrated profound awareness about climate change issues amongst this group of online participants. In addition, a more ambiguous implication for climate change communication can be inferred from this work. Since opinions and discussions are driven by communicators who tend to pursue opinion leadership, not experts who can provide comprehensive knowledge, the two-step flow process becomes more like a co-production of thinking through asynchronous interactions, where it appears that contributors / communicators' attainment of opinion leadership is their main concern. Active communicators want to be recognized and acknowledged, and providing some 'useful' information is only one means for this.

Regarding to gaining opinion leadership, the study further suggests that active communicators may find ways of encouraging people to engage people in topics related to their interests. Observers may receive additional motivation to participate in the forum discussion once they believe that their opinion matters; challengers may believe that instead of simply challenging the opinion of a forum leader they may offer a constructive alternative and continue the debate in a more effective, fruitful manner. People who are sceptical about the contribution of their views to the discussions are less motivated to participate, though they may have much to offer. Therefore, the study indicates that other more creative ways need to be explored to allow active communicators to engage passive observers in the communication process.

To summarize, it is leadership theory and practice within models of communication to which this study contributes most profoundly. Direct physical interaction has traditionally been the prime area of research concerning leadership; only recently has research about online opinion leadership started to develop – this is where the work contained in this thesis is situated. Some physical means of influencing others (e.g. appearance, voice intonations, gaze, pauses in speech, gestures and other non-verbal means) have been considered as key tools used by leaders to achieve persuasion (Argyle, 1969/2007). In contrast to traditional leadership techniques, online opinion leaders, either individuals or communicators groups, have only their rhetoric, communication and negotiation skills, and data that they use to win public recognition. The face to face element does not take place online. However, Verderber *et al.* (2007) stated that people tend to reveal similar tendencies in online communication as they do face-to-face. For instance the desire to give timely responses, the usage of vocabulary and grammar that relate to the atmosphere and participants involved in the communication, and attempts to personalise interlocutors by asking about their gender, age, location etc.

Thus, the present study represents an innovation in the field of exploring online opinion leadership. It, uses and proposes quantitative and qualitative techniques to understand who and how interact with others online. The contribution of these findings to practice is identifying characteristics of communication process, key roles, and improving communication taking into account the characteristics of the internet and online fora. These findings may be useful for those wishing to encourage action on climate change, and by internet fora authors who want to increase public awareness of certain issues, to form public opinion in a specific way.

8-3. Limitations of the Research

Though this research makes a significant contribution to research on internet-mediated communication processes as well as to studies on climate change communication, its limitations need to be acknowledged as they relate mainly to the validity and reliability of the results obtained.

Firstly, the study is based on Internet-mediated communication, and it does not provide comparison with traditional approaches of communication, such as mass media or face to face interaction, to evaluate the impact of new media. The difficulty of comparison comes from the nature of Internet discussion, which is very dynamic and changeable which make it very difficult to comparing the communication flow in 'virtual communities' with that in physical communities. A good example of the changeable features of fora-based communication was the forum 'OurPlanet / EarthDay', established on the MySpace platform at the beginning of the research (Sept. 2008). There were more than 75 posts (including articles and replies) generated in a day on average. Suddenly due to declining membership of MySpace, many authors in OurPlanet left, and the forum changed its name to EarthDay in August 2009. Though the study in the thesis attempted to carry out a longitudinal study (nearly two years of observation), the dynamics of forum evolution could not be properly documented due to the extreme intensity of communication that took place when the change occurred (daily, hourly, and sometimes even in real time by several users) (Middleton, 2010). Therefore the quickly evolving nature of online communications demands longitudinal detailed work to capture the dynamics of user interactions. There is a risk otherwise that the vibrant and changeable environment of Internet-mediated communication becomes studied as a static entity and is out-of-date

immediately once it has happened.

Secondly, the questionnaire was completed by respondents on a voluntary basis, following an e-mail invitation via email lists collected by forum administrators; there was no possibility of verifying information, identity of respondents, credibility of responses etc. Given the survey was web-based, it could have lent itself to misuse (e.g. someone could have filled in a questionnaire twice, or irresponsibly, without thoughtful consideration of the information requested). The researcher checked all responses received before analysing the data to spot anomalies (see Chapter 3); some inaccuracies were detected, but such issues cannot always be prevented.

Thirdly, the research was not able to fully examine the impact of online communications on participants' behaviour. The questionnaire asked respondents to state whether the material and views expressed in fora discussions had had any influence on their everyday lives. Clearly the answers were based on personal reflections and self-reporting which are liable to a variety of different biases (memory recall, desirability, etc.) making it impossible to verify the responses. It is also possible that responses reflected a value-action gap (i.e. respondents feeling that they were influenced to take action but did not in fact do so). So in this research the responses regarding action are treated with caution.

Responses to the survey were received from 148 respondents, but of these only 119 were fully completed and contained analysable information. This represents a low response rate. Thus, it is possible to suppose that those who responded to the survey represent the active group of communicators in the fora. They may have a set of characteristics, behavioural patterns and habits not typical of other forum participants. Therefore, any generalisation from the results reported has to be done with careful consideration of these limitations. It is more than probable that the key authors and

active communicators actually took part in the survey because of their active communicative position within the fora. Another issue to consider is that the analysis presented in the current study offers an important contribution to the study of media and communication patterns, behavioural peculiarities in digital communities, but as the medium is so dynamic it is never possible to guarantee that the inferences made from the current set of research materials will be valid over a sustained period of time. This research only focuses on a very narrow set of online communities and sampled internet fora with an interest in climate change and broader environmental issues. Continuing this study with a range of fora, perhaps with similar interests but in other countries, or a broader spectrum of fora, over a considerably long period of time, could provide some indication of generating more reliable, and valid results.

Other limitations of the research become apparent in discussing the research findings. Computer-mediated communication (CMC) is a hybrid type of communication based on some more traditional communication types such as the oral, written, personal, and mass communication (Baym, 2000); as such, posts and replies are usually taken as a prime source of information about internet-based communication process. So too, the data of this thesis were completely derived from online discussions and the survey with fora users. Other forms of data (images, video, etc.) would have provided very diverse insights into the communication processes, and would have raised very different interpretative considerations.

Another limitation of this research is the inability to establish the direct contact with communicators in the fora to validate of personal characteristics, views and understandings emerging from the research, for instance, the qualities that communicators may possess to become opinion leaders, to make their leadership credible, and to make others listen to their argumentation. How these characteristics

are developed and the contextual factors leading individuals to acquire leadership roles could not be fully explored.

8-4. Further Research Directions and Challenges

The study in this thesis addresses innovative ways of interacting in online communication media; it reflects on the analysis of a new type of communication flow and considers the differences in communication between new and traditional media.

The fact that the online communication represents a fundamentally new type of communication is indisputable at present. The notion of "active audiences" voluntarily choosing the information to consume according to individual preferences and interests, the leadership of key authors and others active in communicator groups (as online opinion leaders) shaping the communication flow and debating views are comparatively new in media research. Notwithstanding the many empirical findings and theoretical contributions that this study has generated, it also highlights gaps in the modern understanding of the effect of the new media on the modern public, including the role of new media in opinion formation, opinion sharing, participant interaction within online communities, etc. Besides, a key concern is to establish the extent to which this awareness engenders individual or community action. How the internet can be used to promote awareness and communication about climate change outside of dedicated fora needs more exploration in connection to the existing appeal of new media for new generations. These gaps therefore provide indications of further research.

1. Improving identification of opinion leaders

More specific work could be undertaken on the emergence and life of online opinion leader. Once identified they could be asked to take part in studies exploring the mechanisms they utilize to acquire opinion leadership, the techniques they used to gain public support, to shape and alter the public perception on climate change-related issues. Their self-evaluation and reflection on their experiences and successes would help to gain insights into how opinion leadership forms online, the underpinning motivations and processes which may be characteristic of online media, the differences with traditional media.

This research has shown that there is much scope for studying processes of online communication by observing and understanding how participants (from the deeply involved to the marginal) interact with each other and shape outcomes. It is clear that the internet as a medium of communication is extraordinarily versatile and lends itself to a multitude of uses. At the same time, transactions can be hidden or erased by the very fact they are stored electronically, and that individuals' identities need not bear any semblance to their in-life characteristics. This harbours many benefits but makes studying interactions in the internet extremely complex and challenging. Future research may be able to exploit the characteristics of the internet in ways unbeknown to us now, which may facilitate further work in this area. The question of how interactions in a virtual environment (cyberspace) can develop to run in parallel, support or even supersede those in 'real' life remains open.

2. Promoting behaviour change

One area of future work indicated by this research is the exploration of ways to trigger and enhance the behaviour change through online interactions. It is obvious

that internet-based communication tools enable individuals to choose the groups and information they access. Therefore, one can suggest that people who join in the climate change issues groups are genuinely interested in climate change-related issues and look for information, education, and advice in the forum activities. More interactive research processes are needed to creatively explore the interrelation of the internet activities and the direct impact on the human behaviour change.

Also worth noting that as this research only studied internet fora with a focus on climate change and broader environment issue, the types of fora and the scope of the research could be broadened to examine how and whether climate change is discussed in a more diverse range of online interest groups/communities.

Despite the growing number of studies focussing, these studies still contain some uncertainty about the real nature of behaviour change. This uncertainty originates from the inability to measure the real change in behaviours that may occur as a result of online communication. All studies to date have used sampled groups in the controlled experimental conditions, which pose constraints including the artificial decision-making environment for the participants. Consequently, there is a need for more comprehensive, longitudinal and natural observation studies to answer difficult questions about the real effect of online communication on individual action. This could link with explorations of the dynamics of participant interaction in discussions, linked to online opinion leadership, and different stages of online activities (i.e. as newcomers to the online community and as stable members during periods of active participation).

Bibliography

- [1.] Abbot, C. G., Fowle, Jr. (1908). "Income and Outgo of Heat from the Earth, and the Dependence of Its Temperature Thereon." *Annals of the Astrophysical Observatory (Smithsonian Institution, Washington DC)* 2: 159-176.
- [2.] AC Nielsen Company. (2011). A Nielsen Report of Sustainable Efforts & Environmental Concerns Around the World. AC Nielsen, Oxford, UK. August 2011. Retrieved 19th December 2011 from <http://uk.nielsen.com/documents/NielsenSustainabilityReportAug2011FINAL.pdf>
- [3.] Adger, W. N. (2003). Social capital, collective action, and adaptation to climate change. *Economic geography*, 79(4), 387-404.
- [4.] Ajzen, I. (1991). The theory of planned behavior. *Organizational behavior and human decision processes*, 50(2), 179-211.
- [5.] Ajzen, I., & Fishbein, M. (2005). The Influence of Attitudes on Behavior. In Albarracín, D., Johnson, B. T. & Zanna, M. P. (Eds.), *The handbook of attitudes* (pp. 173-221). New Jersey: Lawrence Erlbaum Associates Inc.
- [6.] Albrecht, S. (2006). Whose voice is heard in online deliberation?: A study of participation and representation in political debates on the internet. *Information, Community and Society*, 9(1), 62-82.
- [7.] Allan, S., Anderson, A., & Petersen, A. (2010). Framing risk: nanotechnologies in the news. *Journal of Risk Research*, 13(1), 22-44.
- [8.] Allan, S., & Thorsen, E. (2010). Journalism, Public Service and BBC News Online. In Meikle, G. & Redden, G. (Eds.), *News Online: Transformation and Continuity*. Basingstoke: Palgrave Macmillan. Retrieved 17th August 2011 from <http://eprints.bournemouth.ac.uk/16534/1/9780230233454.pdf>
- [9.] Allen, M., & Reynolds, R. (2006). The elaboration likelihood model and the sleeper effect: An assessment of attitude change over time. *Communication Theory*, 3(1), 73-82.
- [10.] Alley, R., Berntsen, T., Bindoff, N. L., Chen, Z., Chidthaisong, A., Friedlingstein, P., et al. (2007). *Climate change 2007: The physical science basis--summary for policymakers*. Intergovernmental Panel on Climate Change Working Group I: Fourth Assessment Report. Retrieved 15th Nov. 2012 from <http://ds.heavyoil.utah.edu/dspace/handle/123456789/9951> .
- [11.] Anderegg, W. R. L., Prall, J. W., Harold, J., & Schneider, S. H. (2010). Expert credibility in climate change. *Proceedings of the National Academy of Sciences*, 107(27), 12107-12109.
- [12.] Antilla, L. (2005). Climate of scepticism: US newspaper coverage of the science of climate change. *Global Environmental Change*, 15(4), 338-352.
- [13.] Arentze, T., & Timmermans, H. (2008). Social networks, social interactions, and activity-travel behavior: a framework for microsimulation. *Environment and Planning B: Planning and Design*, 35(6), 1012-1027.
- [14.] Argyle, M. (2007). *Social interaction*. Methuen (Aldine:2nd edition), Lobdon.

- [15.] Babbie, E. R. (2007). *The practice of social research*. Wadsworth Pub Co, Belmont, CA.
- [16.] Babbie, E. R. (2008). *The basics of social research*. Wadsworth Pub Co, Belmont, CA.
- [17.] Bagozzi, R. P., & Dholakia, U. (1999). Goal setting and goal striving in consumer behavior. *The Journal of Marketing*, 63(Special Issue), 19-32.
- [18.] Bailenson, J. N., Yee, N., Blascovich, J., & Guadagno, R. E. (2008). Transformed social interaction in mediated interpersonal communication. In EKonijn, E. A., Utz, S., Tanis, M. & Barnes, S. B. (Eds.), *Mediated Interpersonal Communication* (pp. 77-99). Abingdon, Oxon: Routledge Publication Inc.
- [19.] Bakshy, E., Hofman, J. M., Mason, W. A., & Watts, D. J. (2011). Everyone's an influencer: quantifying influence on twitter. In *Proceedings of the fourth ACM international conference on Web search and data mining* (pp. 65-74). ACM.
- [20.] Baker, M., Coaffee, J., & Sherriff, G. (2007). Achieving successful participation in the new UK spatial planning system. *Planning, Practice & Research*, 22(1), 79-93.
- [21.] Baran, S. J., & Davis, D. K. (2011). *Mass communication theory: Foundations, ferment, and future (Sixth Edition)*. Wadsworth Pub Co, Boston, MA (USA).
- [22.] Bar-Ilan, J. (2005). Information hub blogs. *Journal of Information Science*, 31(4), 297-307.
- [23.] Bar-Ilan, J., & Peritz, B. C. (2009). The lifespan of "informetrics" on the Web: An eight year study (1998-2006). *Scientometrics*, 79(1), 7-25.
- [24.] Barr, S. (2007). Factors influencing environmental attitudes and behaviors. *Environment and Behavior*, 39(4), 435-473.
- [25.] Bauen, A. (2006). Future energy sources and systems--Acting on climate change and energy security. *Journal of power sources*, 157(2), 893-901.
- [26.] Bauer, D., Rooney, S., Scotton, P., Buchegger, S., & Iliadis, I. (2002). The performance of measurement-based overlay networks, 115-124.
- [27.] Baym, N., & Baym, N. K. (2010). *Personal connections in the digital age*. Polity Press, Cambridge.
- [28.] Baym, N. K. (2000). *Tune in, log on: Soaps, fandom, and online community*. Sage Publications, Inc, London.
- [29.] Baym, N. K. (2006). Interpersonal life online. In Lievrouw, L. A. & Livingstone, S. (Eds.), *Handbook of new media: social shaping and social consequences of ICTs* (pp. 35-54). London: Sage Publications Ltd.
- [30.] Baym, N. K. (2007). The new shape of online community: The example of Swedish independent music fandom. *First Monday*, 12(8).
- [31.] Baym, N. K. (2009). A call for grounding in the face of blurred boundaries. *Journal of Computer Mediated Communication*, 14(3), 720-723.

- [32.] BBC Report (2010) *Climate scepticism "on the rise", BBC poll shows*. BBC Online, 7 February 2010. Retrieved 11th Dec. 2012 from <http://news.bbc.co.uk/2/hi/8500443.stm>
- [33.] Beaudoin, C. E., & Thorson, E. (2004). Social capital in rural and urban communities: Testing differences in media effects and models. *Journalism and Mass Communication Quarterly*, 81(2), 378-399.
- [34.] Becken, S. (2004). How tourists and tourism experts perceive climate change and carbon-offsetting schemes. *Journal of Sustainable Tourism*, 12(4), 332-345.
- [35.] Berger, A. A. (1995). *Essentials of mass communication theory*. Sage Publications, Incorporated.
- [36.] Bennett, D. J., & Jennings, R. C. (Eds.). (2011). *Successful science communication: telling it like it is*. Cambridge (UK): Cambridge University Press.
- [37.] Bennett, W., & Manheim, J. (2006). The one-step flow of communication. *The Annals of the American Academy of Political and Social Science*, 608(1), 213-232.
- [38.] Berelson, B. (1952). *Content analysis in communication research*. Free Press, New York, NY, US.
- [39.] Bimber, B. (2003). *Information and American democracy: Technology in the evolution of political power*. Cambridge University Press.
- [40.] Bickerstaff, K., Lorenzoni, I., Pidgeon, N. F., Poortinga, W., & Simmons, P. (2008). Reframing nuclear power in the UK energy debate: nuclear power, climate change mitigation and radioactive waste. *Public understanding of science*, 17(2), 145-169.
- [41.] Biggar, J., & Middleton, C. (2010). Broadband and network environmentalism: The case of One Million Acts of Green. *Telecommunications Journal of Australia*, 60(1), 9.1-9.17.
- [42.] Blake, D. E. (2001). Contextual effects on environmental attitudes and behavior. *Environment and Behavior*, 33(5), 708-725.
- [43.] Blake, J. (1999). Overcoming the 'value-action gap' in environmental policy: Tensions between national policy and local experience. *Local Environment*, 4(3), 257-278.
- [44.] Blass, T. (1984). Social psychology and personality: Toward a convergence. *Journal of Personality and Social Psychology*, 47(5), 1013-1027.
- [45.] Blumler, J. G., & Katz, E. (1974). *The uses of mass communications: Current perspectives on gratifications research* (Vol. 3). Sage Publications Ltd., London.
- [46.] Blyth, W., & Lefevre, N. (2004). *Energy security and climate change policy interactions: an assessment framework*. IEA Information Paper: Paris, December 2004, International Energy Agency (IEA).
- [47.] Boase, J., & Wellman, B. (2006). The internet and email aid users in maintaining their social networks and provide pathways to help when people face big decisions. Retrieved June 28, 2011, from *Pew Internet and American Life Project Website*: http://www.pewinternet.com/~media/Files/Reports/2006/PIP_Internet_ties.pdf.pdf

- [48.] Bodendorf, F., & Kaiser, C. (2010, 10-16 Feb. 2010). Detecting Opinion Leaders and Trends in Online Communities. Paper presented at the *Digital Society, 2010. ICDS '10. Fourth International Conference on St. Maarten*. IEEE Xplore Digital Library, 10-16 Feb. 2010 124-129.
- [49.] Bonchek, M. S. (1997). *From broadcast to netcast: the Internet and the flow of political information*. Thesis for Ph.D. Degree of Political Economy and Government, Harvard University, Cambridge, Massachusetts (USA).
- [50.] Bosnjak, M., & Tuten, T. L. (2001). Classifying Response Behaviors in Web-based Surveys. *Journal of Computer-Mediated Communication*, 6(3).
- [51.] Bottrill, C. (2007). Internet-based tools for behaviour change. Paper presented at the *European Council for Energy Efficient Economies (ECEEE) Summer Study 2007*, La Colle sur Loup, France, Panel 9: Dynamics of Consumption, Paper 211.
- [52.] Bowman, T. E., Maibach, E., Mann, M. E., Somerville, R. C. J., Seltser, B. J., Fischhoff, B., et al. (2010). Time to Take Action on Climate Communication. *Science*, 330(6007), 1044.
- [53.] Boyd, D. M., & Ellison, N. B. (2008). Social network sites: Definition, history, and scholarship. *Journal of Computer Mediated Communication*, 13(1), 210-230.
- [54.] Boykoff, M. T. (2007). Flogging a dead norm? Newspaper coverage of anthropogenic climate change in the United States and United Kingdom from 2003 to 2006. *Area*, 39(4), 470-481.
- [55.] Boykoff, M. T., Rajan, S.R. (2007). The cultural politics of climate change discourse in UK tabloids. *Political Geography*, 27(5), 549-569.
- [56.] Boykoff, M. T. (2008a). The cultural politics of climate change discourse in UK tabloids. *Political Geography*, 27(5), 549-569.
- [57.] Boykoff, M. T. (2008b). Lost in translation? United States television news coverage of anthropogenic climate change, 1995-2004. *Climatic Change*, 86(1), 1-11.
- [58.] Boykoff, M. T. (2009). We speak for the trees: media reporting on the environment. *Annual Review of Environment and Resources*, 34, 431-457.
- [59.] Boykoff, M. T., Boykoff, J. M. (2007). Climate change and journalistic norms: A case-study of US mass-media coverage. *Geoforum*, 38(6), 1190-1204.
- [60.] Bramwell, B., & Lane, B. (2011). Interpretation and sustainable tourism: The potencial and pitfalls. *Revista Interamericana de Ambiente y Turismo-RIAT*, 1(1), 20-27.
- [61.] Brass, D. J., Butterfield, K. D., & Skaggs, B. C. (1998). Relationships and unethical behavior: A social network perspective. *Academy of Management Review*, 23(1), 14-31.
- [62.] Bray, D., & Von Storch, H. (1999). Climate science: An empirical example of postnormal science. *Bulletin-American Meteorological Society*, 80, 439-456.
- [63.] Brenchley, C. M. O. (2011). GLOBAL BRIGHTENING AND CLIMATE SENSITIVITY. In *International Seminar on Nuclear War and Planetary Emergencies 43rd Session* (p. 87). World Scientific Publishing Co. Ltd.

- [64.] Hunter, A., & Brewer, J. (2005). *Foundations of multi-method research: Synthesizing styles*. Sage Publications, Incorporated.
- [65.] Bray, D. (2010). The scientific consensus of climate change revisited. *Environmental science & policy*, 13(5), 340-350.
- [66.] Broder, J. M. (2009). Climate change seen as threat to US security. *The New York Times*, Page 9, August 8, 2009. Retrieved from 1st August 2011 from <http://www.nytimes.com/2009/08/09/science/earth/09climate.html?pagewanted=all>
- [67.] Broder, J.M (2010) Title of News Report *New York Times*, 2nd March 2010, Retrieved 10th Oct. 2012 from <http://www.nytimes.com/2010/03/03/science/earth/03climate.html? r=0>
- [68.] Brosius, H. B., & Weimann, G. (1996). Who sets the agenda?: Agenda-setting as a two-step flow. *Communication Research*, 23(5), 561-580.
- [69.] Bruckmann, C. G. (1978). A Systems Model of Communication Processes. *Journal of Technical Writing and Communication*, 8(4), 321-342.
- [70.] Bruns, A. (2008). The Active Audience: Transforming Journalism from Gatekeeping to Gatewatching', in Chris Paterson and David Domingo (eds) *Making Online News: The Ethnography of New Media Production*, New York: Peter Lang, pp. 171-84
- [71.] Bryman, A., & Teevan, J. J. (2004). *Social research methods* (Vol. 2). Oxford university press, Oxford.
- [72.] Bubas , G. (2001 September). Computer mediated communication theories and phenomena: Factors that influence collaboration over the internet. Paper presented at the 3rd. *CARNet Users Conference*, Zagreb.
- [73.] Bucy, E. P., & Gregson, K. S. (2001). Media participation. *New Media & Society*, 3(3), 357-380.
- [74.] Buraphadeja, V., & Dawson, K. (2008). Content analysis in computer-mediated communication: Analyzing models for assessing critical thinking through the lens of social constructivism. *The Amer. Jnl. of Distance Education*, 22(3), 130-145.
- [75.] Burch, S., & Robinson, J. (2007). A framework for explaining the links between capacity and action in response to global climate change. *Climate Policy*, 7(4), 304-316.
- [76.] Burkitt, I. (2010). Dialogues with Self and Others Communication, Miscommunication, and the Dialogical Unconscious. *Theory & Psychology*, 20(3), 305-321.
- [77.] Burnard, P. (1996). Teaching the analysis of textual data: an experiential approach. *Nurse education today*, 16(4), 278-281.
- [78.] Burt, R. S. (1999) The social capital of opinion leaders. *Annals of the American Academy of Political and Social Science*, 566, 37-54.
- [79.] Campbell-Lendrum, D., & Bertollini, R. (2010). Science, media and public perception: implications for climate and health policies. *Bulletin of the World Health Organization*, 88(4), 242-242A.

- [80.] Carlile, P. R. (2004). Transferring, translating, and transforming: An integrative framework for managing knowledge across boundaries. *Organization science*, 15(5), 555-568.
- [81.] Carpini, M. X. D. (2000). Gen. com: Youth, civic engagement, and the new information environment. *Political Communication*, 17(4), 341-349.
- [82.] Carpini, M. X. D., & Williams, B. A. (2001). Let us infotain you: politics in the new media environment. In Lance, B. W. & Entman, R. M. (Eds.), *Mediated Politics: Communication in the Future of Democracy*. (pp. 160-181). Cambridge: Cambridge University Press.
- [83.] Carrico, A., Vandenberg, M. P., Stern, P. C., Gardner, G. T., Dietz, T., & Gilligan, J. M. (2010). Energy and Climate Change: Key Lessons for Implementing the Behavioral Wedge. *Journal of Energy and Environmental Law*, 1, 0-24.
- [84.] Carvalho, A., & Burgess, J. (2005). Cultural circuits of climate change in UK broadsheet newspapers, 1985-2003. *Risk Analysis*, 25(6), 1457-1469.
- [85.] Castells, M. (1996). *The information age: economy, society and culture. Vol. 1, The rise of the network society*. Blackwell, Oxford (UK).
- [86.] Castells, M. (2000). *The rise of the network society* (Vol. 1). Wiley-Blackwell, Oxford (UK).
- [87.] Castells, M. (2002). *The Internet galaxy: Reflections on the Internet, business, and society*. Oxford University Press, Oxford (UK).
- [88.] Castells, M., & Cardoso, G. (1996). *The network society*. Center for Transatlantic Relations, Paul H. Nitze School of Advanced International Studies, Johns Hopkins University.
- [89.] Chang, W.-Y. (2005). Online civic participation, and political empowerment: online media and public opinion formation in Korea. *Media, Culture & Society*, 27(6), 925-935.
- [90.] Chiricos, T., Eschholz, S., & Gertz, M. (1997). Crime, news and fear of crime: Toward an identification of audience effects. *Soc. Probs.*, 44, 342-357.
- [91.] Cho, J., Shah, D. V., McLeod, J. M., McLeod, D. M., Scholl, R. M., & Gotlieb, M. R. (2009). Campaigns, Reflection, and Deliberation: Advancing an O S R O R Model of Communication Effects. *Communication Theory*, 19(1), 66-88.
- [92.] Choi, B. C. K., & Pak, A. W. P. (2005). A catalog of biases in questionnaires. *Prev Chronic Dis*, 2(1), A13. Retrieved 5th Jan. 2012 from http://www.cdc.gov/PCD/issues/2005/jan/pdf/2004_0050.pdf
- [93.] Cohen, G., Joutz, F., & Loungani, P. (2011). Measuring energy security: Trends in the diversification of oil and natural gas supplies. *Energy Policy*, 39(9), 4860-4869.
- [94.] Coleman, S. (1999). Cutting out the middle man: from virtual representation to direct deliberation. In Hague, B. & Loader, B. (Eds.), *Digital democracy: Discourse and decision making in the information age* (pp. 195-211). London: Routledge.

- [95.] Coleman, S., & Wright, S. (2008). Political blogs and representative democracy. *Information Polity*, 13(1), 1-6.
- [96.] Couldry, N. (2008). Actor Network Theory and Media: Do they connect and on what terms?'. In Andreas, H., Friedrich, K., Shaun, M. & Carsten, W. (Eds.), *Connectivity, Networks and Flows: Conceptualizing Contemporary Communications* (pp. 93-111).
- [97.] Cooper, C. M. (2006). 'This is Our Way In': The Civil Society of Environmental NGOs in South-West China. *Government and Opposition*, 41(1), 109-136.
- [98.] Coulter, R. A., Feick, L. F., & Price, L. L. (2002). Changing faces: cosmetics opinion leadership among women in the new Hungary. *European Journal of Marketing*, 36(11/12), 1287-1308.
- [99.] Couper, M. P., Traugott, M. W., & Lamias, M. J. (2001). Web survey design and administration. *Public Opinion Quarterly*, 65(2), 230-253.
- [100.] Craig, R. T. (1999). Communication theory as a field. *Communication Theory*, 9(2), 119-161.
- [101.] Craig, R. T. (2007). Communication theory as a field. *Theorizing Communication: Readings Across Traditions*, 63-98.
- [102.] Center for Research on Environmental Decision (CRED). (2009). *The psychology of climate change communication: a guide for scientists, journalists, educators, political aides, and the interested public*. New York: Columbia University Press.
- [103.] Cvetkovich, G., & Lofstedt, R. (1999). *Social trust and the management of risk*. Earthscan/James & James, London.
- [104.] Dale, A., & Newman, L. L. (2007). E-dialogues: a role in interactive sustainable development? *The Integrated Assessment Journal*, 6(4), 131-141.
- [105.] Dale, A., & Onyx, J. (2005). *A dynamic balance: social capital and sustainable community development*. Univ of British Columbia Press.
- [106.] D'Ambra, J., Rice, R. E., & O'Connor, M. (1998). Computer-mediated communication and media preference: An investigation of the dimensionality of perceived task equivocality and media richness. *Behaviour and Information Technology*, 17(3), 164-174.
- [107.] Dance, F. E. X. (1970). A helical model of communication. In Sereno, K. K. & Mortensen, C. D. (Eds.), *Foundations of communication theory* (pp. 103-107). New York: Harper & Row.
- [108.] Darby, S. (2006). Social learning and public policy: Lessons from an energy-conscious village. *Energy Policy*, 34(17), 2929-2940.
- [109.] Dasgupta, K., Singh, R., Viswanathan, B., Chakraborty, D., Mukherjea, S., Nanavati, A. A., et al. (2008). Social ties and their relevance to churn in mobile telecom networks. Paper presented at the *EDBT'08: Proceedings of the 11th international conference on extending database technology*, pp668-677, New York, 668-677.
- [110.] De Vaus, D. A. (2002). *Surveys in social research*. Routledge Publication Inc., Abingdon, Oxon (UK).

- [111.] DeLuca, K. M. (2009). Greenpeace international media analyst reflects on communicating climate change. *Environmental Communication*, 3(2), 263-269.
- [112.] Delwiche, A. (2005). Agenda-setting, opinion leadership, and the world of Web logs. *First Monday*, 10(12), 5th. December, 2005. Data Retrieved: 14th. June, 2011 from <http://firstmonday.org/htbin/cgiwrap/bin/ojs/index.php/fm/article/view/1300/1220> .
- [113.] Department for Transport (DFT) Report. (2011). *Climate Change and Transport Choices: Segmentation Model - A framework for reducing CO2 emissions from personal travel*. December 2011. Data Retrieved 20th December 2012 from <http://www.dft.gov.uk/pgr/scienceresearch/social/climatechangetransportchoices/>
- [114.] Devine-Wright, P., & Devine-Wright, H. (2006). Social representations of intermittency and the shaping of public support for wind energy in the UK. *International journal of global energy issues*, 25(3), 243-256.
- [115.] Drache, D. M.D. Froese (2008): Omens and Threats in the Doha Round: The Decline of Multilateralism? *Institute on Globalization and the Human Condition Working Paper Series*, 8(01). Paper presented at the ISA Annual Convention 2008, San Francisco, CA. Retrieved 31st Dec. 2012 from https://www.firstgenerationstudents.mcmaster.ca/institute-on-globalization-and-the-human-condition/documents/IGHC-WPS_08-1_DracheFroese.pdf
- [116.] Dholakia, U. M., Bagozzi, R. P., & Pearo, L. K. (2004). A social influence model of consumer participation in network-and small-group-based virtual communities. *International Journal of Research in Marketing*, 21(3), 241-263.
- [117.] Di Benedetto, C. A. (2010). Diffusion of Innovation. In Narayanan, V. & O'Conner, G. (Eds.), *Encyclopedia of Technology and Innovation Management* (pp. 113-116). West Sussex, UK: John Wiley & Sons Ltd.
- [118.] Dunlap, R. E., & McCright, A. M. (2008). A widening gap: Republican and Democratic views on climate change. *Environment: Science and Policy for Sustainable Development*, 50(5), 26-35.
- [119.] Dunlap, R. E., & McCright, A. M. (2010). 14 Climate change denial: sources, actors and strategies. In Constance, L. T. (Ed.), *The Routledge Handbook of Climate Change and Society* (pp. 240-259). New York: Routledge Press.
- [120.] Edwards, C., Edwards, A., Qing, Q., & Wahl, S. T. (2007). The influence of computer-mediated word-of-mouth communication on student perceptions of instructors and attitudes toward learning course content. *Communication Education*, 56(3), 255-277.
- [121.] Egan, L. C., Santos, L. R., & Bloom, P. (2007). The Origins of Cognitive Dissonance. *Psychological Science*, 18(11), 978-983.
- [122.] Ekins, P. (2004). Step changes for decarbonising the energy system: research needs for renewables, energy efficiency and nuclear power. *Energy Policy*, 32(17), 1891-1904.

- [123.] Ellis, A. (2003). Personality type and participation in networked learning environments. *Educational Media International*, 40(1-2), 101-114.
- [124.] Ellison, N. B., Steinfield, C., & Lampe, C. (2007). The benefits of Facebook "friends:" Social capital and college students' use of online social network sites. *Journal of Computer Mediated Communication*, 12(4), 1143-1168.
- [125.] Evans, C., & Lambert, H. (2008a). Implementing community interventions for HIV prevention: Insights from project ethnography. *Social Science & Medicine*, 66(2), 467-478.
- [126.] Evans, C., & Lambert, H. (2008b). The limits of behaviour change theory: condom use and contexts of HIV risk in the Kolkata sex industry. *Culture, health & sexuality*, 10(1), 27-42.
- [127.] Evans, W. D., & McCormack, L. (2008). Applying social marketing in health care: communicating evidence to change consumer behavior. *Medical Decision Making*, 28(5), 781-792.
- [128.] Fallows, D. (2004). *The Internet and daily life*. Pew Internet & American Life Project, Washington, DC. Retrieved 18th. July, 2012 from http://www.ischool.utexas.edu/~i385e/readings/PIP_Internet_and_Daily_Life.pdf.
- [129.] Fisher, D. R. (2010). COP-15 in Copenhagen: how the merging of movements left civil society out in the cold. *Global Environmental Politics*, 10(2), 11-17.
- [130.] Flaherty, L. M., Pearce, K. J., & Rubin, R. B. (1998). Internet and face to face communication: Not functional alternatives. *Communication Quarterly*, 46(3), 250-268.
- [131.] Flanagan, A. J., & Metzger, M. J. (2001). Internet use in the contemporary media environment. *Human Communication Research*, 27(1), 153-181.
- [132.] Flensburg, P. (2009). An enhanced communication model. *The International journal of digital accounting research*, 9 (15), 7: 31-43.
- [133.] Feenberg, A., & Bakardjieva, M. (2004). Virtual community-nokiller implication'. *New media and society*, 6, 37-43.
- [134.] Fortner, R. S. (2007). *Communication, media, and identity: a Christian theory of communication*. Rowman & Littlefield Pub Inc, Maryland (U.S.) / Plymouth (U.K.).
- [135.] Foth, M. (2003). Connectivity does not ensure community: On social capital, networks and communities of place. Paper presented at the *Proceedings of the 5th International Information Technology in Regional Areas (ITiRA) Conference 2003*, Rockhampton, QLD, 31-39.
- [136.] Foth, M. (2004a). Encouraging residents to take social ownership of an online community network through Participation, Animation, Design. Paper presented at the *Building & Bridging Community Networks Conference: Knowledge, Innovation & Diversity through Communication*, Brighton, UK.
- [137.] Foth, M. (2004b). Designing networks for sustainable neighbourhoods: A case study of a student apartment complex. Paper presented at the *Proceedings of CIRN 2004 Conference and Colloquium: Sustainability and Community Technology*, Prato, Italy.

- [138.] Foth, M. (2006). Analyzing the factors influencing the successful design and uptake of interactive systems to support social networks in urban neighborhoods. *International Journal of Technology and Human Interaction*, 2(2), 65-79.
- [139.] Foth, M., & Hearn, G. N. (2007). Networked Individualism of Urban Residents: Discovering the communicative ecology in inner-city apartment buildings. *Information, Communication & Society*, 10(5), 749-772.
- [140.] Foth, M., Klaebe, H. G., & Hearn, G. N. (2008). The role of new media and digital narratives in urban planning and community development. *Body, Space & Technology*, 7(2).
- [141.] Foulger, D. (2002). Roles in media. Paper presented at the *National Communication Association Summer Conference*, May.
- [142.] Foulger, D. (2004). An Ecological Model of the Communication Process. Paper available online. Retrieved 18th., July, 2011, from <http://foulger.info/davis/papers/ecologicalModelOfCommunication.htm>
- [143.] Frewer, L. (1999). Risk perception, social trust, and public participation in strategic decision making: Implications for emerging technologies. *Ambio*, 569-574.
- [144.] Friedlander, A. (2008). The Triple Helix: Cyberinfrastructure, Scholarly Communication, and Trust. *Journal of Electronic Publishing*, 11(1).
- [145.] Frissen, V. A. (2008). The E-mancipation of the Citizen and the Future of E-Government: Reflections on ICT and Citizens' Partnership. In A. Anttiroiko (Ed.), *Electronic Government: Concepts, Methodologies, Tools, and Applications* (pp. 4070-4084). Hershey, PA: Information Science Reference.
- [146.] Fu, T., & Chen, H. (2008). Analysis of cyberactivism: A case study of online Free Tibet activities. Paper presented at the *Proceedings of the IEEE International Conference on Intelligence and Security Informatics*, 1-6.
- [147.] Ganzeboom, K. S., Mairuhu, G., Reitsma, J. B., Linzer, M., Wieling, W., & Van Dijk, N. (2006). Lifetime cumulative incidence of syncope in the general population: a study of 549 Dutch subjects aged 35 ~~to 70 years~~. *Journal of cardiovascular electrophysiology*, 17(11), 1172-1176.
- [148.] Gao, A. X. (2008). *Who are the Influentials in Virtual Community? Opinion Leaders among Participants in Bulletin Board Systems*. Thesis for Master of Science, The Chinese University of Hong Kong.
- [149.] Gao, J., Zhang, M., Jiang, F., & Wang, X. (2005). Analysis of opinion leader in on-line communities. Paper presented at the *11th International Conference, KES 2007 XVII Italian Workshop on Neural Networks. Proceedings, Part 1: Knowledge-Based Intelligent Information and Engineering Systems: KES 2007 - WIRN 2007, September 12-14, Vietri Sul Mare, Italy*, 1153-1159.
- [150.] Garrett, R. K. (2005). *Exposure to controversy in an information society*. Ph.D. Dissertation, University of Michigan.

- [151.] Garrett, R. K. (2011). Troubling Consequences of Online Political Rumoring. *Human Communication Research*, 37(2), 255-274.
- [152.] Garton, L., Haythornthwaite, C., & Wellman, B. (1997). Studying online social networks. *Journal of Computer-Mediated Communication*, 3(1).
- [153.] Gavin, N. T. (2010). Pressure Group Direct Action on Climate Change: The Role of the Media and the Web in Britain -- A Case Study. *The British Journal of Politics & International Relations*, 12(3), 459-475.
- [154.] Gerbner, G., Gross, L., Morgan, M., & Signorielli, N. (1980). The "mainstreaming" of America: Violence profile no. 11. *Journal of communication*, 30(3), 10-29.
- [155.] Gerbner, G., Gross, L., Morgan, M., Signorielli, N., & Shanahan, J. (2002). Growing up with television: Cultivation processes. *Media effects: Advances in theory and research*, 2, 43-67.
- [156.] Gerhards, J., & Schafer, M. S. (2010). Is the internet a better public sphere? Comparing old and new media in the USA and Germany. *New Media & Society*, 12(1), 143-160.
- [157.] Gibbs, W., & Lyall, S. (2007). Gore shares peace prize for climate change work. *The New York Times*. 13th, October, 2007, p. Page A1. Retrieved from 1st August 2011
<http://www.nytimes.com/2007/10/13/world/13nobel.html>
- [158.] Gillin, P. (2008). New media, new influencers and implications for the public relations profession. *Journal of New Communications Research*, 2(2), 1-10.
- [159.] Gil-Garcia, J. R., & Pardo, T. A. (2006). Multi-method approaches to understanding the complexity of e-government. *International Journal of Computers, Systems and Signals*, 7(2), 3.
- [160.] Gladwell, M. (2000). *The tipping point: How little things can make a big difference*. Little, Brown and Company, Boston, Massachusetts, USA.
- [161.] Goidel, K., & Cook, C. (2011). *Political Polling in the Digital Age: The Challenge of Measuring and Understanding Public Opinion*. Louisiana State Univ Press.
- [162.] Goldsmith, R. E., & Horowitz, D. (2006). Measuring motivations for online opinion seeking. *Journal of Interactive Advertising*, 6(2), 1-16.
- [163.] Gorham, R. (2002). Car dependence as a social problem: A critical essay on the existing literature and future needs. In Black, W. R. & Nijkamp, P. (Eds.), *Social Change and Sustainable Transport*. Bloomington, Indiana: Indiana University Press.
- [164.] Gough, S. (2002). Whose gap? Whose mind? Plural rationalities and disappearing academics. *Environmental education research*, 8(3), 273-282.
- [165.] Graneheim, U. H., & Lundman, B. (2004). Qualitative content analysis in nursing research: concepts, procedures and measures to achieve trustworthiness. *Nurse education today*, 24(2), 105-112.
- [166.] Groves, R. M., Dillman, D., Eltinge, J. L., & Little, R. J. A. (2002). *Survey nonresponse*. Wiley New York.

- [167.] Gunawardena, C. N. (1995). Social presence theory and implications for interaction and collaborative learning in computer conferences. *International journal of educational telecommunications*, 1(2/3), 147-166.
- [168.] Gruen, T. W., Osmonbekov, T., & Czapski, A. J. (2006). eWOM: The impact of customer-to-customer online know-how exchange on customer value and loyalty. *Journal of Business Research*, 59(4), 449-456.
- [169.] Gunawardena, C. N., Lowe, C. A., & Anderson, T. (1997). Analysis of a global online debate and the development of an interaction analysis model for examining social construction of knowledge in computer conferencing. *Journal of educational computing research*, 17(4), 397-431.
- [170.] Gunawardena, C. N., & Zittle, F. J. (1997). Social presence as a predictor of satisfaction within a computer-mediated conferencing environment. *American journal of distance education*, 11(3), 8-26.
- [171.] Habermas, J. (2000). *On the pragmatics of communication*. The MIT Press.
- [172.] Hampton, K., & Wellman, B. (2003). Neighboring in Netville: How the Internet Supports Community and Social Capital in. *City & Community*, 2(4), 277-311.
- [173.] Hannigan, J. A. (2006). *Environmental sociology*. Routledge, Abingdon, Oxon (UK).
- [174.] Hansen, A. (2010). *Environment, media and communication*. Routledge, Abingdon, Oxon (UK).
- [175.] Hansen, J., Sato, M., Kharecha, P., Beerling, D., Berner, R., Masson-Delmotte, V., et al. (2008). Target atmospheric CO₂: Where should humanity aim? *Open Atmospheric Science Journal*, 2, 217-231.
- [176.] Hars, A., & Ou, S. (2001). Working for free?-motivations of participating in open source projects. Paper presented at the *Proceedings of the 34th Annual Hawaii International Conference on SystemSciences*, 2284-2292.
- [177.] Haythornthwaite, C., & Wellman, H. (2002). The Internet in everyday life: An introduction. In Wellman, B. & Haythornthwaite, C. (Eds.), *The Internet in everyday life* (pp. 1-41). London: Blackwell Publishing Co.
- [178.] Heiskanen, E., & Lovio, R. (2010). User-Producer Interaction in Housing Energy Innovations: Energy Innovation as a Communication Challenge. *Journal of Industrial Ecology*, 14(1), 91-102.
- [179.] Hennig-Thurau, T., Gwinner, K. P., Walsh, G., & Gremler, D. D. (2004). Electronic word-of-mouth via consumer-opinion platforms: What motivates consumers to articulate themselves on the Internet?. *Journal of interactive marketing*, 18(1), 38-52.
- [180.] Herring, S. C. (2004). Computer-mediated discourse analysis: An Approach to Researching Online Behavior. In Barab, S. A., Kling, R. & Gray, J. H. (Eds.), *Designing for virtual communities in the service of learning* (pp. 338-376). Cambridge (UK): Cambridge University Press.

- [181.] Herring, S. C. (2010). Web content analysis: Expanding the paradigm. *The International Handbook of Internet Research*, 233-249.
- [182.] Hinduja, S., & Patchin, J. W. (2008). Personal information of adolescents on the Internet: A quantitative content analysis of MySpace. *Journal of Adolescence*, 31(1), 125-146.
- [183.] Hill *et al.* (2007) *Key Themes in Interpersonal Communication*, Open University Press, Berkshire, England
- [184.] Hinduja, S., & Patchin, J. W. (2008). Cyberbullying: An exploratory analysis of factors related to offending and victimization. *Deviant behavior*, 29(2), 129-156.
- [185.] Holdren, J. P. (2006). The energy innovation imperative: addressing oil dependence, climate change, and other 21st century energy challenges. *Innovations: Technology, Governance, Globalization*, 1(2), 3-23.
- [186.] Holdren, J. P. (2008). Meeting the Climate-Change Challenge. Paper presented at the *8th Annual John. H. Chafee Memorial Lecture on Sci-ence and the Environment; 17 January 2008*, Washington, D.C.
- [187.] Holland, D. (2007). Bias and concealment in the IPCC process: The "hockey-stick" affair and its implications. *Energy & Environment*, 18(7), 951-983.
- [188.] Holliman, R. (2012). The struggle for scientific consensus: Communicating climate science around COP-15. In B. Wagoner, E. Jensen & J. Oldmeadow (Eds.), *Culture and Social Change: Transforming society through the power of ideas*. Charlotte, N.C.: Information Age Publishing.
- [189.] Hong, J. (2008). *The effect of user ratings on public opinion perception and willingness to express opinions: The third-person effect and spiral of silence theory*. MA Thesis, Michigan State University.
- [190.] Hong, Y. (2008). The Exploration on the BBS Opinion Leadership Filtering Model [J]. *Journalism & Communication*, 2008-02. Lang:Chinese
- [191.] Huckfeldt, R. R., & Sprague, J. (1995). *Citizens, politics and social communication: Information and influence in an election campaign*. Cambridge University Press.
- [192.] Huffaker, D., Wang, J., Treem, J., Ahmad, M. A., Fullerton, L., Williams, D., ... & Contractor, N. (2009). The Social Behaviors of Experts in Massive Multiplayer Online Role-playing Games. In *Computational Science and Engineering, 2009. CSE'09. International Conference on* (Vol. 4, pp. 326-331). IEEE.
- [193.] Hulme, M. (2009). Mediated messages about climate change: reporting the IPCC Fourth Assessment in the UK print media. *Climate change and the media*, 117-128.
- [194.] Hulme, M., Dessai, S., Lorenzoni, I., & Nelson, D. R. (2009). Unstable climates: Exploring the statistical and social constructions of 'normal' climate. *Geoforum*, 40(2), 197-206.
- [195.] Hungerford, H. R., & Volk, T. L. (1990). Changing learner behavior through environmental education. *Journal of environmental education*, 21(3), 8-21.

- [196.] Huxham, M., & Sumner, D. (2001). *Science and environmental decision making*. Prentice Hall, Harlow (UK).
- [197.] Intergovernmental Panel on Climate Change (2001) *Climate change 2001: Impacts, Adaptation, and Vulnerability*, Contribution of Working Group II to the Third Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, UK.
- [198.] Intergovernmental Panel on Climate Change (2004) *16 Years of Scientific Assessment in Support of the Climate Convention*. IPCC 10th Anniversary Brochure. Available at <http://www.ipcc.ch/pdf/10th-anniversary/anniversary-brochure.pdf> last accessed: 22nd Dec., 2012.
- [199.] Intergovernmental Panel on Climate Change (2007) *Climate Change 2007: Impacts, Adaptation and Vulnerability*, Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge University Press, Cambridge, UK.
- [200.] Intergovernmental Panel on Climate Change (2007) *IPCC Press flyer announcing 2007 report*, Source: <http://www.ipcc.ch/pdf/press-ar4/ipcc-flyer-low.pdf>
- [201.] Jackson, J., Allum, N., & Gaskell, G. (2006). Bridging levels of analysis in risk perception research: the case of the fear of crime. *Forum Qualitative Social Research*, 7(20), 1-19.
- [202.] Jackson, J., & Sunshine, J. (2007). Public confidence in policing: A Neo-Durkheimian Perspective. *British Journal of Criminology*, 47(2), 214-233.
- [203.] Jacobs, L. R., Cook, F. L., & Carpini, M. X. D. (2009). *Talking together: Public deliberation and political participation in America*. University of Chicago Press, Chicago.
- [204.] Jaffe, A. M. (2009). Energy Security, Climate and Your Car: US Energy Policy and Beyond. In Sperling, D. & Cannon, J. S. (Eds.), *Reducing Climate Impacts in the Transportation Sector* (pp. 15-35): Springer.
- [205.] James, S., & Lahti, T. (2004). *The natural step for communities: How cities and towns can change to sustainable practices*. New Society Publishers, Gabriola Island, British Columbia, Canada.
- [206.] Jankowski, P. (2009). Towards participatory geographic information systems for community-based environmental decision making. *Journal of Environmental Management*, 90(6), 1966-1971.
- [207.] Jankowski, P., & Stasik, M. (2006). An Experimental Study Using SDS Tools for a Participatory Approach to Local Land Use Planning. In Dragičević, S. (Ed.), *Collaborative Geographic Information Systems* (pp. 150-166). Hershey, PA.: Idea Group Publisher.
- [208.] Jennings, N., & Hulme, M. (2010). UK newspaper (mis)representations of the potential for a collapse of the Thermohaline Circulation. *Area*, 42(4), 444-456.
- [209.] Jensen, G. H., & DiTiberio, J. K. (1984). Personality and individual writing processes. *College Composition and Communication*, 35(3), 285-300.
- [210.] Jensen, K. B., & Helles, R. (2011). The internet as a cultural forum: Implications for research. *New Media & Society*, 13(4), 517-533.

- [211.] Joint science academies' statement. (2007). *Joint science academies' statement on growth and responsibility: sustainability, energy efficiency and climate protection*, 2007, Source: http://www.pik-potsdam.de/aktuelles/nachrichten/dateien/G8_Academies%20Declaration.pdf
- [212.] Joint science academies' statement. (2008). *Joint Science Academies' Statement: Climate Change Adaptation and the Transition to a Low Carbon Society*, 2008, Source: http://www.pik-potsdam.de/aktuelles/nachrichten/dateien/G8_Academies%20Declaration.pdf
- [213.] Joint science academies' statement. (2009). *G8+5 Academies' joint statement: Climate change and the transformation of energy technologies for a low carbon future*, 2009, Source: <http://www.nationalacademies.org/includes/G8+5energy-climate09.pdf>
- [214.] Johnson, G. M. (2006). Synchronous and asynchronous text-based CMC in educational contexts: A review of recent research. *TechTrends*, 50(4), 46-53.
- [215.] Johnson, N. A. Cooper, R. B. Chin, W. W. (2009). Anger and flaming in computer-mediated negotiation among strangers. *Decision Support Systems*, 46(3), 660-672.
- [216.] Johnson, T. J., & Kaye, B. K. (2004). Wag the blog: How reliance on traditional media and the internet influence credibility perceptions of weblogs among blog users. *Journalism & Mass Communication Quarterly*, 81(3), 622-642.
- [217.] Johnson, T. J., Bichard, S. L., & Zhang, W. (2009). Communication Communities or "CyberGhettos?": A Path Analysis Model Examining Factors that Explain Selective Exposure to Blogs1. *Journal of Computer Mediated Communication*, 15(1), 60-82.
- [218.] Jordan, A., & Lorenzoni, I. (2007). Is there now a political climate for policy change? Policy and politics after the Stern Review. *The Political Quarterly*, 78(2), 310-319.
- [219.] Junghyun, K., & Paul, M. H. (2009). The Role of Internet User Characteristics and Motives in Explaining Three Dimensions of Internet Addiction. *Journal of Computer-Mediated Communication*, 14(4), 988-1015.
- [220.] Kahlor, L. A. (2007). An augmented risk information seeking model: The case of global warming. *Media Psychology*, 10(3), 414-435.
- [221.] Kahlor, L. A., & Rosenthal, S. (2009). If we seek, do we learn? Predicting knowledge of global warming. *Science Communication*, 30(3), 380-414.
- [222.] Kahlor, L. A., & Stout, P. A. (2010). *Communicating science*. Routledge, Abingdon, Oxon (UK).
- [223.] Kahn, E. B., Ramsey, L. T., Brownson, R. C., Heath, G. W., Howze, E. H., Powell, K. E., et al. (2002). The effectiveness of interventions to increase physical activity: A systematic review. *American journal of preventive medicine*, 22(4), 73-107.
- [224.] Kahn, R., & Kellner, D. (2004). New media and Internet activism: From the battle of Seattle to blogging. *New Media & Society*, 6(1), 87-95.
- [225.] Kahneman, D. Tversky, A. (1996) On the reality of cognitive illusions: A reply to Gigerenzer's critique. *Psychological Review*. 103. 582-591.

- [226.] Kang, S. (2007). Disembodiment in online social interaction: Impact of online chat on social support and psychosocial well-being. *CyberPsychology & Behavior*, 10(3), 475-477.
- [227.] Kaplan, A. M., & Haenlein, M. (2010). Users of the world, unite! The challenges and opportunities of Social Media. *Business horizons*, 53(1), 59-68.
- [228.] Kasavana, M. L., Nusair, K., & Teodosic, K. (2010). Online social networking: redefining the human web. *Journal of Hospitality and Tourism Technology*, 1(1), 68-82.
- [229.] Kasperson, J. X., & Kasperson, R. E. (2005). *The social contours of risk: publics, risk communication and the social amplification of risk* (Vol. 1). Earthscan/James & James, London (UK).
- [230.] Kasperson, R. E. (2008). Coping with deep uncertainty: challenges for environmental assessment and decision-making. In Banner, G. & Smithson, M. (Eds.), *Uncertainty and risk: multidisciplinary perspectives* (pp. 337-347). London: Earthscan.
- [231.] Katz, E. (1957). The two-step flow of communication: An up-to-date report on an hypothesis. *Public Opinion Quarterly*, 21(1), 61-78.
- [232.] Katz, E. (1987). Communications research since Lazarsfeld. *Public Opinion Quarterly*, 51(4 PART 2), S25-S45.
- [233.] Katz, E., & Lazarsfeld, P. F. (1955, Re-issue Edition 2005). *Personal influence: The part played by people in the flow of masscommunications*. Transaction Publishers; Re-issue edition (30 Sep 2005), New Jersey.
- [234.] Keitaro, N., & Masao, K. (2006). Lognormal Distribution of BBS Articles and its Social and Generative Mechanism. Paper presented at 2006 IEEE/WICACM International Conference.
- [235.] Keller, E. B., & Berry, J. L. (2003). *The influentials*. Free Press New York.
- [236.] Keys, N., Thomsen, D. C., & Smith, T. F. (2010). Opinion leaders and complex sustainability issues. *Management of Environmental Quality: An International Journal*, 21(2), 187-197.
- [237.] Khine, M. S., Yeap, L. L., & Lok, A. T. C. (2003). The quality of message ideas, thinking and interaction in an asynchronous CMC environment. *Educational Media International*, 40(1-2), 115-126.
- [238.] Kim, J. (1997). *On the interactions of news media, interpersonal communication, opinion formation, and participation: Deliberative democracy and the public sphere*. Universal Publishers.
- [239.] Kiecker, P., & Cowles, D. (2002). Interpersonal Communication and Personal Influence on the Internet: A Framework for Examining Online Word-of-Mouth. *Journal of Euromarketing*, 11(2), 71-88. Taylor & Francis. Retrieved from http://www.tandfonline.com/doi/abs/10.1300/J037v11n02_04
- [240.] Klapper, J. T. (1960). *The effects of mass communication*. Free Press, New York.

- [241.] Ko, H. C., Yin, C. P., & Kuo, F. Y. (2008). Exploring individual communication power in the blogosphere. *Internet Research*, 18(5), 541-561.
- [242.] Koh, J., Kim, Y. G., Butler, B., & Bock, G. W. (2007). Encouraging participation in virtual communities. *Communications of the ACM*, 50(2), 68-73.
- [243.] Kollmuss, A., & Agyeman, J. (2002). Mind the gap: why do people act environmentally and what are the barriers to pro-environmental behavior? *Environmental education research*, 8(3), 239-260.
- [244.] Kollock, P., & Smith, M. (2002). *Communities in cyberspace*. Routledge, Abingdon, Oxon (UK).
- [245.] Kotler, P., Kotler, E., & Reviews, C. T. (2006). *Marketing Management. 11th Edition*. Pearson Education (International Edition).
- [246.] Kousky, C., & Schneider, S. H. (2003). Global climate policy: will cities lead the way? *Climate Policy*, 3(4), 359-372.
- [247.] Kraut, R., Kiesler, S., Boneva, B., Cummings, J., Helgeson, V., & Crawford, A. (2002). Internet paradox revisited. *Journal of social issues*, 58, 49-74.
- [248.] Kraut, R., Patterson, M., Lundmark, V., Kiesler, S., Mukophadhyay, T., & Scherlis, W. (1998). Internet paradox: A social technology that reduces social involvement and psychological well-being? *American psychologist*, 53(9), 1017-1031.
- [249.] Kreijns, K., Kirschner, P. A., & Jochems, W. (2003). Identifying the pitfalls for social interaction in computer-supported collaborative learning environments: a review of the research. *Computers in human behavior*, 19(3), 335-353.
- [250.] Kretzmann, J. P., & McKnight, J. L. (1993). *Building communities from the inside out: A path toward finding and mobilizing a community's assets*. ACTA Publications, Chicago.
- [251.] Krippendorff, K. (2004). *Content analysis: An introduction to its methodology*. Sage Publications, Inc, London.
- [252.] Krosnick, J., Tompson, T., & Villar, A. (2010). Change in public opinion about climate change 2006-2010: How trusted sources and personal experience combine. Paper presented at the *American Political Science Association Annual Meeting*, Washington, DC.
- [253.] Lasswell HD (1948) : The structure and function of communication in society. In *The communication of ideas*. Edited by: Bryson L. New York: Harper and Row; 1948:37-51.
- [254.] Lane, N. D., Eisenman, S. B., Musolesi, M., Miluzzo, E., & Campbell, A. T. (2008). Urban sensing systems: opportunistic or participatory? Paper presented at the *Proceedings of the 9th workshop on Mobile computing systems and applications*, 11-16.
- [255.] Laroche, M. (2007). A model of attitude change in groups following a persuasive communication: An attempt at formalizing research findings. *Behavioral Science*, 22(4), 246-257.
- [256.] Latif, M., Roeckner, E., Mikolajewicz, U., & Voss, R. (2010). Tropical stabilization of the thermohaline circulation in a greenhouse warming simulation. *Journal of Climate*, 13, 1809-1813.

- [257.] Lazarsfeld, P. F., Berelson, B., & Gaudet, H. (1948). *The people's choice 2nd Editon*. Columbia University Press, New York.
- [258.] Lean, J. L., & Rind, D. H. (2009). How will Earth's surface temperature change in future decades. *Geophysical Research Letters*, 36, L15708.
- [259.] Lederbogen U, Trebbe J. Promoting science on the web: public relations for scientific organizations— results of a content analysis. *Science Communication* 2003, 24:333–352.
- [260.] Lee, B., Lancendorfer, K. M., & Lee, K. J. (2005). Agenda-setting and the internet: The intermedia influence of internet bulletin boards on newspaper coverage of the 2000 general election in South Korea. *Asian Journal of Communication*, 15(1), 57-71.
- [261.] Lee, J., Choi, Y., & Lee, C. (2003). Agenda setting effects on online users: The analysis of the World Cup coverage and online discussions. Paper presented at the *Annual Conference of the Communication and Technology Division, International Communication Association (ICA)*, San Diego, California.
- [262.] Lee, M., & Youn, S. (2009). Electronic word of mouth (eWOM): How eWOM platforms influence consumer product judgement. *International Journal of Advertising*, 28(3), 473-499.
- [263.] Leeder, K. (2007). Technology and communication in the environmental movement. *Electronic Green Journal*, 1(25).
- [264.] Lefevre, N. (2010). Measuring the energy security implications of fossil fuel resource concentration. *Energy Policy*, 38(4), 1635-1644.
- [265.] Leiserowitz, A. (2007). Communicating the risks of global warming: American risk perceptions, affective images, and interpretive communities. In Moser, S. C. & Dilling, L. (Eds.), *Creating a climate for change: Communicating climate change and facilitating social change* (pp. 44-63). Cambridge: Cambridge University Press.
- [266.] Leiserowitz, A. (2007). International public opinion, perception, and understanding of global climate change. *Human Development Report Office Occasional Paper (2007/2008) - Fighting climate change: Human solidarity in a divided world, UNDP*.
- [267.] Leiserowitz, A. (2007). Public Perception, Opinion and Understanding of Climate Change: Current Patterns, Trends and Limitations. *Human Development Report Office Occasional Paper (2007/2008), UNDP*.
- [268.] Leiserowitz, A., Maibach, E., & Roser-Renouf, C. (2010). Climate change in the American Mind: Americans' global warming beliefs and attitudes in January 2010. *Yale Project on Climate Change Communication. Yale University and George Mason University. New Haven: CT*.
- [269.] Leiserowitz, A., Maibach, E. W., Roser-Renouf, C., Smith, N., & Dawson, E. (2010). Climategate, Public Opinion, and the Loss of Trust. *Working paper posted to the Social Science Research Network, 1633932*.

- [270.] Leiserowitz, A., Roser-Renouf, C., & Smith, N. (2010). Global Warming's Six Americas, June 2010. *Yale Project on Climate Change Communication. Yale University and George Mason University. New Haven: CT.*
- [271.] Leonard-Barton, D. (1985). Experts as negative opinion leaders in the diffusion of a technological innovation. *Journal of Consumer Research*, 11(4), 914-926.
- [272.] Lewandowski, J., Rosenberg, B. D., Jordan Parks, M., & Siegel, J. T. (2011). The effect of informal social support: Face-to-face versus computer-mediated communication. *Computers in human behavior*, 27(5), 1806-1814.
- [273.] Liaw, S., & Huang, H. (2000). Enhancing Interactivity in Web-based Instruction: A Review of the Literature. *Educational Technology*, 40(3), 41-45.
- [274.] Lindzen, R. S. (1992). Global warming: The origin and nature of the alleged scientific consensus. *Regulation*, 15, 87.
- [275.] Litvin, S. W., Goldsmith, R. E., & Pan, B. (2008). Electronic word-of-mouth in hospitality and tourism management. *Tourism Management*, 29(3), 458-468.
- [276.] Liu, X., & Fahmy, S. (2011). Exploring the spiral of silence in the virtual world: Individuals' willingness to express personal opinions in online versus offline settings. *Journal of Media and Communication Studies*, 3(2), 45-57.
- [277.] Lockwood A. (2008) Seeding doubt: how sceptics use new media to delay action on climate change. Association for Journalism Education (AJE) Annual Conference 'New Media, New Democracy?', Sheffield University, 2008.
- [278.] Lorenzoni, I., & Hulme, M. (2009). Believing is seeing: laypeople's views of future socio-economic and climate change in England and in Italy. *Public understanding of science*, 18(4), 383-400.
- [279.] Lorenzoni, I., Leiserowitz, A., Doria, M. D. F., Poortinga, W., & Pidgeon, N. F. (2006). Cross National Comparisons of Image Associations with "Global Warming" and "Climate Change": Among Laypeople in the United States of America and Great Britain1. *Journal of Risk Research*, 9(3), 265-281.
- [280.] Lorenzoni, I., Nicholson-Cole, S., & Whitmarsh, L. (2007). Barriers perceived to engaging with climate change among the UK public and their policy implications. *Global Environmental Change*, 17(3-4), 445-459.
- [281.] Lovell, H., Bulkeley, H., & Owens, S. (2009). Converging agendas? Energy and climate change policies in the UK. *Environment and Planning C: Government & Policy*, 27(1), 90-109.
- [282.] Lowe, T., Brown, K., Dessai, S., de Franca Doria, M., Haynes, K., & Vincent, K. (2006). Does tomorrow ever come? Disaster narrative and public perceptions of climate change. *Public understanding of science*, 15(4), 435-457.
- [283.] Lowery, S. A., & DeFleur, M. L. (1995). *Milestones in mass communication research*. White Plains, NY: Longman.

- [284.] Lüders, M. (2008). Conceptualizing personal media. *New Media & Society*, 10(5), 683-702.
- [285.] Lugmayr, A., Reymann, S., Kemper, S., Dorsch, T., & Roman, P. (2008). Bits of personality everywhere: Implicit user-generated content in the age of ambient media. Paper presented at the *Proceedings of Parallel and Distributed Processing with Applications, 2008. ISPA '08.* , International Symposium on 10-12 Dec. 2008, Sydney, NSW, pp. 516-521.
- [286.] Lupia, A., & Baird, Z. (2003). Can web sites change citizens? Implications of web white and blue 2000. *Political Science and Politics*, 36(1), 77-82.
- [287.] Lyons, B., & Henderson, K. (2005). Opinion leadership in a computer-mediated environment. *Journal of Consumer Behaviour*, 4(5), 319-329.
- [288.] Machin, A. (1989). The Social Helix: Visitor Interpretation as a tool for social development. *Heritage Interpretation*, 2, 149-155.
- [289.] Macnaghten, P. (2003). Embodying the environment in everyday life practices. *The Sociological Review*, 51(1), 63-84.
- [290.] Maibach, E. W., Roser-Renouf, C., & Leiserowitz, A. (2008). Communication and Marketing As Climate Change-Intervention Assets: A Public Health Perspective. *American Journal of Preventive Medicine*, 35(5), 488-500.
- [291.] Makoul, G., Zick, A. B., Aakhus, M., Neely, K. J., & Roemer, P. E. (2010). Using an online forum to encourage reflection about difficult conversations in medicine. *Patient Education and Counseling*, 79(1), 83-86.
- [292.] Mankoff, J., Fussell, S. R., Dillahunt, T., Glaves, R., Grevet, C., Johnson, M., et al. (2010). StepGreen. org: Increasing energy saving behaviors via social networks. Paper presented at the *Proceedings of the Fourth International AAAI Conference on Weblogs and Social Media*, Washington, DC., 106-113.
- [293.] Mankoff, J., Matthews, D., Fussell, S. R., & Johnson, M. (2007). Leveraging social networks to motivate individuals to reduce their ecological footprints. Paper presented at the *40th Annual Hawaii International Conference on System Sciences (HICSS'07)*, Big Island, Hawaii, 2121-2124.
- [294.] Mao, B., & You, W. (2006). Classifying model for virtual community members. *Journal of Tsinghua University (Science and Technology)*, p46(S41).
- [295.] Marcus, B. H., Owen, N., Forsyth, L. A. H., Cavill, N. A., & Fridinger, F. (1998). Physical activity interventions using mass media, print media, and information technology. *American journal of preventive medicine*, 15(4), 362-378.
- [296.] Markandya, A., Golub, A., & Strukova, E. (2003). The influence of climate change considerations on energy policy: the case of Russia. *International journal of global environmental issues*, 3(3), 324-338.
- [297.] Markus, H., & Zajonc, R. B. (1985). The cognitive perspective in social psychology. *Handbook of social psychology*, 1, 137-230.
- [298.] Maslin, M. (2004). Ecological versus climatic thresholds. *Science*, 306(5705), 2197-2198.

- [299.] Mastrandrea, M. D., Heller, N. E., Root, T. L., & Schneider, S. H. (2010). Bridging the gap: linking climate-impacts research with adaptation planning and management. *Climatic Change*, 100(1), 87-101.
- [300.] Mastrandrea, M. D., & Schneider, S. H. (2004). Probabilistic integrated assessment of " dangerous" climate change. *Science*, 304(5670), 571-575.
- [301.] Preece, J., & Maloney-Krichmar, D. (2003). Online communities: focusing on sociability and usability. *Handbook of human-computer interaction*, 596-620.
- [302.] Montero, B., Watts, F., & García-Carbonell, A. (2007). Discussion forum interactions: Text and context. *System*, 35(4), 566-582.
- [303.] Morzy, M. (2009). On Mining and Social Role Discovery in Internet Forums. In *Social Informatics, 2009. SOCINFO'09. International Workshop on* (pp. 74-79). IEEE.
- [304.] Mcalister, S., Ravenscroft, A., & Scanlon, E. (2004). Combining interaction and context design to support collaborative argumentation using a tool for synchronous CMC. *Journal of Computer Assisted Learning*, 20(3), 194-204.
- [305.] McCombs, M. (1997). Building consensus: The news media's agenda-setting roles. *Political Communication*, 14(4), 433-443.
- [306.] McCombs, M., & Ghanem, S. I. (2001). The convergence of agenda setting and framing. In Reese, S. D., Gandy, O. H. & Grant, A. E. (Eds.), *Framing public life: Perspectives on media and our understanding of the social world* (pp. 67-81). London: Routledge; new edition 2003.
- [307.] McCombs, M. E., & Shaw, D. L. (1993). The evolution of agenda-setting research: Twenty-five years in the marketplace of ideas. *Journal of communication*, 43(2), 58-67.
- [308.] McDevitt, M., Kioussis, S., & Wahl-Jorgensen, K. (2003). Spiral of moderation: Opinion expression in computer-mediated discussion. *International Journal of Public Opinion Research*, 15(4), 454-470.
- [309.] McDonald, K. (2008). Fostering departmental communication and collaboration with online discussion forums. *The JALT CALL Journal*, 4(2), 17-28.
- [310.] McKenna, K. Y. A., & Green, A. S. (2002). Virtual group dynamics. *Group Dynamics: Theory, Research, and Practice*, 6(1), 116-127.
- [311.] McKenna, K. Y. A., Green, A. S., & Gleason, M. E. J. (2002). Relationship formation on the Internet: What's the big attraction? *Journal of social issues*, 58(1), 9-31.
- [312.] McKenzie, P. J. (2003). A model of information practices in accounts of everyday-life information seeking. *Journal of documentation*, 59(1), 19-40.
- [313.] Savolainen, R. (2011). Judging the quality and credibility of information in Internet discussion forums. *Journal of the American Society for Information Science and Technology*, 62(7), 1243-1256.

- [314.] McLeod, J. M., Kosicki, G. M., & McLeod, D. M. (1994). The expanding boundaries of political communication effects. In J. Bryant & D. Zillman (Eds.) *Media effects, advances in theory and research* (pp. 123–162). Hillsdale, NJ: Lawrence Erlbaum.
- [315.] McLeod, J. M., Zubric, J., Keum, H., Deshpande, S., Cho, J., Stein, S. (2001). Reflecting and connecting: Testing a communication mediation model of civic participation. Paper presented to the Communication Theory and Methodology Division, AEJMC annual meeting, Washington, DC.
- [316.] McQuail, D. (1996). *Mass communication theory*. Sage Publications, London.
- [317.] McQuail, D. (2001). With more hindsight: conceptual problems and some ways forward for media use research. *Communications*, 26(4), 337-350.
- [318.] Meraz, S. (2009). Is there an elite hold? Traditional media to social media agenda setting influence in blog networks. *Journal of Computer Mediated Communication*, 14(3), 682-707.
- [319.] Meraz, S. (2011). The fight for "how to think": Traditional media, social networks, and issue interpretation. *Journalism*, 12(1), 107-127.
- [320.] Middleton, C. (2010). Can broadband support environmental sustainability? An exploration of claims at the household level. *Telecommunications Journal of Australia*, 59(1), 10.01-10.14.
- [321.] Miller, R. E., & Wanta, W. (1996). Sources of the public agenda: The president-press-public relationship. *International Journal of Public Opinion Research*, 8(4), 390-402.
- [322.] Miranda, S. M., & Saunders, C. S. (2003). The social construction of meaning: An alternative perspective on information sharing. *Information systems research*, 14(1), 87-106.
- [323.] Mital, M., Israel, D., & Agarwal, S. (2010). Information exchange and information disclosure in social networking web sites: Mediating role of trust. *Learning Organization, The*, 17(6), 479-490.
- [324.] Monge, P. R., & Contractor, N. S. (2003). *Theories of communication networks*. Oxford University Press, Oxford (UK).
- [325.] Moran-Ellis, J., Alexander, V. D., Cronin, A., Dickinson, M., Fielding, J., Sleney, J., et al. (2006). Triangulation and integration: processes, claims and implications. *Qualitative Research*, 6(1), 45-59.
- [326.] Morris, D. (2001). Direct democracy and the Internet. *Loyola of Los Angeles Law Review*, 34(3), 1033-1053.
- [327.] Morris, M., & Ogan, C. (1996). The Internet as mass medium. *Journal of communication*, 46(1), 39-50.
- [328.] Moser, S. C. (2010). Communicating climate change: history, challenges, process and future directions. *Wiley Interdisciplinary Reviews: Climate Change*, 1(1), 31-53.
- [329.] Naruse, K., & Kubo, M. (2006). Lognormal distribution of bbs articles and its social and generative mechanism. Paper presented at the *Proceedings of the IEEE/WIC/ACM International Conference on Web Intelligence*, Washington, DC., pp.103-112.

- [330.] Natarajan, S., Padget, J., & Elliott, L. (2011). Setting an agenda for a step-change in UK domestic energy and carbon emissions modelling. *Energy and Buildings*, 43(10), 2602-2612.
- [331.] Nerlich, B., Koteyko, N., & Brown, B. (2010). Theory and language of climate change communication. *Wiley Interdisciplinary Reviews: Climate Change*, 1(1), 97-110.
- [332.] Neuendorf, K. A. (2002). *The content analysis guidebook*. Sage Publications Inc., London.
- [333.] Newman, L., & Dale, A. (2005). Network structure, diversity, and proactive resilience building: a response to Tompkins and Adger. *Ecology and Society*, 10(1), r2.
- [334.] Nielsen, A. E., & Thomsen, C. (2010). Sustainable development: the role of network communication. *Corporate Social Responsibility and Environmental Management*, 18(1), 1-10.
- [335.] Nisbet, M. C., & Mooney, C. (2009). Framing science. *Understanding Science: New Agendas in Science Communication*, 40.
- [336.] Nisbet, M. C., & Kotcher, J. E. (2009). A Two-Step Flow of Influence? *Science Communication*, 30(3), 328-354.
- [337.] Nisbet, M. C., & Scheufele, D. A. (2009). What's next for science communication? Promising directions and lingering distractions. *American Journal of Botany*, 96(10), 1767-1778.
- [338.] Noelle Neumann, E. (1974). The Spiral of Silence A Theory of Public Opinion. *Journal of communication*, 24(2), 43-51.
- [339.] Noelle-Neumann, E. (1984). The spiral of silence: A response. *Political communication yearbook*, 66-94.
- [340.] Nonnecke, B., & Preece, J. (2000, April). Lurker demographics: Counting the silent. In *Proceedings of the SIGCHI conference on Human factors in computing systems* (pp. 73-80). ACM.
- [341.] Northrup, P. (2002). A framework for designing interactivity into web-based instruction. *The ASTD E-Learning Handbook*, 127-138.
- [342.] Ockwell, D., Whitmarsh, L., & O'Neill, S. (2009). Reorienting climate change communication for effective mitigation. *Science Communication*, 30(3), 305-327.
- [343.] Offenhuber, D., & Donath, J. (2008). Comment Flow: visualizing communication along network paths. In Sommerer, C., Mignonneau, L. & King, D. (Eds.), *Interface cultures: artistic aspects of interaction*. London: Transaction Publishers
- [344.] Olausson, A. (2007). StrategyAnalytics Report -- The People's Revolution: Implications of Web 2.0 and Social Media Applications. StrategyAnalytics Report.
- [345.] Ölz, S., Sims, R., & Kirchner, N. (2007). *Contribution of renewables to energy security*. IEA Information Paper (No. 72). Paris: International Energy Agency.
- [346.] O'Neill, S., & Nicholson-Cole, S. (2009). "Fear Won't Do It" Promoting Positive Engagement With Climate Change Through Visual and Iconic Representations. *Science Communication*, 30(3), 355-379.

- [347.] Oreskes, N. (2007). "The Scientific Consensus on Climate Change: How Do We Know We're Not Wrong?". In DiMento, Joseph F. C.; Doughman, Pamela M. *Climate Change: What It Means for Us, Our Children, and Our Grandchildren*. MIT Press. pp. 65–66.
- [348.] Owens, S., & Driffill, L. (2008). How to change attitudes and behaviours in the context of energy. *Energy Policy*, 36(12), 4412-4418.
- [349.] Page, B. I., Shapiro, R. Y., & Dempsey, G. R. (1987). What moves public opinion?. *The American Political Science Review*, 23-43.
- [350.] Park, N., Jeong, J., & Han, J. H. (2008). Who are the power bloggers as potential target public in PR?: Public issue involvement-production of messages model. Paper presented at the *Proceedings of the 11th International Public Relations Research Conference*, Miami, FL, (USA).
- [351.] Park, N., Kee, K. F., & Valenzuela, S. (2009). Being immersed in social networking environment: Facebook groups, uses and gratifications, and social outcomes. *CyberPsychology & Behavior*, 12(6), 729-733.
- [352.] Parker, A., Reddy, S., Schmid, T., Chang, K., Saurabh, G., Srivastava, M., et al. (2006). Network system challenges in selective sharing and verification for personal, social, and urban-scale sensing applications. Paper presented at the *Record of the 5th Workshop on Hot Topics in Networks (HotNets V)*, Irvine, California, Session 3: The Masses (37-42).
- [353.] Patchen, M. (2006). *Public attitudes and behavior about climate change: what shapes them and how to influence them*. Indiana, University of Purdue, East Lafayette.
- [354.] Payne, G. A. (2009). Information control and imperiled public discourse: A general process model of gatekeeping, agenda setting, and news content homogenization. *Global Communication*, 199-208.
- [355.] Petersen, A., Anderson, A., Allan, S., & Wilkinson, C. (2009). Opening the black box: Scientists' views on the role of the news media in the nanotechnology debate. *Public Understanding of Science*, 18(5), 512-530
- [356.] Pidgeon, N. F., Poortinga, W., Rowe, G., Horlick Jones, T., Walls, J., & O'Riordan, T. (2005). Using surveys in public participation processes for risk decision making: The case of the 2003 British GM nation? Public debate. *Risk analysis*, 25(2), 467-479.
- [357.] Poell, T. (2009). Conceptualizing forums and blogs as public sphere. *Digital Material. Tracing New Media in Everyday Life and Technology*, 239-253.
- [358.] Poortinga, W., & Pidgeon, N. (2003a). *Public perceptions of risk, science and governance. Main findings of a UEA/MORI British survey on five risk cases*. (Technical Report). Norwich, UK: Centre for Environmental Risk, University of East Anglia.
- [359.] Poortinga, W., Pidgeon, N., & Lorenzoni, I. (2006). *Public perceptions of nuclear power, climate change and energy options in Britain: summary findings of a survey conducted during October and November 2005*. Technical Report (Understanding Risk Working Paper06-02). Norwich: Centre for Environmental Risk, University of East Anglia.

- [360.] Poortinga, W., & Pidgeon, N. F. (2003b). Exploring the dimensionality of trust in risk regulation. *Risk analysis*, 23(5), 961-972.
- [361.] Poortinga, W., & Pidgeon, N. F. (2005). Trust in risk regulation: cause or consequence of the acceptability of GM food? *Risk analysis*, 25(1), 199-209.
- [362.] Poortinga, W., Spence, A., Whitmarsh, L., Capstick, S., & Pidgeon, N. F. (2011). Uncertain climate: An investigation into public scepticism about anthropogenic climate change. *Global Environmental Change*, 21(3), 1015-1024.
- [363.] Pralle, S. B. (2009). Agenda-setting and climate change. *Environmental Politics*, 18(5), 781-799.
- [364.] Preston, J. M., & Clair, S. A. (2011). Selective viewing: Cognition, personality and television genres. *British journal of social psychology*, 33(3), 273-288.
- [365.] Putnam, R. (2001). Social capital: Measurement and consequences. *Canadian Journal of Policy Research*, 2(1), 41-51.
- [366.] Putnam, R. D. (1995). Tuning in, tuning out: The strange disappearance of social capital in America. *PS: Political science and politics*, 28(4), 664-683.
- [367.] Putnam, R. D. (2000). *Bowling alone: The collapse and revival of American community*. Simon and Schuster, New York.
- [368.] Quinton, S., & Harridge-March, S. (2010). Relationships in online communities: the potential for marketers. *Journal of Research in Interactive Marketing*, 4(1), 59-73.
- [369.] Raacke, J., & Bonds-Raacke, J. (2008). MySpace and Facebook: Applying the uses and gratifications theory to exploring friend-networking sites. *CyberPsychology & Behavior*, 11(2), 169-174.
- [370.] Rajan, S. C. (2006). Climate change dilemma: technology, social change or both?: An examination of long-term transport policy choices in the United States. *Energy Policy*, 34(6), 664-679.
- [371.] Ralph Sims, S. O., & Kirchner, N. (2007). Contribution of renewables to energy security. Paper presented at the *IEA Information Paper Paris: International Energy Agency*, 72.
- [372.] Ramirez, A. (2009). The Effect of Interactivity on Initial Interactions: The Influence of Information Seeking Role on Computer-Mediated Interaction. *Western Journal of Communication*, 73(3), 300-325.
- [373.] Reeves, A., Lemon, M., & Cook, D. (2011). Local support for community action on climate change: lessons from the Communities Cutting Carbon project. Paper presented at the *Knowledge Transfer Partnership (KTP) Associates Conference 2011*, Brighton, UK.
- [374.] Richmond, B. (1998). The strategic forum: aligning objectives, strategy and process. *System dynamics review*, 13(2), 131-148.
- [375.] Renckstorf, K., & McQuail, D. (1996). Social Action Perspectives in Mass Communication Research. *Communications*, 21(1), 5-26.

- [376.] Renn, O. (1992). Risk communication: towards a rational dialogue with the public. *Journal of hazardous materials*, 29(3), S. 465-519.
- [377.] Rheingold, H. (2000). *The virtual community: homesteading on the electronic frontier (Revised Edition)*. MIT Press, Cambridge, MA (U.S.).
- [378.] Rheingold, H. (2007). Using participatory media and public voice to encourage civic engagement. *The John D. and Catherine T. MacArthur Foundation Series on Digital Media and Learning*, 97-118.
- [379.] Rice, R. E., & Katz, J. E. (2001). *The Internet and health communication: Experiences and expectations*. Sage Publications Inc., London.
- [380.] Riffe, D., Lacy, S., Fico, F., & Fico, F. G. (2005). *Analyzing media messages: Using quantitative content analysis in research*. Lawrence Erlbaum Associates Inc., New Jersey.
- [381.] Roberts, M., Wanta, W., & Dzwo, T. H. D. (2002). Agenda setting and issue salience online. *Communication Research*, 29(4), 452-465.
- [382.] Robinson, J. P. (1976). Interpersonal influence in election campaigns: two-step flow hypotheses. *Public Opinion Quarterly*, 40, 204-319.
- [383.] Roch, C. H. (2005). The Dual Roots of Opinion Leadership. *The Journal of Politics*, 67(1), 110-131.
- [384.] Rogers, E. M. (2003). *Diffusion of innovations*. Free Press, New York.
- [385.] Rogers-Hayden, T., Hatton, F., & Lorenzoni, I. (2011). 'Energy security' and 'climate change': Constructing UK energy discursive realities. *Global Environmental Change*, 21(1), 134-142.
- [386.] Romano Jr, N. C., Donovan, C., Chen, H., & Nunamaker Jr, J. F. (2003). A methodology for analyzing web-based qualitative data. *Journal of Management Information Systems*, 19(4), 213-246.
- [387.] Rosen, B., Furst, S., & Blackburn, R. (2007). Overcoming barriers to knowledge sharing in virtual teams. *Organizational Dynamics*, 36(3), 259-273.
- [388.] Rosenberry, J. (2005). Few papers use online techniques to improve public communication. *Newspaper Research Journal*, 26(4), 61-73.
- [389.] Roy, J., & Pal, S. (2009). Lifestyles and climate change: link awaiting activation. *Current Opinion in Environmental Sustainability*, 1(2), 192-200.
- [390.] Rubin, A. (1993). Audience activity and media use. *Communications Monographs*, 60(1), 98-105.
- [391.] Rubin, A., & Babbie, E. R. (2008). *Research methods for social work, Sixth Edition*. Student edition: Thomson Brooks/Cole Publishing Co., Grove, CA.
- [392.] Ruggiero, T. E. (2000). Uses and gratifications theory in the 21st century. *Mass Communication & Society*, 3(1), 3-37.

- [393.] Sade-Beck, L. (2008). Internet ethnography: Online and offline. *International Journal of Qualitative Methods*, 3(2), 45-51.
- [394.] Sampei, Y., & Aoyagi-Usui, M. (2009). Mass-media coverage, its influence on public awareness of climate-change issues, and implications for Japan's national campaign to reduce greenhouse gas emissions. *Global Environmental Change*, 19(2), 203-212.
- [395.] Sanders, C. E., Field, T. M., Diego, M., & Kaplan, M. (2000). The relationship of Internet use to depression and social isolation among adolescents. *Adolescence*, 35, 237-242.
- [396.] Sayre, B., Bode, L., Shah, D., Wilcox, D., & Shah, C. (2010). Agenda Setting in a Digital Age: Tracking Attention to California Proposition 8 in Social Media, Online News and Conventional News. *Policy & Internet*, 2(2), Article 2, 7-32.
- [397.] Schaefer, D. R., & Dillman, D. A. (1998). Development of a standard e-mail methodology: Results of an experiment. *Public Opinion Quarterly*, 62(3), 378-397.
- [398.] Scheufele, D. (2008). Spiral of Silence Theory. *The SAGE handbook of public opinion research* (pp. 175-183). London: Sage Publications.
- [399.] Scheufele, D. A. (1999). Framing as a theory of media effects. *Journal of communication*, 49(1), 103-122.
- [400.] Scheufele, D. A., & Tewksbury, D. (2007). Framing, agenda setting, and priming: The evolution of three media effects models. *Journal of communication*, 57(1), 9-20.
- [401.] Schneider, S., Holdren, J. P., Bongaarts, J., & Lovejoy, T. (2002). Misleading math about the Earth. *Scientific American (American Edition)*, 286(1), 59-69.
- [402.] Schneider, S. M., & Foot, K. A. (2004). The web as an object of study. *New Media & Society*, 6(1), 114-122.
- [403.] Schneider, S. H. (2004). Abrupt non-linear climate change, irreversibility and surprise. *Global Environmental Change Part A*, 14(3), 245-258.
- [404.] Schneider, S. H., & Lane, J. (2006). An overview of "dangerous" climate change (pp. 7-23): Cambridge: Cambridge University Press.
- [405.] Schramm, W., & Roberts, D. F. (1971). *The process and effects of mass communication. Revised Edition*. University of Illinois Press, Urbana, Illinois.
- [406.] Semenza, J. C., Hall, D. E., Wilson, D. J., Bontempo, B. D., Sailor, D. J., & George, L. A. (2008). Public Perception of Climate Change:: Voluntary Mitigation and Barriers to Behavior Change. *American journal of preventive medicine*, 35(5), 479-487.
- [407.] Shah, D. V. (1998). Civic Engagement, Interpersonal Trust, and Television Use: An Individual Level Assessment of Social Capital. *Political Psychology*, 19(3), 469-496.
- [408.] Shah, D. V., Kwak, N., & Holbert, R. L. (2001). "Connecting" and "disconnecting" with civic life: Patterns of Internet use and the production of social capital. *Political Communication*, 18(2), 141-162.

- [409.] Shen, F., Wang, N., Guo, Z., & Guo, L. (2009). Online network size, efficacy, and opinion expression: Assessing the impacts of Internet use in China. *International Journal of Public Opinion Research*, 21(4), 451-476.
- [410.] Shannon, C. E., Weaver, W., & Blahut, R. E. (1949). *The mathematical theory of communication* (Vol. 117). Urbana: University of Illinois press.
- [411.] Shoemaker, P. J., & Reese, S. D. (1997). A new gatekeeping model. In Berkowitz, D. A. (Ed.), *Social meanings of news: A text-reader* (pp. 57-62). London: Sage Publications Inc.
- [412.] Shoemaker, P. J., Vos, T. P., & Reese, S. D. (2008). Journalists as gatekeepers. *Handbook of Journalism Studies*, 73-87.
- [413.] Siegrist, M., & Cvetkovich, G. (2000). Perception of hazards: The role of social trust and knowledge. *Risk analysis*, 20(5), 713-720.
- [414.] Sills, S. J., & Song, C. (2002). Innovations in survey research. *Social Science Computer Review*, 20(1), 22-30.
- [415.] Slocum, R. (2004). Polar bears and energy-efficient lightbulbs: strategies to bring climate change home. *Environment and Planning D*, 22, 413-438.
- [416.] Sloep, P., & Kester, L. (2009). From Lurker to active participant. *Learning Network Services for Professional Development*, 17-25.
- [417.] Slovic, P. (1993). Perceived risk, trust, and democracy. *Risk analysis*, 13(6), 675-682.
- [418.] Smith, J. (2005). Dangerous news: Media decision making about climate change risk. *Risk Analysis*, 25(6), 1471-1482.
- [419.] Smith, J. B., Schneider, S. H., Oppenheimer, M., Yohe, G. W., Hare, W., Mastrandrea, M. D., et al. (2009). Assessing dangerous climate change through an update of the Intergovernmental Panel on Climate Change (IPCC) "reasons for concern". *Proceedings of the National Academy of Sciences*, 106(11), 4133-4137.
- [420.] Smith, T., Coyle, J. R., Lightfoot, E., & Scott, A. (2007). Reconsidering models of influence: the relationship between consumer social networks and word-of-mouth effectiveness. *Journal of Advertising Research*, 47(4), 387.
- [421.] Solomon, S. (2007). *Climate Change 2007: the physical science basis: contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge University Press, Cambridge.
- [422.] Song, X., Chi, Y., Hino, K., & Tseng, B. (2007). Identifying opinion leaders in the blogosphere. Paper presented at the *CIKM'07 Proceedings of the sixteenth ACM conference on Conference on information and knowledge management*, Lisboa, Portugal, 971-974.
- [423.] Soroka, V., & Rafaeli, S. (2006). Invisible participants: how cultural capital relates to lurking behavior. Paper presented at the *WWW'06 Proceedings of the 15th international conference on World Wide Web*, Edinburgh, UK, 163-172.

- [424.] Spence, A., Poortinga, W., Pidgeon, N., & Lorenzoni, I. (2010). Public Perceptions of Energy Choices: The Influence of Beliefs About Climate Change and the Environment. *Energy & Environment*, 21(5), 385-407.
- [425.] Steele, R., Mummery, K. W., & Dwyer, T. (2007). Development and process evaluation of an Internet-based physical activity behaviour change program. *Patient Education and Counseling*, 67(1-2), 127-136.
- [426.] Steg, L. (2005). Car use: lust and must. Instrumental, symbolic and affective motives for car use. *Transportation Research Part A: Policy and Practice*, 39(2-3), 147-162.
- [427.] Steg, L. (2008). Promoting household energy conservation. *Energy Policy*, 36(12), 4449-4453.
- [428.] Steg, L., Vlek, C., & Slotegraaf, G. (2001). Cognitive-Reasoned and Affective-Emotional Motives for Using a Motor Car. *Transportation Research-F: Psychology and Behaviour*, 4(3), 1-19.
- [429.] Stern, N. H., Peters, S., Bakhshi, V., Bowen, A., Cameron, C., Catovsky, S., et al. (2006). *Stern Review: The economics of climate change* (Vol. 30). HM Treasury London.
- [430.] Stoneman, P. and M.J. Kwon (1994). "The Diffusion of Multiple Process Technologies," *Economic Journal* 104 (423): 420-431.
- [431.] Sun, T., Youn, S., Wu, G., & Kuntaraporn, M. (2006). Online Word of Mouth (or Mouse): An Exploration of Its Antecedents and Consequences. *Journal of Computer Mediated Communication*, 11(4), 1104-1127.
- [432.] Thomas, M. J. W. (2002). Learning within incoherent structures: The space of online discussion forums. *Journal of Computer Assisted Learning*, 18(3), 351-366.
- [433.] Thompson, P. B., & Dean, W. (1996). Competing conceptions of risk. *Risk: Health, Safety and Environment*, 7, 361-374.
- [434.] Thurlow, C., Lengel, L. B., & Tomic, A. (2004). *Computer mediated communication: Social interaction and the Internet*. Sage publications ltd, London.
- [435.] Tompkins, E. L., & Adger, W. N. (2004). Does adaptive management of natural resources enhance resilience to climate change? *Ecology and Society*, 9(2), 10.
- [436.] Trammell, K. D., & Keshelashvili, A. (2005). Examining the new influencers: A self-presentation study of A-list blogs. *Journalism and Mass Communication Quarterly*, 82(4), 968-982.
- [437.] YouGov (2012). 'YouGov / The Sunday Times Survey Results'. Available at: http://d25d2506sfb94s.cloudfront.net/cumulus_uploads/document/0w8gg3rki9/YG-Archives-Pol-ST-results-22-240612v2.pdf (accessed on 29th Dec 2012).
- [438.] Valente, T. W., & Pumpuang, P. (2007). Identifying opinion leaders to promote behavior change. *Health Education & Behavior*, 34(6), 881-896.
- [439.] Van Dijk, J. (2006). *The network society: Social aspects of new media*. Sage Publications Ltd, London.

- [440.] Verderber, K. S., Verderber, R. F., & Berryman-Fink, C. (2007). *Inter-act: Interpersonal communication concepts, skills, and contexts (11th. Edition)*. Oxford University Press, Oxford (UK).
- [441.] Volkmer, I. (2003). The global network society and the global public sphere. *development*, 46(1), 9-16.
- [442.] Wallack, L. (2000). The role of mass media in creating social capital: A new direction for public health. In Smedley, B. D. & Syme, S. L. (Eds.), *Promoting health: Intervention strategies from social and behavioral research* (pp. 337-365). Washington, DC.: National Academies Press
- [443.] Walsh, G., Brach, S., & Mitchell, V. W. (2009). Enlisting Online Communicators in Web 2.0. In Kollmann, T., Kuckertz, A. & Stöckmann, C. (Eds.), *E-Entrepreneurship and ICT Ventures: Strategy, Organization and Technology* (pp. 137-148). Hershey, PA: Business Science Reference / IGI Global.
- [444.] WALTER, J. F. (2004). How and why brains create meaning from sensory information. *International Journal of Bifurcation and Chaos*, 14(02), 515-530.
- [445.] Walther, J. B. (2008). Problems and interventions in computer-mediated virtual groups. In EKonijn, E. A., Utz, S., Tanis, M. & Barnes, S. B. (Eds.), *Mediated Interpersonal Communication* (pp. 271-289). Abingdon, Oxon: Routledge Publication Inc.
- [446.] Walther, J. B., Carr, C. T., Choi, S. S. W., DeAndrea, D. C., Kim, J., Tong, S. T., et al. (2011). Interaction of interpersonal, peer, and media influence sources online. In Papacharissi, Z. (Ed.), *A Networked Self: Identity, Community, and Culture on Social Network Sites* (pp. 17-38). Abingdon, Oxon: Routledge Publication Inc.
- [447.] Wang, C. (2009). *Community Participation in Climate Protection Actions A Case Study of Climate Change and Community Sustainability Planning in the City of Davis, California*. MA, Community Development Graduate Group, UC Davis.
- [448.] Wang, Z., Walther, J. B., & Hancock, J. T. (2009). Social Identification and Interpersonal Communication in Computer-Mediated Communication: What You Do Versus Who You Are in Virtual Groups. *Human Communication Research*, 35(1), 59-85.
- [449.] Wanta, W., & Ghanem, S. (2007). Effects of agenda setting. In Preiss, R. W., Gayle, B. M., Burrell, N., Allen, M. & Bryant, J. (Eds.), *Mass media effects research: Advances through meta-analysis* (pp. 37-51). New Jersey: Lawrence Erlbaum Associates Inc.
- [450.] Wanta, W., Golan, G., & Lee, C. (2004). Agenda setting and international news: Media influence on public perceptions of foreign nations. *Journalism and Mass Communication Quarterly*, 81(2), 364-377.
- [451.] Watts, D. J., & Dodds, P. S. (2007). Influentials, networks, and public opinion formation. *Journal of Consumer Research*, 34(4), 441-458.
- [452.] Weart, S. R. (2008). *The discovery of global warming*. Harvard University Press.
- [453.] Weber, C., & Perrels, A. (2000). Modelling lifestyle effects on energy demand and related

- emissions. *Energy Policy*, 28(8), 549-566.
- [454.] Wegener, D. T., Petty, R. E., & Klein, D. J. (2006). Effects of mood on high elaboration attitude change: The mediating role of likelihood judgments. *European Journal of Social Psychology*, 24(1), 25-43.
- [455.] Wei, Y. M., Liu, L. C., Fan, Y., & Wu, G. (2007). The impact of lifestyle on energy use and CO2 emission: An empirical analysis of China's residents. *Energy Policy*, 35(1), 247-257.
- [456.] Weichselgartner, J., & Kasperson, R. (2010). Barriers in the science-policy-practice interface: Toward a knowledge-action-system in global environmental change research. *Global Environmental Change*, 20(2), 266-277.
- [457.] Weimann, G. (1982). On the importance of marginality: One more step into the two-step flow of communication. *American Sociological Review* 47, 764-773.
- [458.] Weimann, G. (1991). The influentials: back to the concept of opinion leaders? *Public Opinion Quarterly*, 55(2), 267.
- [459.] Weimann, G., Tustin, D. H., van Vuuren, D., & Joubert, J. P. R. (2007). Looking for Opinion Leaders: Traditional vs. Modern Measures in Traditional Societies. *International Journal of Public Opinion Research*, 19(2), 173-190.
- [460.] Weinberg, H. (2001). Group process and group phenomena on the Internet. *International journal of group psychotherapy*, 51(3), 361-378.
- [461.] Weingart, P., Engels, A., Pansegrau, P. (2000) Risks of communication: discourses on climate change in science, politics, and the mass media. *Public Understanding of Science* 9: 261-283.
- [462.] Wellman, B. (1997). An electronic group is virtually a social network. In Kiesler, S. (Ed.), *Culture of the Internet* (pp. 179-205). New Jersey: Lawrence Erlbaum Associates Inc.
- [463.] Wellman, B. (2002). Little Boxes, Glocalization, and Networked Individualism. In Tanabe, M., van den Besselaar, P. & Ishida, T. (Eds.), *Digital Cities II: Computational and Sociological Approaches* (Vol. 2362, pp. 337-343). Berlin: Springer Berlin / Heidelberg.
- [464.] Wellman, B. (2005). Community: from neighborhood to network. *Communications of the ACM*, 48(10), 53-55.
- [465.] Wellman, B. (2007). The Network is Personal: Introduction to a Special Issue of Social Networks. *Social Networks*, 29, 349-356.
- [466.] Wellman, B., & Frank, K. (2001). Network capital in a multi-level world: Getting support from personal communities. In Lin, N., Cook, K. & Burt, R. S. (Eds.), *Social capital: Theory and research* (pp. 233-273). New Jersey (USA): Transaction Publishers.
- [467.] Wellman, B., & Gulia, M. (1999). Net Surfers Don't Ride Alone: Virtual Communities as Communities. In Wellman, B. (Ed.), *Networks in the global village* (pp. 331-366). Boulder, CO (USA): Westview Press.
- [468.] Wellman, B., Haase, A. Q., Witte, J., & Hampton, K. (2001). Does the Internet increase, decrease,

or supplement social capital? *American Behavioral Scientist*, 45(3), 436-455.

- [469.] Wellman, B., & Haythornthwaite, C. A. (Eds.). (2002). *The Internet in everyday life*. Oxford (UK): Wiley-Blackwell Publishing.
- [470.] Wellman, B., Quan Haase, A., Boase, J., Chen, W., Hampton, K., Diaz, I., et al. (2003). The social affordances of the Internet for networked individualism. *Journal of Computer Mediated Communication*, 8(3).
- [471.] West, R., & Turner, L. H. (2010). *Understanding interpersonal communication: Making choices in changing times*. Wadsworth Publishing Company.
- [472.] Whitmarsh, L. (2009). Behavioural responses to climate change: Asymmetry of intentions and impacts. *Journal of Environmental Psychology*, 29(1), 13-23.
- [473.] Whitmarsh, L. (2011). Scepticism and uncertainty about climate change: dimensions, determinants and change over time. *Global Environmental Change*, 21(2:Special Issue on The Politics and Policy of Carbon Capture and Storage), 690-700.
- [474.] Whitmarsh, L., & Lorenzoni, I. (2010). Perceptions, behavior and communication of climate change. *Wiley Interdisciplinary Reviews: Climate Change*, 1(2), 158-161.
- [475.] Whitmarsh, L., Seyfang, G., & O'Neill, S. (2011). Public engagement with carbon and climate change: To what extent is the public 'carbon capable'? *Global Environmental Change*, 21(1), 56-65.
- [476.] Wilson, K. M. (2000). Communicating climate change through the media. In Allan, S., Adam, B. & Carter, C. (Eds.), *Environmental risks and the media* (pp. 201-217). London: Routledge Inc.
- [477.] Windahl, S., & McQuail, D. (1993). *Communication Models*. New York: Longman.
- [478.] Windahl, S., Signitzer, B., & Olson, J. T. (Eds.). (2008). *Using communication theory: An introduction to planned communication*. London: Sage Publications Ltd.
- [479.] Wolff, M. W., & Wolff, K. A. (2002). Personality characteristics as a function of frequency and type of substance use. *Adolescence*, 37(148), 705-716.
- [480.] Wood, B. D., & Vedlitz, A. (2007). Issue definition, information processing, and the politics of global warming. *American journal of political science*, 51(3), 552-568.
- [481.] Woo-Young, C. (2005). The Internet, alternative public sphere and political dynamism: Korea's non-gaek*(polemist) websites. *The Pacific Review*, 18(3), 393-415.
- [482.] Wright, S., & Street, J. (2007). Democracy, deliberation and design: the case of online discussion forums. *New Media & Society*, 9(5), 849-869.
- [483.] Wright, D. K., & Hinson, M. D. (2010). An analysis of new communications media use in public relations: Results of a five-year trend study. *Public Relations Journal*, 4(2), 1-27.
- [484.] Wyatt, R. O., Kim, J., & Katz, E. (2000). How feeling free to talk affects ordinary political conversation, purposeful argumentation, and civic participation. *Journalism and Mass*

Communication Quarterly, 77(1), 99-114.

- [485.] Wynne, B. (1992). Misunderstood misunderstanding: social identities and public uptake of science. *Public understanding of science*, 1(3), 281-304.
- [486.] Wynne, B. (2002). Risk and environment as legitimacy discourses of technology: reflexivity inside out? *Current sociology*, 50(3), 459-477.
- [487.] Wynne, B. (2005). Reflexing Complexity. *Theory, culture & society*, 22(5), 67-94.
- [488.] Yang, G. (2009). *The power of the Internet in China: Citizen activism online*. New York: Columbia University Press..
- [488.] Yang, J., Gao, J. B.(2007). Analysis of Opinion Leader in On-Line Communities. *Journal-University of Electronic Science And Technology Of China*, 36 (6), 1249
- [489.] Yardley, L., Osmond, A., Hare, J., Wills, G., Weal, M., De Roure, D., et al. (2009, 6-9th April 2009). Introduction to the LifeGuide: software facilitating the development of interactive behaviour change internet interventions. Paper presented at the *Proceedings of the Persuasive Technology and Digital Behaviour Intervention Symposium (AISB 2009)*, Edinburgh, Scotland, 6-9th April 2009.
- [490.] Ye, X., & Li, X. (2006). Internet newspapers' public forum and user involvement. In Li, X. (Ed.), *Internet newspapers: the making of a mainstream medium* (pp. 243-260). New Jersey (USA): Lawrence Erlbaum Associates, Inc.
- [491.] Young, K. S., & Rogers, R. C. (1998). The relationship between depression and Internet addiction. *CyberPsychology & Behavior*, 1(1), 25-28.
- [492.] Zhang, W., & Chia, S. C. (2006). The effects of mass media use and social capital on civic and political participation. *Communication Studies*, 57(3), 277-297.
- [493.] Zhang, W., Johnson, T. J., Seltzer, T., & Bichard, S. L. (2010). The Revolution Will be Networked. *Social Science Computer Review*, 28(1), 75-92.
- [494.] Zhang, X., & Dong, D. (2008). Ways of identifying the opinion leaders in virtual communities. *International Journal of Business and Management*, 3(7), 21-27.
- [495.] Zhou, Y., & Moy, P. (2007). Parsing framing processes: The interplay between online public opinion and media coverage. *Journal of Communication*, 57(1), 79-98.
- [496.] Zia, A., & Todd, A. M. (2010). Evaluating the effects of ideology on public understanding of climate change science: How to improve communication across ideological divides? *Public understanding of science*, 19(6), 743-761.

Appendix I: Questionnaire

Purpose of Questionnaire:

Probing users' responses and actions to communication activities and opinion leadership in Internet forum

- Profiling people's communication activities in Internet fora through self-report (Motivation, usage, and experience of access)
- Probing people's perceptions of opinion leadership in Internet fora (The development of topic-threads, leading opinions, and candidates of opinion leader)
- Detecting people's responses and actions of these communication activities and opinion leadership in Internet fora (Participation in discussions, perceived self-attitude or opinion building / alteration, perceived self-behaviours and reactions of forum communication activities)

Part I: Background, Access and Use

1. How long ago did you start accessing this forum? (Access)

- Only recently (in 2010) About 1 year ago (in 2009) About 2 years ago (in 2008) About three years ago (in 2007) More than 3 years ago (before 2007)
- I can't remember

2-1. Are you a member of this forum? (Usage: membership)

- Yes, I have joined this forum as a member
- No, I only visit the cyberspace and read articles posted by other users in this forum
- I can't remember / I'm not sure

2-2. If you answered "Yes" in Q2-1, when did you become a member of this forum?

(Access)

- Only recently (in 2010) About 1 year ago (in 2009) About 2 years ago (in 2008) About three years ago (in 2007) More than 3 years ago (before 2007)
- I can't remember

3. How often, on average, do you access (i.e. login to) this forum? (Usage: frequency)

- Seldom (e.g. 1~2 times a month) Occasionally (e.g. 1~2 times a week) Often (e.g. 1~2 times a day) Very often (1~2 times an hour)

4. How often do you access this forum when you are on the internet? (Usage: dependency)

- This forum drives me to access the Internet, and I have to access this forum every time when I log onto Internet
- I quite often access this forum while I log onto Internet
- I access this forum occasionally (every 2 or 3 times I access Internet)
- I only access this forum if I have some time to surf Internet for leisure purposes.
- I seldom access or visit this forum even when I log onto Internet
- others, please state your situation _____

Part II: Experiences of Usage (Experience)

5-1. Have you ever posted any message (including articles or replies) in this forum?

(Please tick all that apply)

- Yes, I have posted articles on this forum
- Yes, I have replied to articles on this forum

- Yes, I have both posted and replied to articles on this forum
- No, I have never posted nor replied to any article on this forum
- I can't remember

5-2. If you have posted messages (i.e. articles, replies or both), have you ever received any responses directly from other users?

- Yes, I have received responses from other users on this forum in direct response to my posts
- No, I have never receive any direct responses to my posts from other users on this forum
- I haven't posted any message (either article or reply) on this forum
- I can't remember

5-3. Have you ever initiated discussions in this forum? (Participation in discussion)

- Yes, I have initiated a discussion among members through posting articles or replies
- No, I have never initiated a discussion
- I can't remember

(If you answer "No" or "I can't remember", please jump to **Q8**)

5-4 If you answered "YES" in Q5-2, to what extent do you agree or disagree with each of the following statements about your overall experiences of participating in discussions. Please read the following statements and tick your score from 5 (Strongly Agree) to 1 (Strongly Disagree) or 0 (I don't know) in box.

(5=Strongly Agree →1=Strongly Disagree, 0=I don't know) (Participation in discussion)

- When I contribute (i.e. post a message or a reply) on this forum, I receive a large

volume of responses from other users.

- When I post or reply to an article on this forum, I receive instant responses from other users.
- When I receive a notice of a new article posted in this forum, I instantly check and read the latest article
- When I receive a notice of a new article posted in this forum, I instantly respond to the article
- When I receive a response of my posts (either articles or replies) from another user, I instantly respond to him / her
- In my posts / replies, I tend to include additional information on topics of interest to this forum
- In my posts / replies, I tend to include additional comment on topics of interest to this forum
- In my posts / replies, I tend to share challenging information or comments
- I usually get responses from people with similar views to mine

Part III: Your Reasons for Accessing the Forum

(Internal: Purposes of Access / Participation (Motivation))

6. What are the main reasons you visit / have joined this forum? (Please tick all that apply)

- I'm interested in seeking information about climate change issues
- I'm interested in seeking information about environmental issues (not just climate change issues)
- I'm interested in establishing more dialogue (i.e. leaving comments, posting

replies, etc.) with other users in this forum

I look for opportunities to have discussions with people who have different views to mine

I have friends who have joined this forum

I'm interested in sharing information and knowledge with others who visit / access the forum

I feel proud of being a member of this forum given it's environmental focus

I like to learn more about opinions of other members of this forum

I generally identify with the goal of this forum

I generally share the views of other members in this forum

I can't remember my specific reasons for joining this forum

other reasons, please state _____

7. If you have posted or replied to articles on this forum, please state why (otherwise go to Q9) (Please tick all that apply)

to share information, ideas, comments, or actions for tackling climate change issues

to share information, ideas, comments, or actions about issues covered in this forum

to support the views of other users of this forum

to challenge other users' viewpoints

to build communication / networks with other users

I can't remember my specific reasons for joining this forum

other, please state _____

8. If you have initiated a discussion on this forum, please tell me your reasons for doing so (If your postings did not raise any discussion, please jump to Q9) (Please tick all that apply)

- I'm interested in a topic and want to share information, ideas, comments, or actions that may contribute to other discussions
- I'm interested in a topic and keen to know more (i.e. information or opinions) from other users
- I want to encourage networking among users in this forum

Part IV: Opinion Leadership on the Forum

9-1. Referring to this forum, who do you think most frequently provides useful information or comments to you?

- Please list them according to their IDs: _____ ; _____ ; _____
- No specific member has ever offered me useful information or comments in forum frequently
- I can't remember / I'm not sure

9-2. Referring to this forum, who do you think most frequently communicates (e.g. through initiating discussions, posting articles or replies) with members?

- Please list them according to their IDs: _____ ; _____ ; _____
- No - one
- I can't remember

9-3. Referring to this forum, whose posts (including articles and replies) do you think trigger most discussions among the members of the forum?

- Please list them according to their IDs: _____ ; _____ ; _____

- No –one
- I can't remember / I'm not sure

9-4. Referring to this forum, whose opinions (in their articles and replies) receive most agreement and support from other forum members?

- Please list them according to their IDs: _____ ; _____ ; _____
- No – one specific members' postings are specially recognized by other users in this forum
- I don't know

10-1. Overall, do you feel there is a prevalent view shared by members of this forum?

(perceptions of opinion leadership)

- Yes (please go to **Q10-2**)
- No, I don't feel there is a perspective on this forum shared by most members
- I don't know / I'm not sure

10-2. If you answered "Yes" in Q10-1, would you please indicate how the forum's main views are communicated (Please tick all that apply)

- discussions / postings presenting information (eg climate change science)
- discussions / postings regarding collective actions / campaigns (eg Transition Town movement)
- discussions / postings regarding individual attitudes or behaviours (eg switching off lights)
- discussions / postings regarding internal communication and interaction on the forum (eg responses to particular postings)
- Other, please specify:

10-3. Following the question Q10-2, how strongly do you feel these views are shared among members of this forum? Please tick your score from 5 (Strongly Agree) to 1 (Strongly Disagree) or 0 (I don't know) in box.

(5=Strongly Agree →1=Strongly Disagree, 0=I don't know)

- Discussions / postings presenting information (eg climate change science)
- Discussions / postings regarding collective actions / campaigns (eg Transition Town movement)
- Discussions / postings regarding individual attitudes or behaviours (eg switching off lights)
- Discussions / postings regarding internal communication and interaction on the forum (eg responses to particular postings)
- Others, please specify: _____

11. Overall, how do you feel other forum users regard your opinion? (perceptions of user's own opinion leadership)

- Not relevant (My opinions are not specifically sought or noticed by other users on this forum)
- A little bit relevant (My opinions are sought and discussed by some users in this forum)
- Somewhat relevant (People in this forum tend to ask for my opinions about specific issues)
- Very relevant (People in this forum would ask for my opinion before making their opinions or decisions)

I'm not sure / I can't tell

12. In general, to what extent do you agree or disagree with each of the following statements about your experiences on seeking opinions on this forum: (use and gratification of opinion leadership in forum)

(5=Strongly Agree → 1=Strongly Disagree, 0=I don't know)

- I tend to seek out or search for others' opinions or comments online generally
- I tend to search for the latest information online generally
- I tend to seek advice and comments from my friends specifically on this forum
- I tend to consult other users on this forum to form my opinions
- I feel more confident about my views or actions when I have learnt from or consulted opinions of others on this forum.
- I like to seek out perspectives that could be different from mine on this forum
- I like to seek out perspectives that could be different from the “mainstream” on this forum
- I tend to try to persuade others on this forum to agree with my opinions / views
- I tend to urge others on this forum to consider some aspects of particular issues if they are not being discussed
- I like sharing posts from this forum with friends who are not members of this forum

Part V: Self-Evaluation of Effects of Online Communication (Responses and actions)

13. Have you ever accessed information or discussions regarding climate change and energy issues on this forum? (Access to CC and E issues)

Yes, I have accessed information regarding climate change and energy issues on this forum (Please answer Q14-1 and Q14-2)

Yes, I have joined discussions regarding climate change and energy issues on this forum

(Please answer Q14-1 and Q14-2)

No, I have not accessed any discussion(s) about climate change and energy issues

(Please answer Q14-2)

No, I have not been involved in any discussion about climate change and energy issues on this forum (Please answer Q14-2)

Not applicable: this forum does not discuss climate change and energy

14-1. What type of information regarding climate change and energy have you accessed from this forum? (Access to CC and E issues)

scientific knowledge information on collective actions or personal behaviours

sceptical viewpoints controversial issues and considerations collective / public opinions information on technology development policy and regulations campaigns others _____

14-2. If you ever skip fora contents regarding climate change and energy issues, could you please tell me why you did not access or become involved in such discussions on this forum? (Open Question) (Access to CC and E issues)

15. In general, to what extent do you agree or disagree with each of the following statements regarding your experiences as a member / user of this forum (Self-evaluation of Responses and Actions)

(5=Strongly Agree →1=Strongly Disagree, 0=I don't know)

■ being a member of this forum has made me feel much closer to people who share

my same interests and attitudes on this forum

■ being a member of this forum has made me feel much closer to people I knew even before joining the forum (i.e. friends, family members, etc.)

■ being a member of this forum has made me feel more networked with people in my surroundings (i.e. my neighbours, classmates, colleagues, etc.).

■ being a member of this forum has inspired me with more ideas about climate change and energy issues

■ being a member of this forum has made me consider more carefully the possible effects of my everyday actions / behaviours on the environment

■ being a member of this forum has spurred me to change some of my behaviours (please state which: _____)

■ being a member of this forum has offered me a an opportunity to express my opinion and network with other users

16. How do you feel the forum has affected your life? (Please tick all that apply)

This forum has changed my views about climate change issues

This forum has changed my views about environmental issues, please state which ones specifically: _____

I have become more aware of possible effects of my daily actions on the environment after accessing contents in this forum

I have changed my behaviour after accessing contents in this forum

I have changed my behaviour after interacting with other users on this forum.

Please specify which actions you are now undertaking that are different:

Part VI: 'About You' (Socio – demographics)

17. Your Gender

- Male Female

18. Your age

- Under 15 15-24 25-34 35-44 45-54 55-64 65-74 75

and above

19. Number of children in the household?

- None 1 2 3 4 or more I don't know / I refused to

say

20. Your working status

- Working - Full time (30+ hrs)
 Working - Part time(9-29 hrs)
 Unemployed
 Not working – retired
 Not working – looking after house / children
 Not working – invalid / disabled
 Student
 Other

21. What is your main profession?

Please State: _____

22. Which (if any) is the highest education or professional qualification you have obtained? (If you are still studying, please tick the highest achieved so far) (Please tick one)

- Vocational qualification
- High School / A level or equivalent
- Bachelor Degree or equivalent
- Masters / PhD or equivalent
- Other
- No formal qualifications
- Still Studying
- Don't know

23. Which (if any) of the following applies to you? (Multiple choices)

- Have a science or engineering degree
- Have taught a science subject
- Currently subscribe to a science magazine / TV channel / online news letter
- Have (ever) subscribe to a science magazine / TV channel / online news letter
- Have(ever) bought a science magazine / Internet content in the past year
- Have(ever) looked up scientific information on the Internet
- Have(ever) attend other online forum / community regarding to science or engineering topics
- I am a scientist or an engineer
- I used to work as a scientist or an engineer
- I have never met a scientist or engineer

- I have scientists or engineers among my friends and relatives
- I meet scientists or engineers frequently (i.e. at least once a month)
- I worked with scientists or engineers
- I am a member of a science organization
- I used to be a member of a science organization
- None of these
- Don't know

24. Which (if any) of the following things have you done in the past year (please tick all that apply)

- Subscribed to a magazine concerned with environmental protection issues (i.e. wildlife / natural resources conservation)
- Selected one product over another because of its environmental-friendly certified labelling, packaging, formulation or advertising)
- Been a member of an environmental group / charity (even if you joined more than two years ago)
- Given money to or raised money for environmental issue-relevant charities
- Visited / written a letter to an MP / councillor / REP about environmental issues
- Written a letter for publication to a newspaper / journal about environmental issues
- Taken bottles, glass, paper, cans or other materials to be recycled, or left them for others to collect for recycling
- Have a car that runs on alternative fuel or a car with a "hybrid" engine
- Have a property / rent a property that match the criteria of green building standard

None of these

Don't know

25. In which of the following are you currently based?

United Kingdom (UK)

European country other than UK

North America

South America

Middle East of Asia

Asian countries other than the Middle East countries

Australia and New Zealand

Africa

Other , please specify: _____

=====**End of Questionnaire**=====

Appendix II: Coding Table for Qualitative Analysis

Section A: Coding for Key Author's Position & Content Type

Table 3-3-2. KA's Position in KA's Postings			
Supporting Attitude toward Actions for CC	Neutral Activities		Declining / Raise Challenge toward Actions for CC
	Open Questions	Not Relevant to Topic of CC & Environmental issue	
S	N1	N2	D

Table 3-3-2. Content Type of KA's Postings (Articles & Replies)			
Information Resource	Idea / Comment	Sharing Experiences	Chatting / Networking
KP-A	KP-B	KP-C	KP-D

Section B: Coding for Replier’s Supporting/Declining Attitude & Content Type

Table 3-3-3. Supporting / Declining Attitude in Replier’s Postings		
Express Attitude of Support / Decline (to OP*)		S
Communicate with others (not directly respond to OP*)	Agree viewpoints in other replies	C1
	Disagree / challenge viewpoints in other replies	C2
	Raise questions to other replies	C3
	Reply questions in other replies	C4
	Presenting clear leadership or strong opinions of the development of discussions	C5
	Other communication activities	C6
Neutral Activities	Raise Non-Challenging Questions to OP*	N1
	Answer questions from OP*	N2
	Change to Other Subjects	N3
Decline / Raise Challenge or Questioning to OP* (D)	Decline OP*	D1
	Raising challenging Questions to OP*	D2

*OP: Original Posting

Table 3-3-4. Content Type of Replier’s Postings (Articles & Replies)			
Information Resource	Idea / Comment	Sharing Experiences	Chatting / Networking
CP-A	CP-B	CP-C	CP-D

Appendix III: Record of Qualitative Analysis —

Topic-Thread Coding Record

1. Sampling KA Threads in Climate Concern Forum												
Coding for KA Postings (Articles & Replies)	KA ID: Jim			KA ID: Alex Harvey			KA ID: Ross Mayhew			KA ID: Eric		
	Top Ranked Thread Title:			Top Ranked Thread Title:			Top Ranked Thread Title:			Top Ranked Thread Title:		
	Global Warming - a century of warming or not? http://groups.yahoo.com/group/ClimateConcern/message/14428			Tropical tropospheric warming...today's IPCC scientist report http://groups.yahoo.com/group/ClimateConcern/message/15678			The methane question, revisited. http://groups.yahoo.com/group/ClimateConcern/message/15795			Is It Really Too Late? http://groups.yahoo.com/group/ClimateConcern/message/14321		
	Code: (A-T)	ANS:	Note:	Code: (A-T)	ANS:	Note:	Code: (A-T)	ANS:	Note:	Code: (A-T)	ANS:	Note:
KP-A KP-B	D1 D2		Strong opinions with information holding sceptical attitude in the controversial discussions of relationship between CO2 and global temperature	KP-A D		Responding to Phil's argument and redmeatliberal's comment by posting an article with his comments and supposed activities. Questioning current model of climate science applied by mainstream scientists.	KP-A S		Notifying the announcement of research projects (and paper) to come under the Living With Environmental Change programme. Provide links of these projects and programme in post.	KP-A KP-B KP-D	S	Forward Tony Blair's speech at G8 and give high recognition of the speech. Raise questions about politicians and hope raising more discussions and actions.
Repliers List (SN)	Code: (A-T)	ID:	ANS:	Code: (A-T)	ID:	ANS:	Code: (A-T)	ID:	ANS:	Code: (A-T)	ID:	ANS:
			Note:			Note:			Note:			Note:
1	CP-B D1	emadaj1	OP* (Jim)	CP-A CP-B D2	redmeatliberal	OP* Challenging	CP-B D		Ross Mayhew OPKA	CP-B N2		

				Directly decline OPKA's argument by pointing out his mis-interpretation of the report he forward. Making claim that GW is "real" as personal conclusion.				argument of OP by current temperature record.			Richard Hanson	Question OPKA's research report and decline the effort of tackling climate change				
2	CP-B OKA	S C2	Jim	emadaj1	CP-B CP-A CP-D	S	Hugh Bartlett	redmeatliberal OP*	CP-B S C2	Phil Henshaw	Richard Hanson	CP-D	C6			
				Defending self-opinion by arguing the content of these research reports and disagree emadaj1's viewpoint line by line				Answering redmeatliberal's questioning and support OP*'s notions and postings.								
3	CP-B	D1 C2	emadaj1	Jim	CP-B OKA	S	Alex Harvey	Redmeatliberal (Edmund)	CP-B S C2			CP-B CP-A	N2			
				Stating his stand point and implying that he actually is the "editor/author" of these reports in "his book"				Provide more info about Lindzen's predictions, and raise more challenging questions.								

4	CP-B CP-D OKA	S C2	Jim	emadaj1 Continue debate by arguing the trend of global climate rather than misinterpreting these reports. Questioning emadaj1's credit by posting in several different IDs	CP-B CP-D	C2 C3	Phil Henshaw	Raising questions to others who doubt the statistics (of long term).	CP-B CP-A	D			CP-B	N2 C2		
5	CP-D	D2 C3 N3	redmeatliberal	Jim, emadaj1 Questioning these discussions actually change his interested subjects in previous topic-threads. Raising question of "what to convince denialists of GW" again to challenge denialists who don't believe anthropogenic global warming	CP-B OKA	C2 C4	Alex Harvey	Phil Henshaw Declining Phil's view of "long term data" and insist that their argument is to find out the "trend" of long term change while the effect of GHGs is regarded as "noise" and the real trend has been "covered" by the noise.	CP-B	N3 C2			CP-B	C2 N2		

				is happening.													
6	CP-B CP-A	C4 N3	Alex Harvey	redmeatliberal	CP-B CP-C	C2 C3 D2	Phil Henshaw	Alex Harvey	CP-B CP-A	N3 C3							
				Answering redmeatliberal's questions by indicating that biased depression of different viewpoints (to AGW) and recent research peer-review process actually could more significantly contribute to the distrustiness of scepticals.				Decline Alex's argument by his own understanding of scientists' efforts in revealing the GHG's effect (with its importance) Stating the current understanding and application of long and short term data and raise challenging questions to Alex.									
7	CP-B	C6 N3	wright gregson	Stating the long argument could come from mis-claim of GW rather than sending information about "global devastation" which also include the	CP-B CP-A OKA	C2 C3	Alex Harvey	Phil Henshaw	CP-A CP-B	S C2							
				Using IPCC's report to present the meaning of GHG "fingerprint" and relevant discussion, casting				NP-B									

				concept of GW				questions of real, enhanced effects of GHGs								
8	CP-B	C1 N3	Rodney Michaelson	wright gregson	CP-A CP-B CP-C OKA	C2	Alex Harvey	Phil Henshaw	CP-B	S C2			NP-B NP-A	C2		
				Support Wright's viewpoint which recognizing some use climate as a "scientific" tool to achieve change for tackling "global devastation"				Continue arguing with Phil about current works of scientists and the "fingerprint" of GHG debate.								
9	CP-D CP-B	C6 D1	Alex Harvey	Ross Mayhew, Lance Olsen	CP-A CP-B CP-C	D C2	Phil Henshaw	Alex Harvey	CP-B	S			NP-B	C2 N3		
				Networking with administrator and other forum members. Defending self-position as "supporter of "green movement" but refuse to support "the lack of scientific discipline & intellectual dishonesty in climate science"				Arguing with Alex paragraph with paragraph, also appreciate his sources of information, and finally change subject to the capacity and potential economic loss								

				while he is still convinced that GW is real and suggestion action is urgently needed.													
10	CP-B	D1	Alex Harvey	Further clarify that he believes the GW is largely man-made	CP-A CP-B	C6	Richard Hanson	Alex Harvey Phil Henshaw Join the continuing debate and indicate one latest report about the AGW model that reflect the warming trend					CP-A	C2 C4			
11	CP-B	C6 C1	Alex Harvey	Lance Olsen Explain some comments toward Lance's postings are "kidding" and the truth is that his postings are useful.	CP-B	C1	Phil Henshaw	Richard Hanson Acknowledging Richard's updated paper information and provide his own interpretation of the report which point out some potential questions of current models.					CP-B	N3 C1			
12	CP-B CP-A	C3 S	Rodney Michaelson	Moderator (Administrator of ClimateConcern) Clarify his definition of	CP-A OKA	C5	Alex Harvey	Introduce new information from others'					CP-A	C2			

				layperson and his position. Back to debate about the real science or not of IPCC's report of "Climate Change and Water"(2008)				blog and introduce the debate about the info.								
13	CP-B CP-C	C4	redmeatliberal	Rodney Michaelson Respond to Rodney's challenge with his experience of teaching students	CP-A CP-B	C4 S	Richard Hanson	Phil Henshaw Referring to collected information and offer his suggestion that the effect of GHGs could not be significant or limited.					CP-A CP-B	C2		
14	CP-B OKA	C2	Jim	redmeatliberal Reveal the redmeatliberal is also Edmund (emadaj1) and continue the debate by using Alex's statement of his attitude to unbalanced peer review process in major journals.	CP-A OKA	C6	Alex Harvey	 Forward and introduce another article that clearly corresponded his viewpoints.								

15	CP-B CP-A	C2	redmeatliberal	Jim	CP-B CP-A	C6	Phil Henshaw	Alex Harvey	Indicate another posting that author posts to the Climateaudit.org website.									
				Continue debate with Jim by clarifying more points in papers.														
16	CP-B	C4	emadaj1	Moderator (Administrator of ClimateConcern)	CP-C OKA	C3	Alex Harvey	Richard Hanson	Raise one detail question about Richard's comment									
				Correct some wording he used in last post														
17	CP-B OKA	C2 C4	Jim	redmeatliberal	CP-A CP-B CP-C	C2	Phil Henshaw	Alex Harvey	Continue arguing with Alex about the interpretation of temperature variation while reading other more stuff regarding to the topic									
				Continue debate with Edmund and figuring out the forwarded news as reference. Asking all debates and discussions should come back to the main topic question he raised.														

18	CP-D CP-B OKA	C6 C4 C2	Jim	Moderator (Administrator of ClimateConcern) (Ross Mayhew)	CP-A CP-B	C4	Richard Hanson	Alex Harvey										
				Thank the moderator of CC with the open discussion of the topic and respond those questions raised				Introducing the latest debates and discussions of PDO to respond Alex's question										
19	CP-B CP-A	C2	redmeatlibera l	Jim	CP-A CP-B OKA	C4 C5 N3	Alex Harvey	Richard Hanson										
				Continue to debate with Jim about the information from reports				Introduce further details of relevant theory which is the foundation of his casted doubts. Subject changed to PDO.										
20	CP-B	C2 N1 N3	Alex Harvey	Moderator (Administrator of ClimateConcern) (Ross Mayhew)	CP-B CP-A	C4	Richard Hanson	Alex Harvey										
				Disagree moderator's claim of the past decade (since 1998) is the				Continue discussion with Alex										

				warmest decade and stating that specific La Nina event could drastically affect temperature (i.e. cool down). Raising question: did it possible that researcher "correct" information to amplify the CO2 influence while exclude other factors?											
21	CP-B	C4 N3	redmeatliberal	Alex Harvey Respond to Alex's questions and state IPCC's statement could be affected by its "inter-governmental" pressure	CP-B CP-C CP-D	C2 D N3	redmeatliberal	Clarify all points to those "denialists" that some papers (i.e. Lindzen's) in some journal (ie. Energy & Env) could have some bias, arguing the real effect happening in the real world.							
22	CP-D	N1 N3	Alex Harvey	redmeatliberal Ask	CP-B CP-D	C1 D	Phil Henshaw	redmeatliberal							

				redmeatliberal for further information about possible pressure that IPCC could face				Support Redmeatliberal's strong opinions and decline the questioning from denialists.								
23	CP-B	C4 N3	Lance Oslen	Alex Harvey Stating the pressure of negotiation cannot be represented but it did exist while scientists are "pressured" to change language from likes of "very likely" to "likely" which could affect public understandings.	CP-A CP-B CP-D	C3 N1	Hugh Bartlett	redmeatliberal Expect networking with redmeatliberal while presenting his questions and express his own concern and observations								
24	CP-B	C2	redmeatliberal I	Alex Harvey Stating his own standard of	CP-A CP-B CP-D	C4	Phil Henshaw	Hugh Bartlett								

				reading materials from different viewpoints (i.e. denialists' papers) if the peer-review is NOT repeated by other denialists. In his opinion, papers should be recognized by professional journals' review.				Responding Hugh Bartlett's question while expressing his idea of warming trend							
25	CP-B	C2	Alex Harvey	Lance Oslon Disagreeing that scientists' wording can be an excuse of their arbitrary conclusion	CP-B CP-D OKA	C2 C4	Alex Harvey	Phil Henshaw redmeatliberal Continue debate and respond by disagreeing those statement made by Phil and redmeatliberal							

26	CP-B	C1	richardhfoy	Alex Harvey	CP-B	C2	Phil Henshaw	Alex Harvey								
				Agree with Alex's proposed approach in his discussion with Ross. Presenting strong belief to GW science and present optimistic attitude for the debate End Discussion				Attack Alex and with strong opinions, dispute the "fake" science, and others end responding him.								

2. Sampling KA Threads in Our Planet / Earth Day Forum

Coding for KA Postings (Articles & Replies)	KA ID: Chris			KA ID: Hans			KA ID: JeffreyandtheKingfisherinSilentR unningII			KA ID:		
	Top Ranked Thread Title:			Top Ranked Thread Title:			Top Ranked Thread Title:			Top Ranked Thread Title:		
	What are you doing to be green?			Go NUCLEAR!!!!!!			Heatwaves					
	Code: (A-T)	ANS:	Note:	Code: (A-T)	ANS:	Note:	Code: (A-T)	ANS:	Note:	Code: (A-T)	ANS:	Note:
CP-D N1		OPKA trigger discussion about personal behaviour to be "green"	CP-D S		Urge users to write to their Rep or Senator about the supporting of reapplying nuclear energy	CP-A S		Forwarding information regarding to heatwave				
Repliers List (SN)	Code: (A-T)	ID:	ANS: Note:	Code: (A-T)	ID:	ANS: Note:	Code: (A-T)	ID:	ANS: Note:	Code: (A-T)	ID:	ANS: Note:
1	CP-C N2	Stephanie	Reply OP*'s questions to share their actions	CP-B OKA S	Hans		CP-D N1	Dan	OP* Raise questions for further interpretation			
2	CP-C CP-A N2	a2zresource	Answer OP*'s questions and	CP-A OKA S	Hans		CP-A CP-B S C4	Jeffreyandt	Dan			

				share his experiences and tips with some more information					Oka		heKingfisherinSilentRunningII					
3	CP-C	N2	uber flyy		CP-B	D1	Dhiiga Qabsoo		CP-B	D1	Dan	OP*(JeffreyandtheKingfisherinSilentRunningII) Repeat KA's explanation in parable, casting doubt in scientific research report about heatwave temperature record in past 500 years.				
4	CP-C	N2	A. "H.K." G.		CP-B	S	Will "The Thrill"		CP-B OKA	C4	JeffreyandtheKingfisherinSilentRunningII	Dan Explain the methodology				
5	CP-A	N3	Viva!	Completely irrelevant to OP's question and change to	CP-B	C2 D1	Dhiiga Qabsoo	Will "The Thrill"	CP-B	D1 C2	Dan	JeffreyandtheKingfisherinSilentRunningII				

				other subjects with some information.				Start debate for nuclear waste				Questioning the research report that OP*KA posted and the OP*KA's explanations				
6	CP-C	N2	a2zresource		CP-B	D1	J.Darby		CP-B OKA	C1 S	JeffreyandtheKingfisher inSilentRunningII	Dan Recognize Dan's question about the flaw of time-scale but indicate the revealed risk in the research report should be considered				
7	CP-B	D1	Allie	Using Sarcasm to decline the OPKA's idea of sharing users' green behaviour	CP-B CP-C	S	Margaret (NYDM/WADM)		CP-A CP-B	D	Dan					
8	CP-B	C2	Jeffrey and the Kingfisher in Silent Running II	Allie Using same Sarcasm approach to decline Allie's viewpoints	CP-B CP-A	D1	Dhiiga Qabsoo		CP-D OKA	C3	JeffreyandtheKingfisher inSilentRunningII	Dan Raising question of Dan's standpoint				
9	CP-B	C2 D1	Allie	Make a public claim that her understanding and conclusion is that global warming is a lie so no need to be green.	CP-B	S C5	a2zresource	Help OP* to edit the letter template for REP or Senator.	CP-C	D	Allie	Raise challenge by self-observation				

10	CP-B	C2	Jeffrey and the Kingfisher in Silent Running II	Allie Continue to use sarcasm approach to express author's disagreement with Allie's idea	CP-B	D1	Thomas Daniel Valls	Also focus on the waste and continue the debate	CP-A CP-B	D	Gregor					
11	CP-D	C2 C6	Jeffrey and the Kingfisher in Silent Running IIs	Allie (ad hominem argument and deleted by administrator) Respond to the ad hominem argument with humour but continue to insist the importance of rational discussions and debates	CP-B CP-A	D1	Dhiiga Qabsoo	thomas daniel Share china experience to avoid same mistake of US policy	CP-A CP-B CP-C	D C4	Dan	Jeffreyandthe KingfisherinSilentRunningII Respond to OP*KA's questioning about the graph information he offered. Share experiences of cooler temperature in his own location				
12	CP-D	C2 C6	Allie	Jeffrey and the Kingfisher in Silent Running IIs Stating her posts are sarcasm and she can be	CP-B	C1	Thomas Daniel Valls	Dhiiga Qabsoo Accept Dhiiga Qabsoo's	CP-A CP-B	D N3	Gregor	Decline the phenomenon that OPKA's post argued but ask other users to pay attention on sun's activities of				

				serious if she needs to do or wants to do				idea but doubt it's applicable in US while stakeholders are persistent.				producing sunspots.				
13	CP-D CP-B	C2 C6	Jeffrey and the Kingfisher in Silent Running IIs	Allie	CP-B	C4	LiL IŞIAH	Respond to waste debate by stating "space" as place to dump waste.	CP-B	C1	Dan	Gregor				
				Disagree the sarcasm and insist that the discussion should be more serious								Support the idea of Gregor's post and recognize more research will be needed in the sunspot observation				
14	CP-B	C3 D2	Allie	Stating different core concept of OP* -- considering next generation as "sustainable development" is not necessary	CP-B	D1	Vicky		CP-B	D C6	a2zresource	Dan				
												Commenting current research models are for specific purposes such as fund raising for communities; Therefore challenging research report				
15	CP-B CP-C	C2 C4	Jeffrey and the	Allie	CP-B	S	a2zresource	LiL IŞIAH	CP-C OKA	C2 S	Jeffreyandt	Start using self				
				Support the								experience to				

			Kingfisher in Silent Running II	importance of long term consideration for future generation because installing change needs time and insist we should not let future generation to inherit problems.				Stating LiL İŞIAH's approach feasible but cannot implement today because of military reasons.			heKingfisher in Silent Running II	convince others that global warming is a real risk				
16	CP-B CP-A	C4 C2	a2zresource	Allie Replying Allie's question with similar viewpoint of Jeff in last post. Stating some projects (CERCLA) to urge our generation to take our own responsibility rather than pass problems to next generation	CP-A CP-B	C2	a2zresource	Dean Strongly question Dean's idea as too "oversimplified" and present more information regarding to nuclear waste	CP-B	D	Dan	Jeffrey and the Kingfisher in Silent Running II				
17	CP-A CP-B	N3	Gregor	Forward a news regarding to the election of US President. change the subject to decide	CP-B OKA	C4	Hans	Replying the waste debate by indicating a place to dump waste in US.	CP-B OKA	C2 C3	Jeffrey and the Kingfisher in Silent Running II	Dan Decline Dan's viewpoints of "benefit" of GW and raise question of benefit to				

				which way is better to be "green"								criticize the viewpoint				
18	CP-B	C2 N3	Jeffrey and the Kingfisher in Silent Running IIs	Gregor	CP-A OKA	C2	Hans	Sarah	CP-D OKA	C3	Jeffrey and the Kingfisher in Silent Running IIs	BO				
				Disagree Gregor's viewpoints to the election				Correct information				The author "BO" delete posts with Dan's posting (viewpoint of "benefit")and stop responding to OPKA's and Dan's request. Thereafter the OKA, Dan, and other users argued in the discussion all stop responding too.				
19	CP-B	C2 C4 N3	Gregor	Jeffrey and the Kingfisher in Silent Running IIs	CP-D OKA	C4 C6	Hans	a2zresource	CP-C	C4	Green Scene	Allie				
				Respond to challenges from Jeff of his attitude				Accept modification while urging real action				Questioning those experience and observations made by other authors that they are not precise. The thread formally ended				
20	CP-B	C2 N3	Jeffrey and the	Gregor Continue to	CP-B OKA	C2	Hans	joy to the world								

			Kingfisher in Silent Running IIs	disagree Gregor's viewpoint to consider this relying on politician's decisions				Show strong disagreement of the opinion and regarding the post as propaganda from stakeholders								
21	CP-C	N2	Farmer John	Back to the OP*'s topic and respond to OPKA's question	CP-D CP-B OKA	C1	Hans	Zhestokaya Express appreciation for the supporting information from Zhestokaya as "100% true".								
22	CP-C	N2	Ty-Dye		CP-B OKA	C2	Hans	thomas daniel Responding to thomas daniel's challenge with strong words.								
23	CP-A	S C2	a2zresource		CP-B OKA	C1 C2	Hans	Vicky Agree Vicky's viewpoint but stating the "temporary" solution can last at least next 500 years. (Sarcasm)								
24	CP-B	S	Farmer		CP-B	D1	Patrick	OP*								

		C2	John			White!											
25	CP-B	C2 N3	Dan	Jeffrey and the Kingfisher in Silent Running IIs	CP-C	C4 C5	a2zresource	Hans									
				Challenge people's role in government even they refuse to vote				Provide a template letter and advices to write to politician									
26	CP-C	N2	Armando		CP-B	C2	The Hippie Love Gods ~Ô~	Dhiiga Qabsoo Disagree the viewpoint that China gave up embracing the nuclear option									
27	CP-B	D1	Allie	Continue challenge the need to be "green"	CP-B	D1	A. "H.K." G.										
28	CP-B CP-A	S C2	Farmer John	Allie	CP-A CP-B OKA	C2	Hans	Patrick White!									
				Debate with Allie and provide some more information				Continue defending KA own's viewpoint about waste by providing more information									
29	CP-B	D1	Allie	Farmer John	CP-B CP-A OKA	C2	Hans	A. "H.K." G.									
				Responding Farmer John's provided with				Continue defend own viewpoint in debate with									

				strong opinions and information				referencing information									
30	CP-D CP-B	C2 N3	Jeffrey and the Kingfisher in Silent Running IIs	Dan Challenging new comer's (only seen in a few month) viewpoints while clearly stating his intention of "rational discussion again	CP-D OKA	C6	Hans	a2zresource									
31	CP-D CP-B	C2 N3	Dan	Jeffrey and the Kingfisher in Silent Running IIs Stating his disagreement with Jeff's viewpoint and stating his "sceptical thoughts"	CP-B	D2	Dhiiga Qabsoo	Hans Challenging OP*'s opinion by raising more questions and offer negative answers.									
32	CP-B	C2 N3	Jeffrey and the Kingfisher in Silent Running IIs	Dan Continue debate	CP-A	S	The Hippie Love Gods ~Ô~	Indicating that government has already funded some projects regarding to nuclear options									
33	CP-B	C2	Farmer John	Allie Debate with	CP-B CP-A	C4	Hans	Dhiiga Qabsoo									

				Allie about the energy portfolio in US.	OKA			Respond to other questions which bring new wave of debates by introducing more reference information									
34	CP-B	D1	Gregor	Given a cartoon to present current attitude of American to lowering carbon footprint	CP-D OKA	C6	Hans	The Hippie Love Gods ~Ô~									
								Thanks The Hippie Love Gods ~Ô~ for supporting information									
35	CP-B	C1	Dan	Gregor	CP-B	C2 D	Dhiiga Qabsoo	Hans									
				Respond to the cartoon and state that cartoon correspond to the current US attitude				Continue challenging and debate									
36	CP-C	N2	Ambrosia {Hunted}	Back to the main theme of OP* again	CP-A CP-B OKA	C4 C3	Hans	Dhiiga Qabsoo									
								Continue debate and try convincing other doubters about the nuclear option with more data and									

							information. Ask these doubters (other users) if they have better suggestion to get rid of fossil fuel?										
37	CP-B	D1	Allie	Strong opinion about how GW argument "disturb" others who refuse to believe GW and needs to be green.	CP-A	N	Sinkisschic	Provide neutral information without showing supporting or decline.									
38	CP-B	D1	Allie		CP-B	D	shawn	Refuse to support OP's opinion or networking									
39	CP-C	N2	I am no human..... .i am nothing...	Back to theme of being "green" again	CP-D OKA	C6 C5	Hans	shawn Exclude shawn from discussion									
40	CP-C	N2	dylan.	Ask for more radical approach of abandon job to grow food by oneself.	CP-B	D N3	Dhiiga Qabsoo	Hans Still decline OP* and change subject to water conservation									
41	CP-B	D1	Verminator	Decline the need to be green	CP-B CP-A	D C2	Dhiiga Qabsoo	Hans Defend his viewpoint and argument with some more info.									

42	CP-B	D1	Scott Saturday	Using sarcasm as "green" behaviour but actually challenge the argument of GW threats and the need to be more environmental friendly	CP-B CP-A OKA	C4	Hans	Presenting Calculation energy needs and costs to convince those doubters.								
43	CP-B	N2	♥ Amanda ♥		CP-B	C2 D	Dhiiga Qabsoo	Hans, all Questioning Hans' calculation and supporter's viewpoints.								
44	CP-B CP-C	N2	Stan	Share experience and discuss about public recognition of the GW topic in the past and present day	CP-B	D2 D1	JAKE									
45	CP-C CP-A	N2	Mark O		CP-B CP-A	D	Randy									
46	CP-C	N2	Abby		CP-D	N3 C6	a2zresource	Attack persons who regard the discussion among the group members as meaningless.								
47	CP-B	N3	American Honey	Change subject to discuss the children raising	CP-B	D	Sara	Decline while recognizing the importance of energy portfolio								

							in different area										
48	CP-B	D1	Weirdcrazy von die Nocht	Totally decline the need of being green by being not green as much as possible	CP-B OKA	C1 C2 C4	Hans	Dhiiga Qabsoo Continue debate but achieve some consensus that the environment and the context of nuclear option needs to be changed if the option wants to be promoted									
49	CP-B	C2 N3	Weirdcrazy von die Nocht	a2zresource Decline a2zresource's idea of filtering water but recognize the risk of directly drinking tap water	CP-B CP-A OKA	C2	Hans	Randy Arguing costs of nuclear option is not higher than others.									
50	CP-C	C2 N3	a2zresource Weirdcrazy von die Nocht	Remind that the risk of drinking tap water without filtering could be even higher	CP-D OKA	C6 C1	Hans	a2zresource									
51	CP-C	N2	Ⓟ Airam ✕		CP-A	C2	Hans	adrenaline rush									

					CP-B OKA	C5		Depreciate challenges by arguing that they did not do enough readings.									
52	CP-C CP-B	N2	sweetness :		CP-B OKA	C1	Hans	Sara Agree with Sara's concept of energy portfolio while insisting the importance of nuclear option in portfolio while not excluding the development of other options									
53	CP-B	N2	K.Dawn;		CP-B CP-A OKA	C4	Hans	RealityQueen Replying those challenging questions.									
54	CP-B CP-A	N2 N3	Scott Saturday	Contending that climate change is a scam and the claim of climate change is based on highly unreliable computer models	CP-B	D C2	Christian(tm)	Hans									
55	CP-B	C2	a2zresource	Scott Saturday	CP-B OKA	C2	Hans	Christian(tm) Continue to									

				Disagree Scott's viewpoint through questioning his information sources.				defend the supply of uranium									
56	CP-B	C2 D1	Scott Saturday	a2zresource Disagree that ONLY US scholars with their models are qualified to explain GW. In advance challenge the opinion leader role of a2zresource in this forum	CP-B	D1 D2	Tagle										
57	CP-B CP-C	C2	a2zresource	Scott Saturday Defending his statement and indicate that the discussion have been happened in another threads so that his opinions and knowledge have been consolidated in other threads. End of Discussion	CP-B OKA	C1 C2	Hans	Tagle Agree that in Australia there may be better solution but not the case in US. Continue to defend his viewpoint on wastes.									

58				CP-A OKA	S	Hans	Provide supporting information of uranium supply								
59				CP-A OKA	S	Hans	Provide supporting information of water desalination benefits								
60				CP-B	S N3	Robb	Hans Support nuclear and optimistic water solutions, change subjects to whether GW are caused by human and to whether we can survival.								
61				CP-B CP-D OKA	C5	Hans	Robb								
62				CP-A	C2	a2zresource	Hans Disagree statement of sufficient Uranium supply								
63				CP-D OKA	C2 C6	Hans	Admit the challenge exist based on the supply number and cost of yield Uranium and state that								

							further research will be needed.								
64					CP-B	S	JB								
65					CP-B CP-A	C1	Hans	Partly agree a2zresource's challenge that the huge amount of cost but insist worthy comparing with status quo (dependent on Middle East)							
66					CP-B	D C5	a2zresource								
67					CP-A OKA	C3	Hans	Challenging a2zresource's information but consult his approval of his knowledge							
68					CP-A	C4 C5	a2zresource	Explain Han's misunderstanding of the numbers, showing clear leadership by offering correction of information							
69					CP-B	C1	Hans	a2zresource							

					OKA		Accept a2zresource's information and consult him where to find more reading material regarding to the topic								
70					CP-A	C4 C5	a2zresource	Hans Offering more information for Hans' request							
71					CP-B	C3	Evo (E.O.A)	Raise questions to all users about another option (human power)							
72					CP-B	C4 C5	a2zresource	Evo (E.O.A) Acknowledge Evo (E.O.A) proposed option but indicate that the option cannot cover all energy consumption. Prestige answer "drawing our attention" in the end showing the clear leadership of the group							

73					CP-B	D	ECOVISION										
74					CP-B OKA	C2 N3	Hans	Evo (E.O.A) Question the wide application of human power by pointing out several potential difficulties. Subject clearly changed after a2zresource clearly present information of nuclear option and Hans stop arguing.									
75					CP-A	C5	a2zresource	Offer updated information about the application of nuclear energy and military usage. End Discussion									

3. Sampling KA Threads in Transition Town Forum

Coding for KA Postings (Articles & Replies)	KA ID: SteveAtkins			KA ID: Treachlemin			KA ID: Benbrangwyn			KA ID:		
	Top Ranked Thread Title:			Top Ranked Thread Title:			Top Ranked Thread Title:			Top Ranked Thread Title:		
	Hopenhagen to Brokenhagen at Copenhagen - "Where do we go from here?"			Starting out?			Collaborative approach: comments invited.					
	Code: (A-T)	ANS:	Note:	Code: (A-T)	ANS:	Note:	Code: (A-T)	ANS:	Note:	Code: (A-T)	ANS:	Note:
	KP-B	S N1	Opening question to trigger discussion	KP-D	S N1	Opening question to learn experiences	KP-C KP-D	S N1	Invite comments of Transition Software Platform, the collaborative approach based on IT. Encouraging more opinion leaders to speak out.			
Repliers List (SN)	Code: (A-T)	ID:	ANS: Note:	Code: (A-T)	ID:	ANS: Note:	Code: (A-T)	ID:	ANS: Note:	Code: (A-T)	ID:	ANS: Note:
1	CP-D OKA	C6	SteveAtkins Adding terms for social networking	CP-C	N2	citrus OP* Stating experiences and suggest a feasible approach (smaller area)	CP-B	N1	Peter OP* Raise some questions regarding to measuring index and feasibility in practice.			

2	CP-B	S	Trip		CP-C CP-D	C1 N2	csquirrel	OP*, citrus	CP-A CP-C	S	Tomma100	OP*				
				Presenting attitude with providing hyperlink of another threads in external website.				Supporting previous replier's viewpoint for answering OP*				Give support by sharing experiences in software development.				
3	CP-B	S C3	Nchadborn		CP-D	C1 C6	durruti	csquirrel	CP-B CP-D	S	Tomma100	Offer idea of "marketplace" function for the supposed platform				
				Asking to find other local groups' links.				Asking for presentation from Chris (csquirrel)								
4	CP-B	S C2	DaveDann	nchadborn	CP-D	C1 C6	JudithN	durruti,csquirrel	CP-B	S	pamelagray	Support and remind all members about the tight time frames				
				Showing ideas of supporting OP*, but disagree other repliers' viewpoints				Follow the idea of asking for Chris presentation durruti								
5	CP-B	S C2	JohnMason	DaveDann	CP-D	C1 C6	HJG	csquirrel	CP-A CP-B CP-C	S	MakeHayJez	Offer supporting information and resources, and experiences of past cases.				
				Respond DaveDann's viewpoints				Follow the idea of asking for Chris presentation durruti								
6	CP-B	S C2	Nchadborn	DaveDann, OP	CP-A CP-D	C6	BarryGraham	Communicate to provide stuff to others (presentation)	CP-B CP-A CP-C	S	spiritquest	Provide some ideas of software development, including the goal for fulfil group needs, based on				
				Respond DaveDann's viewpoints – forming a debate of												

				approach								professional perspectives and past experiences				
7	CP-B	S C2	DaveDann	JohnMason, nchadborn Express disagreement of John's & Neil;s view	CP-C CP-B	C6 N3	Eva	Stating experiences and past debates of approaches in her group and her personal opinions	CP-B OKA	C5	benbrangwyn	Remind thread followers to check current pages (as goal, requirement, approach to build a platform tool) before posting comments				
8	CP-B	S C2	JohnMason	DaveDann Respond Dave	CP-D	C3	Eva	Asking Rob's comment about up to 10,000 scale	CP-A OKA	C5	benbrangwyn	Remind launch date of the project and expected time table				
9	CP-B	S C2	DaveDann	JohnMason, nchadborn Ending debate with the idea of diversity of action, still show disagreement	CP-C CP-D	N2	RuthWallsgrave	Sharing experiences, show interests of presentation	CP-D	C1 C6	MakeHayJez	Benbrangwyn (OKA of OP*) Admit misunderstanding of KA's proposed idea but clarify that other communicators simply want to help the project work.				
10	CP-B OKA	C2 C5	SteveAtkins	DaveDann, ALL Express disagreement of Dave's opinion AND End the debates	CP-A CP-D	C4 C5	csquirrel	Sharing presentation material with others	CP-C CP-D CP-A	S	stevecreedon	Support the project as a web application developer				
11					CP-D	C6	mummydeb	OP*, Eva	CP-B	C5	garyalex	Stating strong				

					CP-C			Networking and sharing experiences in Swindon	CP-D			opinions for the project development; indicating some potential opinion leaders including "TT Core Groups", Ben, Rob, Sophine, Naresh who could lead the TT.				
12					CP-C	C4	Jane	Eva Share experiences in Bristol	CP-D OKA	C1	Benbrangwyn	Agree with Gary (replier)'s input and positively respond to enhance networking with Gary.				
13					CP-B CP-D	C3	Subhasha	Jane, Mummydeb Sharing experiences and feelings of promoting TT in Sweden (Archipelago), then asking questions for promotions in practices.	CP-B CP-C	N1	Tomma100	Op*, garyalex Questioning the need of this platform, which was proposed by the OP* KA and request comments in the thread. Propose an improved approach for networking				
14					CP-C CP-D	C5 N3	Citrus	Eva Guiding other users to find material in handbook, introducing skills	CP-A	S	Tomma100	Still show support of the OP*KA and provide information regarding to the discussion				

										of motivating groups in Swansea, sharing plan, approach and expectations. Optimistic to the possible result by applying the approach, seeking supporting evidence or networking about the approach but without responses.								
15									CP-B CP-C	D	CathyKing	Confuse about the goal of the project, and request opportunity for networking – decline considering the idea to avoid duplication efforts with belonging groups. Propose more communication with others about the idea.						
16									CP-D OKA	C1 C4 C5	Benbrangwyn	CathyKing, garyalex	Agree with Cathy's					

											comment and promise to revise project goal, reject the idea of clusters of requirement proposed both by Cathy and Gary.				
17								CP-D	C1	garyalex	Tomma100, CathyKing Support Tom's idea, agree with Cathy's comment				
18								CP-B	N1	rimu					
19								CP-C	C4	jdaviescoates	rimu Reply question raised by Rimu and stating current situation of TT website and relevant project				
20								CP-C CP-D	C5	garyalex	Stating experiences of "virtual conference" approach, and request supporting of the approach by peer networking				
								CP-B CP-D	C1 N1	josiah	garyalex Support gary's ideas as part of				

										the solution of approach				
								CP-B CP-C	C2	dahacouk	Disagreeing picking a CMS solution before fully understand the requirement			
								CP-B	C4	dahacouk	jdaviescoate s Discussing approach to build the CMS based on needs.			
								CP-A CP-B	C2	jdaviescoate s	dahacouk Discussing suitable solutions of CMS and offer more detailed information. End with consideration of needs of a starting out group.			

4. Sampling KA Threads in LocalSustUK Forum

Coding for KA Postings (Articles & Replies)	KA ID: John Bone			KA ID: ferrand			KA ID: Jamie Saunders			KA ID: DaveHampton-CarbonCoach									
	Top Ranked Thread Title:			Top Ranked Thread Title:			Top Ranked Thread Title:			Top Ranked Thread Title:									
	Home owners Are Not Ready For ZeroCarbon Homes, Research Shows http://groups.yahoo.com/group/localustuk/message/9573			EU forms algae group, plans first conference http://groups.yahoo.com/group/localustuk/message/11552			Living With Environmental Change http://groups.yahoo.com/group/localustuk/message/11712			Tony Blair on CC http://groups.yahoo.com/group/localustuk/message/9283									
	Code: (A-T)	ANS:	Note:	Code: (A-T)	ANS:	Note:	Code: (A-T)	ANS:	Note:	Code: (A-T)	ANS:	Note:							
KP-A	S	Forward a news report regarding to current status of home owners and house builders attitude toward zero carbon schemes.	KP-A	S	Notifying progress of EU algae group and the first conference	KP-A	S	Notifying the announcement of research projects to come under the Living With Environmental Change programme. Provide links of these projects and programme in post.	KP-A KP-B KP-D	S	Forward Tony Blair's speech at G8 and give high recognition of the speech. Raise questions about politicians and hope raising more discussions and actions.								
Repliers List (SN)	Code: (A-T)	ID:	ANS:	Code: (A-T)	ID:	ANS:	Code: (A-T)	ID:	ANS:	Code: (A-T)	ID:	ANS:							
1	CP-B	S N1	Christine Collins	OP*	Partially support	CP-A	D1	Frank Holland	OP*	Supporting	CP-B	D1	Paul@TNC	OP*	Annoying about	CP-B	N2	Derek Deighton	DaveHampton n Reply OP* by

				ideas of zero-carbon homes and cast doubt regarding to health risks of living in "airtight" house.				OP*'s report of algae progress but offer more information about industrial development of algae biofuel which has been questioned by market and VC.				KA's (Jamie Saunders') postings keep promoting "government's propaganda". Arguing the OP* also presented how government "waste" money in funding useless co-ordination bodies.				Fred Starr's comments. Criticize Tony Blair's past actions
2	CP-B	S C4	Chris Goodall	Christine Collins	CP-A OKA	C2 C4	ferrand	Frank Holland	CP-B	S C2	Roy Tindle	Paul@TNC	CP-D	C6	Dave Hampton - Carbon Coach	Networking with other users
				Replying Christine's questions and explain good design will overcome the problem.				Introduce and summarize another report about using microscopic organism as major direction of solving fuel crisis.				Lend support to Jamie (KA of OP*) and recognize KA's effort despite the information could not be relevant to some users' focuses in the group.				
3	CP-B	S C4	Bob Irving	Christine Collins	CP-B	C2 N3	chrismccoys3	Ferrand, Frank Holland, all	CP-B	S C2	Nico Jabin	Paul@TNC	CP-B CP-A	N2	David Oakley-Hill	OP*
				Replying question by explaining practical approaches.				Present different approach of solving fuel crisis and warn the danger of focusing on tech				Support values of KA's postings and criticize Paul's comment				Stating proposed approach and share practical tips.

							development; change to the subject of arguing tech development and behaviour change									
4	CP-B	C3	Christine Collins	Bob Irving	CP-B CP-D	C1 C6	Dave Hampton	chrismcco3	CP-B CP-A	D1	Paul@TNC	Stating a sense of climate opinion as "10:1 majority" support KA's posting activities and stating he wil "suffer it in silence". Insisting the funding is a waste and questioning some users could work for the similar Quangos which get paid based on these funding and ignore the urgency of real actions. Introducing a Transition Town group's website to emphasize the need of urgent actions.	CP-B	N2 C2	Christine Collins	David Oakley- Hill
				Raise more questions about the term "airtight" and cast more doubts about its purpose in zero carbon home and any possible effects regarding to health.				Networking people who choose behaviour change (quit flying) and introducing a facebook group.								Disagreeing David's opinion of corporation pressure (votes instead) and stating her perceived reasons of the politician's "truth-telling" before retirement
5	CP-A	S C4	paul johannsen	Christine Collins	CP-D	C1 C6	chrismcco3	Dave Hampton	CP-B	N3 C2	Roy Tindle	Paul@TNC	CP-B	C2 N2	Roy Tindle	Christine Collins, David Oakley-Hill
				Respond to				Approve the networking of group for				Change subject to discuss the TT actions and summarizing				Recognize Christine's response but

				Christine's question and point out that the term is not precise				behaviour and lifestyle change				relevant energy information in TT's website. Criticizing the scientific value of the TT website information and Paul's manners. Figuring out that Paul show less "humility" and respects to others in the group.				disagree the attack of shadow body. Indicate that politicians refuse to make real change. Questioning David's approach by taking growing vegetable at local UK as an example to illustrate the controversial issues. Also stating that change cannot be simply a campaign for asking people to "do their bit".
6	CP-B	C3	chrismccooy3	paul johannsen, All Raise more questions regarding to the use of airtight home and want to learn more information, the cost and benefit with consideration of "who is paying the bill", the	CP-A OKA	C2	ferrand	Terry de Winne Emphasize on the application of algae and its importance in GHG reduction	CP-B CP-A	N3 C3	Brian Forsyth	Paul@TNC, all Stating motivation of joining the group is that it is supposed to be hosted by the SDC, as an independent organization from government. Brian is also curious if	CP-B	N2	Chris Keene	Christine Collins Stating the influence from corporation and the threaten of their global roots.

				possible effects either positive or negative, and the possible retrofitting periods.							other users noted this					
7	CP-B	C1 C3	Christine Collins	paul johannsen	CP-B	C2 D1	Terry de Winne	Ferrand (OP*)	CP-A CP-B	S C2	V.E.Hands	Jamie Saunders, Paul@TNC	NP-B	C2 N3	Christine Collins	Chris Keene
				Accept the knowledge offered by other repliers, and raise other detailed problem in practice				Accept Ferrand's argument but point out the huge investment of the approach while indeed other alternatives exist				Support OP*				Defend viewpoint by Insisting the importance of votes to politicians. Aware the subject in debate has been obviously changed.
8	CP-A	S C4	paul johannsen	Christine Collins	CP-A CP-C OKA	C2	Ferrand	Terry de Winne	CP-B	S C2	Anja Leetz	Paul@TNC	NP-B NP-A	C2	Clare Brass	Roy Tindle
				Indicate some possible approaches to fix practical problem raised by Christine.				Provide more supporting information and share experiences.				Support OP* and saying Paul can delete or "leave the forum" at anytime				Disagree Roy's attitude toward urban farming by forward information and indicate research report of vegetable seeds sale soaring.
9	CP-B	C3	Christine Collins	paul johannsen, query to all	CP-B CP-A	S	paul johannsen	OP* (Ferrand), chrismcco3	CP-B	S	mooresv	All	NP-B	C2 N3	Spillard, Candida	Clare Brass
								Acknowledge				Support KA and his				Questioning and forming a new

				Continue to query more questions in practice and state her current problem.				OPKA's effort and information, and question Chris's approach without contacting new tech of organism				OP* posting of government's info, stating all useful info are welcome.				debate of urban farming.
10	CP-B	C4 C3	Frank Holland	Christine Collins	CP-A	C1	Ferrand	paul johannsen					CP-A	C2 C4	Clare Brass	Consulting information about urban farming project to respond those challenges raises by other repliers,
				Replying queries and ask questions to challenge				Recognize Paul's viewpoint and provide samples of application								
11	CP-B	C2 C4	chrismccoy3	Christine Collins, Frank Holland	CP-B	D1 C2	chrismccoy3	OP*, paul johannsen					CP-B	N3 C1	Helen K. Reardon	Acknowledge the value of discussions in the thread despite the changed subject of original discussion and figuring out the common ideas with local transition town group (about the urban farming).
				Continue to challenge Christine's question and argument (about health risks)				Argue the approach he took as widely review of current civilization and the distance with "sustainable living".								
12	CP-B	D1	Richard Watson	Christine Collins	CP-B	C2	David Murray	chrismccoy3					CP-A	C2	Clare Brass	Roy Tindle
				Disagree Chris'				Offer more information regarding to urban farming								

				Challenging viewpoints of “new house better than old house in airtight” and stating that new house use new adhesives and emit more VOCs.				viewpoint of sustainability, indicating the approach should be more feasible.							
13	CP-B	C1	paul johannsen	Richard Watson Agree with Richard’s viewpoint and stating that no specific method can be used in all different contexts.	CP-B	C2 N3 D1	chrismccoy3	David Murra, Terry de Winne Present strong opinion disagreeing to consider people’s opinions and ideas while the “truth” cannot be agreed or disagreed. The debate of the sustainable development has formed and the subject clearly changed from the OP*. Replying Terry by disagreeing massive producing algae fuel (Back to OP* theme).				CP-A CP-B	C2	Roy Tindle	Clare Brass Provide more information of “food mile” while indicating no best approach to suit all different areas and those results of urban farming in carbon emission reduction is yet awaiting to be further explored based on lifecycle assessment thoughts.

14	CP-A	C1	Andrew Jeffrey	paul johannsen	CP-B	C1	Dave Hampton	David Murray									
				Add some information regarding to BRE.				Show support									
15	CP-A	C4	Liz Mutch	Christine Collins	CP-B CP-A	C1	simontgoldsmith	David Murray									
				Introduce a book regarding to the topic and some building material information				Show support to David's viewpoint and indicate similar approach taken by Natural Step Framework.									
16	CP-B	S C5	paul johannsen	All, OP*	CP-D	C3	Bob Irving	Raising question about considerations of personal actions and its relationship with possible effects for other species or ecosystem									
				Questioning the NHBC's effort comparing the contribution of BRE, stating challenges to overcome and encourage others to act immediately while solutions could not be "one fit all"													

17	CP-A OKA	C4	John Bone	Christine Collins	CP-B	C2 C5	paul johannsen	chrismccoy3									
				Clarifying the terms "airtight" by offering more information, and stating more information resources such as regulations.				Strong opinion of disagreeing Chris' opinion and "clarifying" the purpose of the forum is seeking consensus for sustainable development, not stating higher entity and saying others' viewpoints are "incorrect".									
18					CP-A CP-D	S	ferrand	Frank Holland									
								Provide experiences in plant and references about CCS and extracting co2 from flue gases.									
19					CP-B	C2	Terry de Winne	chrismccoy3									
								Replying Chris' post with ironic expression of "expecting his proposal for continuing human race" and disagree his approach.									