

**Networks, Social Influence, and Plans for Dealing with Climate Change:
The Effects of Personal Network Ties to Environmentalists
on the General Public in Canada.**

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ABSTRACT

This paper examines the social influence of environmental social movement organization (ESMO) members on the general public. It sets out to answer the question, “For members of the general public, does having a social network tie to an ESMO member influence one’s concern and plans for dealing with climate change?” This paper draws upon data from two social surveys. The primary data set of interest consists of social survey data collected from a probability sample of the general public in Canada (N = 1007). A comparative data set collected from a probability sample of environmental organization members across Canada is also considered (N = 1148). With regard to this latter study, data from ESMO members were collected regarding their frequency of communication about environmental issues, and the frequency by which they encouraged others to engage in environmentally friendly activities (as well as on other topics). The findings provide evidence that ESMO members frequently engage in these forms of communication, and thus bolsters the plausibility of “social influence effects” resulting from network ties. Multivariate analyses are undertaken (to analyze the general public data), using multiple regression, and logistic regression analyses, to develop models which explain concern about climate change amongst the general public, and personal plans to take action about climate change among the general public. The major finding of this study is that the number of ESMO members that one has ties to increases the likelihood that one has a plan to deal with climate change. This effect holds even when ESMO membership status is controlled for. In other words, amongst non-ESMO members, the greater the number of ties they had to ESMO members, the more likely they were to have a plan to deal with climate change. We argue that this is a “social influence” effect, whereby environmental organization members disseminate information and moral suasion. Findings are discussed in the context of the social movements, social capital, and social network literatures. Implications for environmental organization strategizing are also discussed.

Networks, Social Influence, and Plans for Dealing with Climate Change: The Effects of Personal Network Ties to Environmentalists on the General Public in Canada ¹

INTRODUCTION

This paper uses data from a nation-wide survey of the Canadian general public. It examines the claim that one social factor that influences concern about climate change, and whether or not one has a plan for dealing with it, is the number of ties that individuals have to ENGO members. It is argued that information and social influence flow through such ties. In the context of the social movements and social capital literature, it is argued that the “bridging ties social influence effect” is one potential outcome of social movement mobilization.

The Problem of Global Warming.

Climate change and its consequences are potentially amongst the biggest challenges facing humankind (Coward and Weaver 2004, Gore 2006, IPCC 2007). There is a high degree of scientific consensus that climate change is occurring, and that it is primarily a consequence of human actions (Flannery 2005, IPCC 2007) – namely the production of green house gases (GHGs). One step in attempting to deal with climate change was the signing of the Kyoto Protocol, an agreement made under the United Nations Framework Convention on Climate Change (UNFCCC), whereby participating countries committed to reduce their emissions of GHGs. However, not all nations signed the protocol and/or ratified the protocol, and even

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amongst those who ratified the protocol, many nations have been unable to meet their commitments under the accord.

The Intergovernmental Panel on Climate Change (IPCC) has concluded that, "most of the observed increase in globally averaged temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic greenhouse gas concentrations." (IPCC 2007)

Global warming is caused by a process that has been term "the Greenhouse effect". This is a process by which infrared radiation warms up a planet's surface. The earth receives radiation from the Sun. About 70% of solar radiation is absorbed by the Earth, resulting in warming of lands, atmosphere, and oceans. About 30% of radiation is reflected back into space. The Greenhouse effect refers to the process by which the atmosphere captures and recycles energy emitted by the Earth's surface. Greenhouse Gases are key to this process. The major natural greenhouse gases on earth are water vapor, carbon dioxide, methane, and ozone. The atmospheric concentrations of carbon dioxide and methane have increased dramatically since the beginning of the industrial revolution. About three quarters of the increase in carbon dioxide from human activities has resulted from the burning of fossil fuels. Most of the rest is a result of land use changes such as deforestation. Average global temperatures are believed to be rising as a result of greenhouse gases and the resultant greenhouse effect. Indeed, natural scientists predict that even if greenhouse gases emissions were stabilized at a lower level than today, the inertia of the system would result in temperatures continuing to rise for a considerable period of time. It is believed that the rise in average global temperatures has or will have a number of other climactic effects. Some of these include the melting of glaciers and the resulting rise in sea levels, changes in the frequency and intensity of extreme weather events, changes in agricultural

production, reduced fresh water availability in summer time, species extinctions, and increases in the spread of certain diseases and pests.

As noted above, one step in attempting to deal with climate change was the signing of the Kyoto Protocol, an agreement made under the United Nations Framework Convention on Climate Change (UNFCCC). The treaty was negotiated in Kyoto Japan in December 1997. Canada ratified the treaty in 2002. Through the treaty participating countries (in the developed world) committed to reduce their greenhouse gas emissions by a collective average of 5% below their 1990 levels. Under the Liberal Government, Canada ratified the Kyoto Protocol, but failed to implement an effective plan to meet Kyoto Targets. The Conservative Party came to power in a minority government in 2006, and in contrast to the Liberals, they openly and vigorously opposed the Kyoto Accord. In the past several years there has been a battle between the Conservatives and the Opposition parties regarding the implementation of Kyoto (see Simpson et al. 2007 on Canada and climate change policy).

Individual Versus Systematic Solutions.

The Kyoto Protocol and related policy instruments can be thought of as systematic approaches for dealing with climate change. Systematic approaches, as such are very important. However, a substantial amount of good can also be done through individual level approaches (such as energy conservation, changes in behaviour). And indeed, these two levels of solutions are not entirely disconnected. Systematic policy initiatives can be undertaken to try to influence individual behaviors (e.g. incentives), and individual level behaviors (e.g. such as voting) can influence systematic solutions. This paper focuses primarily on the individual level.

Research Questions.

The general research questions that this paper will explore are: “What explains individual levels of concern about climate change?” and “What explains whether or not individuals have a personal plan to deal with climate change?”. More specifically, this paper focuses on social networks, and whether or not having ties to environmental movement organization members affects concern about climate change, and plans to deal with climate change.

LITERATURE/THEORY

Sociological Research on Climate Change

With regard to climate change, social researchers have examined: concern about global warming (Dunlap 1998), knowledge and understanding (Brechin 2003), risk perception (Heinrichs and Gruenberg), Support for the reduction of GHGs (O’Connor 2002), vulnerability and policy support (Zahran 2006), and meanings that global warming have (Henry 2000).

Of specific interest to the present study is past survey research on the general public concerning climate change. In this regard, Dunlap (1998) reports results from a 1992 Gallup survey conducted in six nations (Canada, USA, Mexico, Brazil, Portugal, and Russia). At that time the publics in these nations perceived that global warming was a problem – but was not as serious as ozone depletion or rain forest destruction. Results also showed that in 1992 the public had a limited understanding about the perceived causes and consequences of global warming. More specifically related to the present study, in 1992 in a survey of 1011 Canadians, 58% of the general public reported that global warming was a very serious problem. Thus even by 1992, a relatively high proportion of the public reported being concerned about global warming.

O’Connor et al. (2002) conducted a mail survey of Pennsylvania residents. They found that respondents who could accurately identify the causes of climate change, and who expected

negative consequences from climate change were more likely to support both government anti-fossil fuel initiatives, and voluntary actions. People who thought that environmental protection would threaten jobs for people like the respondent, limit personal freedom, or harm the economy, were less supportive of such initiatives and voluntary actions.

Finally, Brechin (2003) conducted survey research in 2001 comparing international public opinion and knowledge about climate change and the Kyoto Protocol. He notes that while there is a large degree of scientific consensus about the causes and potential consequences of global warming, a substantial proportion of the citizenry of many nations harbor considerable uncertainties about the problem. In a 2001 survey, the most knowledgeable public were the citizens of Mexico – of whom only 26% of respondents correctly identified burning fossil fuels as the primary cause of global warming. Results also showed a split between U.S. citizens, and European citizens regarding the previous Bush administration's decision to withdraw from the Kyoto protocol, with the U.S. public much more supportive of the decision.

In sum, while there has been some past survey research that examines concern about climate change and support for climate change policy, and examines various socio-demographic, national comparative, and value/attitudinal variables, no one has yet examined the role of interpersonal social networks and social influence on individual concerns and responses to climate change.

Social Networks

There are a variety of theoretical arguments for why social networks might play an important role in influencing concerns and plans about climate change. One set of arguments is to be found in the social capital literature. Putnam defines social capital as "features of social

organization such as networks, norms, and trust that facilitate coordination and cooperation for mutual benefit." (1993:36) A useful distinction is made in the social capital literature between "bonding social capital" which refers to linkages which are mainly or exclusively among members of the same group, and "bridging social capital" in which linkages exist amongst members of different groups. Social capital "is defined by its function. It is not a single entity, but a variety of entities having two characteristics in common: They all consist of some aspect of social structure, and they facilitate certain actions of individuals who are within the structure" (Coleman 1990, p. 302). Social capital can be considered social goods, such as information, values, and social influence, which are produced and dissipated through social relations. There has been some debate about whether social capital is a collectively- or individually-held resource. One perspective on social capital looks at the relationship between the social ties of whole networks and collective expressive outcomes; expressive outcomes are emotional or symbolic actions that are ends in and of themselves, such as the formation of values or norms (e.g., Coleman 1988; Putnam 1993, 1995, 2000). Another perspective views social capital as a resource that is embedded within personal social networks that have instrumental outcomes. Instrumental outcomes are rational actions that are often in one's self-interest, such as social mobility (Lin 2001); within this perspective social capital resides within the realm of the individual as a function of network capital, or "the form of social capital that makes resources available through interpersonal ties" (Tindall and Wellman, 2001, p 278). Despite these differences, there is general agreement about the important contribution that social networks make to the creation and transfer of social capital. Within the context of the present study it can be argued that network ties from environmental organization members to non-members serve as

a type of bridging tie. Further it is argued that information, values, and social influence flow through these ties. In this context, being concerned about climate change and being prepared to do something about it is a “civic duty”.

Granovetter (1973), in discussing the role that informal social networks play in community organization, raises the question: "Why do some communities organize for common goals easily and effectively whereas others seem unable to mobilize resources, even against dire threats." Granovetter suggests that for a community to have many weak ties that bridge different subgroups (or cliques), there must be several distinct ways or contexts in which people may form them. In developing these insights Granovetter constructs a rough principle that might be used for future investigation: the more local bridges (weak ties that link otherwise sociometrically distant cliques) in a community and the greater their degree, the more cohesive the community and the more capable it is of acting in concert. In recent years a number of authors have focused on the role that social networks play in fostering collective action. This work is intertwined with the formentioned social capital perspective, which sees social capital is seen as a resource that facilitates collective action. For example, communities who have greater social capital -in the form of integrating social networks-are better able to mobilize against opponents and to organize to positively adapt to change.

A substantial literature also exists in the social movements area that examines networks and various aspects of social movement participation. What is often crucial to social movements and collective action, according to social movement scholars, is whether or not those holding grievances or pro-movement values become organized, and mobilized for collective action (Tilly, 1978). With regard to values, Klandermans and Oegema (1987) and others, have noted

that pro-movement values determine an individual's latitude of acceptance or rejection of a movement, but do not determine their initial recruitment or ongoing participation. People who do not support the values of a social movement will not join or participate. However, amongst the people who support the values of a given social movement, only a small proportion will get involved. Past research (e.g., Klandermans and Oegema, 1987) has shown that it is contact with an agent of recruitment (such as a network tie) that distinguishes those who hold pro-movement values and get involved, from those who hold pro-movement values but who fail to participate (McAdam 1986). In recent years there has been considerable interest in how personal networks affect people's participation in collective action and social movements (e.g. see Diani 1995; Broadbent 1998; Ansell 2001; Diani and McAdam 2003).

In the context of social movements, networks are important for recruiting individuals into the movement (Klandermans and Oegema), for reinforcing ongoing participation (Tindall 2002), for building coalitions (Diani and Bison 2004), and for diffusion processes (Oliver and Myers 2003). The above discussion presents social network variables as independent variables influencing mobilization and related processes. However, network structures can be seen to be reciprocally influenced by other variables such as activism, and identification (see Tindall 2004). For instance, the more active one is, the more opportunities they have to develop relationships with other activists. Indeed Diani (1997) has noted that network structures may be one consequence of mobilization and social movement activity (and a form of social capital). Relatedly, several scholars have noted that a gap exists in the social movement literature regarding “outcomes” of social movements. Social movements research has tended to focus on processes of movement mobilization, while neglecting the systematic study of social movement

effects (Giugni 1998; Giugni 1999). Where effects research has occurred, it has generally been limited to evaluating social movement effects in terms of changes in political policy. However, social movements also work towards changing public attitudes and behaviours, and as Diani notes, there can be other outcomes as well such as the creation of social capital as a consequence of mobilization. Drawing upon these ideas, Cormier, Tindall, and Diani (2007) have examined networks ties as an “outcome” by examining data collected using the position generator (Lin, Fu, and Hsung 2001, Lin and Erickson 2008) on a sample of environmental movement members, and examining the relationship between individual activism (as an independent variable) and diversity of occupational ties (as a dependent variable). Their analysis shows that controlling for an extensive suite of socio-economic and demographic variables, level of individual activism is a strong and highly significant predictor of diversity of occupational ties (to other movement members). Thus theory and empirical research provides evidence that one outcome of social movement mobilization is the creation of network ties, and the related observation that such ties can serve as a type of social capital.

Other Social Network Arguments.

Within the social network literature more generally, there are a variety of theoretical arguments that describe complimentary processes (to those noted above). There is a substantial literature on “social networks and social influence” (Friedkin 1998, Marsden and Friedkin 1993, Erickson 1988). This literature argues that values, attitudes, norms, opinions, and behaviour are in part of function of social influence processes that occur in the context of social network. Different types of models have been developed, including those rooted in social cohesion, and structural equivalence. Accordingly, the theoretical argument in the present paper

is that bridging ties from environmental organization members to non-environmental organization members serve as a conduit for social influence concerning attitudes and behaviors concerning climate change.

Another complementary literature, is that on networks and diffusion. A variety of scholars have argued that social networks are implicated in the diffusion of various social phenomena including ideas, information, and innovation (Coleman, Katz, and Menzel 1966, Burt 1987, Valente 1995, Strang and Soule 1988). Again, the notion that information is diffused through social networks is complementary to the basic theoretical assertion of this paper, that bridging ties from environmental organization members to non-environmental organization members serve as a conduit for social influence concerning attitudes and behaviors concerning climate change. Indeed, purchasing carbon credits, buying a hybrid car, trying to develop a carbon neutral family or workplace budget are all examples of innovations in behaviour related to the threat of climate change. Often people learn about such innovations through their social network ties with others. In other instances people may learn about innovative behaviour through the media, but evaluate that information through discussion with others in their personal networks (Knoke 1990).

HYPOTHESES.

In this study we examine four formal hypotheses. Thematically, there are really only two: one dealing with the effects of network ties on concern about climate change, and one dealing with the effects of network ties on personal plans to deal with climate change. However, these are stated at both the zero order and multivariate level, which doubles the number of

formally stated hypotheses. The hypotheses stem directly from the networks and social capital/social movements (and related literatures) discussed above. They are:

H1a. Concern About Climate Change is Positively Associated with Number of Social Network Ties to ENGOs.

H1b. Concern About Climate Change is Positively Associated with Number of Social Network Ties to ENGOs net of ENGO membership and other control variables.

H2a. Having a Plan to Deal with Climate Change is Positively Associated with Number of Social Network Ties to ENGOs.

H2b. Having a Plan to Deal with Climate Change is Positively Associated with Number of Social Network Ties to ENGOs net of ENGO membership and other control variables.

We will now turn to review the methodology employed in this study, followed by a presentation of the results, and a discussion of the findings.

METHODS

Data Collection and Samples

The “primary” data examined in this study are data collected through a stratified random sample of the general public in Canada (stratified in proportion to the population by province).

A telephone interview survey was designed by the author and his research team, and administered by a survey research firm (Venture Market Research Corporation). The survey instrument was pre-tested by both the author, and separately by the survey research firm.

The interviews were conducted between May 31st, 2007 and June 28th, 2007. The interviews were conducted in English or in French depending upon the respondent’s preference. There were 1007 completed interviews. The margin of error for the survey is ± 3.1 at the 95%

confidence level.

The response rate for the survey was 23.3%, based on: $\# \text{ completed} / (\# \text{ completed} + \# \text{ refused})$. The completed telephone interviews took an average of 20.5 minutes per interview. In recent years responses rates have declined and thus by polling standards for an interview of this length this is a very good response rate. However, by academic standards it is somewhat low. Fortunately, however, because this is a survey of a population with known characteristics (e.g. the general public, for which we have census information) we can weight the sample to address non-response sampling biases.

In terms of sampling biases, younger males (19-34) tended to be somewhat under-represented in the interviews, and middle-aged (35-54) and older women (55+) tended to be somewhat over-represented. In order to address sampling biases, all of the analyses of the general public data have been conducted using weights. In particular, the data were weighted by province, gender, and age. Thus in terms of geography (province), gender, and age the sample is representative of the general public in Canada aged 19 years and older. It is possible that there are some biases concerning other variables, but this methodology (weighting) is frequently used by pollsters with a high level of predictive success.

It should be noted that while there were 1007 completed interviews, there were only complete data for age and gender for 985 interviews. Thus in order to weight the sample, we excluded the 22 cases for which we did not have complete data on gender and age. The analyses reported here are based on a weighted sample of 985 cases.

The “secondary data set” consists of data from a representative national sample of environmental organization members in Canada. The data were collected by the author and his

research team (with assistance from the ENGOs) using a mailed self-administered questionnaire survey on a stratified systematic sample (with a random start) of environmental organization members across Canada. The data were collected between July and November 2007. The main national and large regional organizations in Canada participated in this survey. The participating environmental groups included: the Canadian Wildlife Federation, the David Suzuki Foundation, Èquiterre, Greenpeace of Canada, the Sierra Legal Defense Fund (now known as Ecojustice Canada), the Sierra Club of Canada, the Sierra Youth Coalition, the Wilderness Committee (formerly known as the Western Canada Wilderness Committee), and the World Wildlife Fund of Canada. The completed N for this survey was 1148. As analysis of these data play a relatively minor role in the present analysis, no additional information will be given here, but more information is available by contacting the author.

Measures.

Appendix Table 2 provides details on the measurement of all independent and dependent variables (used in the multivariate analyses), and also provides means and standard deviations.

Dependent Variables.

Concern about Climate Change. This variable is based on people's responses to the question: "On a scale of 1 to 5 with 1 being Not concerned at all and 5 being Extremely concerned, how concerned are you about the effects of climate change?" This is treated as a dependent variable in some analyses, and an independent variable in others (e.g. in those models that explain plan for climate change). This is a Likert-type scale where 1 = not concerned at all, and 5 = extremely concerned.

Plan for Dealing with Climate Change. This is a dichotomous variable (where 1 = yes, and 0 =

no) based on people's responses to the question: "Do you personally plan to do anything in response to climate change?" With regard to the use of this variable as an "independent variable" past research has found that concern with environmental issues is a predictor of behavioural intent, and self-reported behaviours. Thus we would expect that those with higher levels of concern about climate change would be more likely to have a plan to deal with climate change.

Independent Variables.

A set of socio-demographic-economic control variables are included in the multivariate analyses. These include: education, income, gender, age, and youth.

Education. Years of education. E.g., completed high school = 12 years, obtained a university bachelor's degree = 16 years, etc. Past research in environmental sociology has shown positive associations between education and environmental concern. Thus we would expect those with higher levels of education to be more concerned about climate change, and more likely to have a plan to deal with climate change.

Income. Annual personal income in dollars. The relationship of income to climate change issues is ambiguous. On the one hand those with higher income are better able to make purchases etc. to respond to climate change (e.g. purchasing a hybrid car), in some instances those with higher income may be more affected by potential responses to climate change to their lifestyles (e.g. higher costs for travelling). On the other hand, some scholars argue that those who give preference to materialist values tend to be less concerned about the environment. In any event this variable needs to be controlled for in the multivariate analyses.

Gender/Female. This is a dichotomous dummy variable where female = 1, and male = 0. In

some studies women have been found to be more concerned about some environmental issues, or to be more likely to engage in pro-environmental behaviour.

Age. Age in years. Some past research has found an inverse relationship between age and environmental concern. Relatedly it has been argued that younger generations are more likely to hold “postmaterialist values” and that these underlie increased concern with environmental issues.

Youth. This is a dummy variable where those aged 29 and under = 1, and those aged 30 and above = 0. Beyond a possible effect for age, it is theoretically possible that youth are more concerned about climate change, and more likely to have a plan for dealing with it. This is because in recent decades there has been a great increase in environmental education in schools. Further, a number of important environmental problems have arisen and/or become subject to high levels of media exposure in the past several decades, including: the hole in the ozone, global warming, deforestation, loss of biodiversity, etc. These trends both suggest possible “generational effects” for “youth”.

Explanatory Variables.

Concern about Climate Change. Described above.

New Ecological Paradigm. This is a scale that is created by summing together responses to seven statements about environmental issues (see Appendix Table 2). This measure was developed by Dunlap et al. (2000), and has been extensively used and tested in past research. It measures the extent to which people have a pro-environmental (biocentric) value orientation versus a more anthropocentric orientation. The general theoretical expectation is that those with a more biocentric orientation will be more concerned about climate change, and more likely to

have a personal plan to deal with it.

Number of Ties to ENGO Members. Respondents were provided with a list of 15 environmental organizations, and for each were asked whether they know a member of the group. Responses were coded 0 for no, and 1 for yes. The responses were then summed. Technically this is a measure of the number of different environmental groups that a respondent had a tie to. The theoretical expectation is that the greater the number of environmental groups one has a tie to, the greater their level of concern about climate change, and the more likely they are to have a plan to deal with climate change.

ENGO Membership. This is a dichotomous dummy variable. Respondents were asked whether or not they belonged to an environmental organization. 1 = yes, 0 = no. In the present analyses this variable is primarily used as a “control variable”. Theoretically we would expect ENGO members to be more concerned about climate change, and to be more likely to have a plan to deal with climate change. More importantly in terms of its role as a “control variable”, we would expect ENGO members to have a greater number of ties to ENGO members than would non-ENGO members. Because concern, plan, membership and ties are all likely intercorrelated, it is important to control for membership when examining the effects of ties on other variables (notably concern).

RESULTS

The Social Influence of Environmentalists

The analysis reported here will begin by reporting some results from a secondary data set (in the sense that it is not the primary focus of this paper) involving survey data collected from a nationwide sample of environmental organization members in Canada (referred to as the

Environmental Movement Study Sample).

The theoretical contention of this paper is that one of the effects of environmental movement mobilization is social influence by environmentalists upon those outside of the movement. Of course, formal organizations do lots of things to create such influences, such as organize demonstrations, press releases, media campaigns, direct mailings, and so on. But the central contention of this paper is that environmentally-relevant social influences also occur through more informal interpersonal interaction. With this in mind we will examine some findings regarding the interaction of environmentalists with other people.

INSERT TABLE 1 ABOUT HERE

Table 1 provides results on whether environmental movement study respondents encourage others to protect the environment, and whether they receive encouragement from others along these lines. Results show that 86.1% of environmental organization members (self-report that they) encourage others to protect the environment. This provides unequivocal evidence that environmentalists are not just quietly trying to protect the environment on their own. They are also – in overwhelming numbers – trying to influence others.

Of less importance to the current analysis, Table 1 also shows that 62.1% of environmental organization members also receive encouragement from others to protect the environment.

INSERT TABLE 2 ABOUT HERE

Further pursuing this theme (social influence) Table 2 shows findings about environmentalists' communication with others about environmental issues, and about how often they encourage others to participate in environmental organization activities. Here we find that

over 70% of environmentalists talk with someone about conservation and environmental issues at least once a week (this includes those who talk every day). Thus, these findings show environmentalists are talking very frequently about environmental issues with others, and thus have many opportunities to influence others.

In terms of encouragement of others to participate in ENGO activities, this occurs less often. About 35% of environmentalists encourage someone to participate in ENGO activities (or contribute in some other way) several times a year or more often.

Table 2 also shows how often environmentalists receive encouragement to participate in ENGO activities, and in environmental movement activities more generally. (These results are not discussed here as they are less relevant to the present analysis.)

We have established that there is a considerable amount of communication, and social pressure (in terms of encouragement to act) directed from environmentalists to others to protect the environment, and participate in pro-environmental behaviours. Now let us turn to the primary data set for this study: survey data from a nation-wide survey of the general public in Canada.

Concern about, and Plans for Dealing with Climate Change.

Table 3 shows frequencies and percentages concerning the general public's level of concern about the effects of climate change. Results show that there is a high level of concern about climate change. Almost 57% of the sample are either "very concerned" or "extremely concerned". If we include together the categories of "concerned", "very concerned", and "extremely concerned" this account for 83.4% of the sample. In sum, in general there is a high level of concern about climate change. (Though, at the same time, from a statistical point of

view, there is still substantial variation in responses for this item.)

Concern about climate change will be utilized as one of the main dependent variables in the multivariate analyses reported later in this paper. In some analyses it will also be used as an independent variable (to explain whether or not respondent's have a personal plan for dealing with climate change). For these analyses it will be treated as an interval-ratio level variable using the number scheme shown in Table 3.

INSERT TABLE 3 ABOUT HERE

Table 4 provides frequencies and percentages regarding responses for whether or not members of the general public had a personal plan for dealing with climate change. 82.4% said yes, 14.2% said no. Thus a high majority of the general public report having a plan for dealing with climate change.

INSERT TABLE 4 ABOUT HERE

“Plan for dealing with climate change” is the second dependent variable that will be analyzed in the multivariate analyses to be reported later in this paper. For these analyses it will be treated as a dichotomous nominal variable where “yes” = 1, and “no” = 0.

Those respondents who said “yes” to the question of whether they had a plan to deal with climate change were asked the following open-ended question: “Can you please briefly describe what you plan to do?”

INSERT TABLE 5 ABOUT HERE

In order to provide some context to what people were thinking about in saying they had a plan to deal with climate change, Table 5 provides a summary of a content analysis of these

open-ended responses. As Table 5 illustrates, three thematic areas dominate participants' talk about what they are doing, or plan to do, to address climate change. These are: transportation, waste reduction and energy use. Within these dominant themes (in results not shown here), the main actions centre on reducing the impact of car use, recycling and reducing energy use in the home. Talk about reducing the impact of cars includes: buying a more fuel efficient car, not idling or pre-heating the car, moving from being a 2-car household to a 1-car household, choosing not to own a car, and so on. Within the "master theme" of transportation, participants also talked about transportation alternatives that address the climate impacts of automobility. In order of frequency, this included: walking instead of driving, cycling, using public transit, buying a hybrid vehicle and carpooling. Talk about reducing energy use in the home includes: improving home insulation, turning down the thermostat, limiting the use of air conditioning or getting rid of the air conditioner, and so on. Within this "master category," other measures participants are taking - or plan to take -- to reduce their energy use include: switching to energy efficient bulbs, using solar power and hanging their clothing outside instead of using a clothes dryer.

INSERT TABLE 6 ABOUT HERE

Table 6 illustrates some of the connections between dominant themes from the content analysis data set. Table 6 shows the intersections between the master categories, focusing on the three dominant categories: transportation, waste reduction and reducing energy use. Here, we see that there is quite a bit of overlap between talk about the three dominant categories, but especially between talk about transportation and waste reduction. This seems to show that many respondents aren't thinking about a single response or action, but are engaged in trying to make

changes in a number of areas simultaneously. In the subsequent analyses we will not focus on these individual categories, but rather whether the respondent had a plan in general to deal with climate change.

INSERT TABLE 7 ABOUT HERE

Table 7 provides some further context about the range of opinion about climate change issues. It shows that a strong majority of Canadians feel that “Canada should live up to its commitments under the Kyoto Accord” (78% “mostly or completely agree”). About 78% of respondents “completely disagreed” or “mostly disagreed” that “climate change is a myth – there is no compelling evidence for it”.

Responses regarding energy issues were somewhat more mixed. Respondents were almost evenly divided about whether “Canada should focus more intensively on developing the oil and gas sector of the economy”. (The oil industry has become increasingly important to Canada’s economy. Indeed, for some time Canada has been the leading exporter of oil to the United States.) Regarding alternative energy sources, however, over 93% of respondents either “completely agreed” or “mostly agreed” that “Canada should place more emphasis on alternative energy sources (such as windpower, solar energy, and bio-fuels).

Now that we have considered the general public’s views concerning climate change and related issues more generally, it is now time to consider the factors that explain concern about climate change, and people’s plans for dealing with it.

Explaining Concern about Climate Change

To begin our analysis it is useful to consider the results of the zero order correlation between number of social ties to ENGO members, and concern with climate change. In results

not reported in the tables, these two variables were positively and significantly correlated: $r = .07$, $p. \leq .05$. Thus at the zero order level Hypothesis H1a is supported (Concern About Climate Change is Positively Associated with Number of Social Network Ties to ENGOs), the greater the number of ties respondents had to ENGO members, the greater their level of concern about climate change. (Though it should be noted that this is a relatively small correlation.)

Now, as noted previously, any statistical effects associated with ENGO ties is possibly a function of the respondent's ENGO membership status. To guard against this, in Table 8 a multiple regression analysis is undertaken that statistically explains concern with climate change, for the General Public for non-ENGO membership as well as a variety of other measures. (Thus controlling for ENGO membership status).

INSERT TABLE 8 ABOUT HERE

Looking at the Socio-Demographic-Economic Control Variables we find that those with higher levels of education had higher levels of concern, while those with higher levels of personal income had lower levels of concern.

Examining the other explanatory variables we find that the more "biocentric" people were in terms of the NEP Scale, the greater their concern about the effects of climate change. Finally, we observe that number of ties respondents had to ENGO members is not significantly associated with their concern about climate change. Thus, H1b (Concern About Climate Change is Positively Associated with Number of Social Network Ties to ENGOs net of ENGO membership and other variables) is not supported at the multivariate level. It appears that the effects of ENGO ties is indirect through other variables (e.g. the NEP scale; in results not reported here, for the correlation between the NEP scale and number of ENGO ties, $r = .17$, $p. \leq$

.001).

We now turn to examine results concerning respondents' plans to deal with climate change.

Explaining Plans to Deal with Climate Change

Again, we should first consider the zero order correlation between number of ties to ENGOs and plan to deal with climate change. Here $r = .12$, $p. \leq .001$. Thus H2a (Having a Plan to Deal with Climate Change is Positively Associated with Number of Social Network Ties to ENGOs) is supported. (It should also be noted, that the more appropriate statistical test, a t-test, showed a highly significant difference in number of ties between those with a plan, and those without a plan.)

Again, to guard against the possibility that the ENGO ties effect is really due to ENGO membership and other variables, we now undertake a multiple logistic regression (see Table 9) that examines whether there is a relationship between the number of ties respondents had to ENGO members and whether or not the respondent had a plan to deal with climate change, controlling for ENGO membership (by running the analysis for non-ENGO members) as well as a variety of other measures.

INSERT TABLE 9 ABOUT HERE

Looking at the Socio-Demographic-Economic Control Variables we find that those with higher levels of education were more likely to have a plan to deal with climate change. Otherwise, none of the other control variables had a significant effect on the likelihood that respondents had a plan.

Examining the other explanatory variables we find that respondents' level of concern

about climate change increases the likelihood they had a plan, and respondents who were more biocentric (had higher scores on the NEP scale) were more likely to have a plan.

Concerning H2b (Having a Plan to Deal with Climate Change is Positively Associated with Number of Social Network Ties to ENGOs net of ENGO membership and other variables), those with a greater number of ENGO ties were more likely to have a plan to deal with climate change (net of the effects of other variables).

DISCUSSION

The major finding of this study is that among non-ENGO members of the general public, the number of ENGO members that one has ties to increases the likelihood that one has a plan to deal with climate change. We argue that this is a “social influence” effect, whereby environmental organization members disseminate information and moral suasion.

Somewhat surprisingly, at the multivariate level we did not find similar effects regarding concern with climate change. At the zero order level, the greater the number of ties one had to ENGO members, the more concerned they were about climate change – but this effect did not persist when other variables were controlled for. We speculate that the effect of having ties to ENGO members on concern about climate change is probably indirect. For example, ties are significantly associated with respondent’s NEP scale score (level of value biocentrism), and the NEP scale is positively and significantly associated with concern with climate change. (Further, the greater one’s level of concern about climate change, the more likely they were to have a plan to deal with climate change – thus this shows that ties also have an indirect effect on climate change plans through concern.)

Other factors which are not measured here also likely affect concern with climate change,

and plans to deal with it. In particular, there has been an enormous amount of media attention given to climate change in the past year or two. Media consumption likely has an influence on these variables, and in particular may explain the null effect for ties in relationship to concern about climate change. It may be that through the media people are well aware that climate change presents a threat, but are perhaps less informed through the media about plans to deal with it

Earlier in this paper it was suggested that bridging ties between members of the environmental movement, and the general public could be seen as a type of social capital. Further, it was argued that social influence by environmental organization members on non-members could be seen as one type of social movement outcome. We argue that the effect for ENGO ties on plan to deal with climate change illustrates both of these processes. Our findings provides substantial evidence that through social network processes non-environmental organization members are influenced to develop a plan for climate change. The fact that self-reports from environmentalists provide evidence about high levels of communication with others, and a substantial effort in trying to influence others, reinforces these interpretations.

In recent years there has been a debate about “the death of environmentalism” (Shellenberger and Nordhaus 2004). In particular, it has been argued that as environmental organizations have become increasing formalized and reliant on foundations for funding, grassroots involvement in them has declined. Further, to the extent that “rank and file” individuals are still members of environmental organizations, they primarily serve the function of donors (Fisher 2006).

The current research findings suggest that individual level activism is extremely

important, and should be fostered by environmental organizations. While it is surely the case that environmental organizations should continue to be involved at the policy level, and continue to work on pressuring governments for change – they should, or at least some organizations should, continue to foster the involvement and activism of individual members. In particular, events and activities that involves grass roots members and provide an interface with the general public should be encouraged. Funding considerations are also implicated here. Many government agencies and private foundations evaluate the effectiveness of the organizations they provide funding to (McConnachie 2007). The current study suggests that one measure of effectiveness is the informal influence that ENGO members have on the general public. Again, some funding should be targeted to organizations to facilitate these processes.

In the literature on social networks and social movements there has been some discussion of the fact that while we have considerable evidence for network effects such as the correlation between network ties and micro-mobilization, we have less knowledge about the processes that underlie such effects. Much of the research on networks and social movements has been quantitative. Some scholars have argued that further qualitative research is needed to further understand the processes and mechanisms that underlie network effects. We would echo this call. Further research stemming from the current study should focus on the social influence processes that seemingly underlie the relationship between network ties and having a plan to deal with climate change.

Finally, much social networks on “personal networks” has examined the differential importance of having “weak ties” versus “strong ties” to others. This distinction has been found to be important to diverse processes such as information dissemination, getting a job, and

facilitating collective action (Granovetter 1973, Gould 2003). Further research on network effects on concern about climate change, and individual responses to climate change, should examine if there are differential effects of weak ties and strong ties.

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Table 1. Encouragement to Protect the Environment. Frequency and Percentage Distribution: Environmental Movement Study Sample.					
		Yes	No	Don't Know/Other/No Response	Total
1. Does R Encourage Others to Protect the Environment	f	989	142	17	1148
	%	86.1	12.4	1.5	100.0
2. Does Others Encourage R to Protect the Environment	f	713	416	19	1148
	%	62.1	36.2	1.7	100.0

		Every Day	At Least Once a Week	At Least Once a Month	Several Times a Year	Once a Year or Less Often	Never	Don't Know/Other/No Response	Total
1. How often does R talk with someone about conservation and other environmental issues?	f	239	562	189	118	19	10	11	1148
	%	20.8	49.0	16.6	10.2	1.7	.9	1.0	100.0
2. How often does R encourage SOMEONE ELSE to participate in ENGO activities, or contribute in some other way?	f	N.A.	62	107	237	230	481	31	1148
	%	N.A.	5.4	9.3	20.6	20.0	41.9	2.7	100.0
3. How often does someone encourage R to participate in ENGO activities, or contribute in some other way?	f	N.A.	60	170	280	229	383	26	1148
	%	N.A.	5.2	14.8	24.4	19.9	33.4	2.3	100.0
4. About how often does someone encourage R to participate in environmental movement activities in general? For example, activities besides those of the ENGO?	f	N.A.	121	168	345	213	270	31	1148
	%	N.A.	10.5	14.6	30.1	18.6	23.5	2.7	100.0

Table 3. Level of Concern about Climate Change Frequency and Percentage Distribution: Whole National General Public Sample, Weighted by Age and Gender.							
	Not at all concerned (1)	Slightly concerned (2)	Concerned (3)	Very Concerned (4)	Extremely Concerned (5)	Don't Know/Other/ No Response	Total
f	22	140	265	354	202	2	985
%	2.2	14.2	26.9	36.0	20.5	.2	100.0

Table 4. Individual Plan to Deal with Climate Change Frequency and Percentage Distribution: Whole National General Public Sample Weighted by Age, Gender, and Province.				
	Yes	No	Don't Know/Other/No Response	Total
f	812	140	34	985
%	82.4	14.2	3.4	100.0

Table 5. Content Analysis of Open Ended Responses Describing R's Climate Change Plan. Whole National General Public Sample Unweighted.		
Master Category	# of Coding References	% of Participants (n=838)
1. Transportation	450	53.7
2. Waste Reduction	429	51.2
3. Reduce Energy Use	358	42.7
4. Water Use	90	10.7
5. Food Production and Consumption	48	5.7
6. Use of Chemicals	48	5.7
7. Landscaping	38	4.5
8. Education Awareness	27	3.2
9. Political Action	22	2.6

Table 6: Master Category Intersections (# of coding references)

	WASTE REDUCTION	REDUCE ENERGY USE	TRANSPORTATION
TRANSPORTATION	230	204	450
WASTE REDUCTION	429	167	230
REDUCE ENERGY USE	167	358	204
WATER USE	57	56	49
FOOD PRODUCTION & CONSUMPTION	27	23	29
USE OF CHEMICALS	32	21	26
LANDSCAPING	16	15	18
EDUCATION & AWARENESS	11	6	11
POLITICAL ACTION	11	4	8

	Completely Disagree	Mostly Disagree	Partly Agree/ Disagree	Mostly Agree	Completely Agree	Valid Total	Valid N
1. Canada should live up to its commitments under the Kyoto accord.	4.2	3.2	14.6	24.3	53.7	100.0	891
2. Climate change is a myth – there is no compelling scientific evidence for it.	57.9	19.8	10.2	7.9	4.1	100.0	970
3. Canada should focus more intensively on developing the oil and gas sector of the economy.	14.8	18.5	33.4	18.2	15.1	100.0	956
4. Canada should place more emphasis on alternative energy sources (such as windpower, solar energy, and bio-fuels)	.5	.6	5.7	20.1	73.0	100.0	982

Table 8. Multiple Regression Model Explaining Concern for Climate Change Using Standardized Regression Coefficients. General Public Sample (Non-ENG0 Members) Weighted by Age, Gender, and Province.		
Socio-Demographic-Economic Control Variables		
Years of Education	.15****	
Personal Income	-.11*	
Gender (Female = 1)	.05	
Age	.05	
Youth (Under 30 = 1)	-.02	
Values, Ties, and ENG0 Membership		
NEP Scale	.43****	
Number of Ties to ENG0s	-.02	
R ²	.23****	
N	653	
Notes: * p. ≤ .05, ** p. ≤ .01, *** p. ≤ .005, ****p. ≤ .001		

Table 9. Logistic Regression Model Explaining Individual Plan for Dealing with Climate Change Using Logistic Regression Coefficients: National General Public Sample (Non-ENGO Members) Weighted by Age, Gender, and Province.	
Socio-Demographic-Economic Variables	
Years of Education	.13*
Personal Income	.00
Gender (Female = 1)	-.24
Age	-.01
Youth (Under 30 = 1)	-.06
Concern about Climate Change, Values, and Ties	
Concern about Climate Change	.87*****
NEP Scale	.46*
Number of Ties to ENGOs	.39*****
χ^2	103*****
Cox and Snell R ²	.15
Nagelkerke R ²	.27
N	633
Notes: * p. ≤ .05, ** p. ≤ .01, *** p. ≤ .005, *****p. ≤ .001	

Appendix Table 1. Intercorrelation Matrix.										
	CC Plan	Education	Income	Female	Age	Youth	CC Concern	NEP	Ties	Membership
CC Plan	----	----	----	----	----	----	----	----	----	----
Education	.11***	----	----	----	----	----	----	----	----	----
Income	-.03	.32*****	----	----	----	----	----	----	----	----
Female	.06	.02	----	----	----	----	----	----	----	----
Age	-.10***	-.04	.16*****	.03	----	----	----	----	----	----
Youth	.03	-.07*	-.28*****	-.08*	-.64*****	----	----	----	----	----
CC Concern	.36*****	.14*****	-.06	.14*****	.05	-.09*****	----	----	----	----
NEP	.23*****	.06*	-.03	.06	.03	-.03	.44*****	----	----	----
Ties	.12*****	.11*****	.17*****	-.01	.05	-.04	.07*	.17*****	----	----
Membership	-.01	.09***	.10***	-.02	.05	.01	.13*****	.15*****	.24*****	----

Notes: * p. ≤ .05, ** p. ≤ .01, *** p. ≤ .005, *****p. ≤ .001

Appendix Table 2. Measures.		
Variable Name	Mean (S.D.)	Description
Concern about Climate Change	3.58 (1.04)	Response to question: “On a scale of 1 to 5, with 1 being Not concerned at all and 5 being extremely concerned , how concerned are you about the effects of climate change.” This is treated as an interval ratio level variable. The following categories were also available to assist respondents: 1 = not concerned at all, 2 = slightly concerned, 3 = concerned, 4 = very concerned, 5 = extremely concerned.
Plan for Climate Change	.85 (.35)	Dichotomous variable based on people’s responses to whether or not they had a personal plan to deal with climate change. 1 = yes, 0 = no.
Education	14.04 (2.32)	Years of education. E.g., completed high school = 12 years, obtained a university bachelor’s degree = 16 years, etc.
Income	45,303 (33,514)	Annual personal income in dollars.
Gender/Female	.52 (.50)	Dichotomous variable. Female = 1, male = 0.
Age	46.94 (16.14)	Age in years.
Youth	.16 (.37)	Dummy variable where those aged 29 and under = 1, and those aged 30 and above = 0.

Appendix Table 2. Measures (Continued).		
Variable Name	Mean (S.D.)	Description
New Ecological Paradigm	3.6 (3.71)	Responses to the following statements were reverse coded where appropriate (items # 2, 3, 5, 6) and the set of items were then combined into an index: 1. We are approaching the limit of the number of people the earth can support, 2. Humans have the right to modify the natural environment to suit their needs, 3. The earth has plenty of natural resources if we just learn how to develop them, 4. Plants and animals have as much right as humans to exist, 5. The so-called "ecological crisis" facing humankind has been greatly exaggerated, 6. Humans will eventually learn enough about how nature works to be able to control it, 7. If things continue on their present course, we will soon experience a major ecological catastrophe. The response categories for these items were: Strongly Agree = 5, Mildly Agree = 4, Unsure = 3, Mildly Disagree = 2, Strongly Disagree = 1. To create the index the responses to these 7 items were summed together and then divided by 7.
Number of Ties to ENGO members	1.19 (1.71)	Respondents were provided with a list of 15 environmental organizations, and for each were asked whether they know a member of the group. Responses were coded 0 for no, and 1 for yes. The responses were then summed. Potential responses could vary from 0 to 15.
ENGO Membership	.09 (.29)	Dichotomous variable. Respondents were asked whether or not they belonged to an environmental organization. 1 = yes, 0 = no.

Social Networks Influence Analysis. Doaa Gamal. Suggested Citation. Gamal, Doaa, "Social Networks Influence Analysis" (2017). UNF Graduate Theses and Dissertations. 723. <https://digitalcommons.unf.edu/etd/723>. Pedro Domingos asserts that the existence of network effects is acknowledged in marketing literature (Domingos, 2005). Domingos developed a social network model to identify the optimal set of customers to market to such that marketing to that set will yield the highest return on investment.

5. • Amplification: Amplification indicates the effect on audiences a user has. That is how much a user influences other users within his/her reach by having them act on his/her published contents. • Impact: This is the influence of user's audience. Individual action on climate change can include personal choices in many areas, such as diet, means of long- and short-distance travel, household energy use, consumption of goods and services, and family size. Individuals can also engage in local and political advocacy around issues of climate change. As of 2020, emissions budgets are uncertain but estimates of the annual average carbon footprint per person required to meet the target of limiting global warming to 2 degrees by 2100 are all below the Furthermore, projections of the effects of climate change on our society can frighten, overwhelm, or discourage students. This can result in denial or resistance to learning. What many educators have begun to do, as a way to deal with the scientific, technical and emotional difficulties of the subject matter, is weave solutions into the discussion every step of the way. Carbon emissions have risen from about 2.5 gigatons per year in the late 1950s to 9 gigatons per year today. Middle school students will be familiar with climate change/global warming gathered from the media, family or at school. This can be an opportunity to develop their understanding of how human activities connect to climate change, particularly the increase in CO₂ in the atmosphere. This global network of computer networks creates a multimodal and interactive communication. Thus, the purpose of this chapter will be to summarize some of the key research findings on the social effects of the Internet relying on the evidence provided by some of the major institutions specialized in the social study of the Internet. More specifically, I will be using the data from the world at large: the World Internet Survey conducted by the Center for the Digital Future, University of Southern California; the reports of the British Computer Society (BCS), using data from the World Values Survey of the University of Michigan; the Nielsen reports for a variety of countries; and the a