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Public Awareness about Global Warming in Hyderabad, India

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PUBLIC AWARENESS ABOUT GLOBAL WARMING IN HYDERABAD, INDIA

A Thesis

Presented to

The Faculty of the Department of Environmental Studies

San Jose State University

In Partial Fulfillment

of the Requirements for the Degree

Master of Science

by

Vani S. Rao

August 2011

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The Designated Thesis Committee Approves the Thesis Titled

PUBLIC AWARENESS ABOUT GLOBAL WARMING IN HYDERABAD, INDIA

by

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APPROVED FOR THE DEPARTMENT OF ENVIRONMENTAL STUDIES

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August 2011

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ABSTRACT

PUBLIC AWARENESS ABOUT GLOBAL WARMING IN HYDERABAD, INDIA

by Vani S. Rao

This study addressed public perceptions and awareness about global warming in India through a survey of 851 subjects in the city of Hyderabad in the year 2007. A stratified sample of nine segments of society showed that, although people consider global warming a serious problem, they do not clearly understand its causes, impacts, and solutions. The analysis of data using paired T-tests indicated differences in levels of awareness about global warming, across age and education. ANOVA and regression analysis suggested that levels of awareness among respondents varied according to their occupation. The degree of seriousness with which subjects viewed global warming influenced the degree of their support for eco-friendly initiatives. The level of education of subjects was correlated with variations in their perceptions about global warming and support for environmentally friendly initiatives. However, subjects associated global warming with the issue of air pollution. They showed a tendency to advocate action by society and government rather than by individual initiatives to address the problem. Based on these findings, policy makers can tailor awareness initiatives, highlighting the seriousness of the problem and the measures that could be taken at the individual level.

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Introduction

Global Warming Awareness

Public awareness about global warming as a problem is a recent phenomenon tracing its origins to the Earth Summit (held in Rio de Janeiro in 1992) where the United Nations called for a time-bound stabilization of greenhouse gases (GHG) to address climate change. The Inter-governmental Panel on Climate Change (IPCC, 2007) has been instrumental in establishing the fact that anthropogenic GHG emissions will lead to many changes in global climate such as melting ice-caps, rising sea-levels, changing agricultural patterns, expansion of deserts, warmer summers, and colder winters (IPCC, 2007). Although global warming is merely one of the consequences of climate change, the term global warming is being used widely in public and media discourse to refer to all impacts of climate change.

The 1997 The Kyoto Protocol seeks to reduce global warming through GHG cutbacks by developed countries, as per specific targets. The Kyoto Protocol categorized countries into three groups on the basis of their levels of economic development. Annex I, or developed countries, are expected to reduce GHG emissions by the year 2012, to an average of 5.2% below levels of these gases in 1990. Annex II are countries that are included in Annex I and also finance mitigation costs in developing countries. Non-Annex I, or developing nations like India and China, do not have obligations to reduce GHG emissions but can voluntarily join Annex I when they are sufficiently developed. As The Kyoto Protocol expires in 2012, in December 2007, the Bali roadmap decided to draft a fresh international agreement on climate change by 2009.

India acceded to The Kyoto Protocol in August 2002 as a non-Annex I group member, and in June 2004 submitted to the United Nations its first and only national GHG inventory (NATCOM, 2004). Among other things, the inventory states that with rising incomes, households at all socioeconomic levels in India are increasingly using energy through electric bulbs, fans, televisions, refrigerators, washing machines, air-coolers, air-conditioners, water heaters, scooters, and cars. The related GHG emissions are expected to rise even though energy efficiencies of these appliances are continually improving (NATCOM, 2004). Carbon dioxide (CO₂) forms 65% of all GHG emissions in India and the energy sector accounts for 61% of GHG emissions in from all sectors.

India's Position on Climate Change

Although The Kyoto Protocol doesn't require developing countries like India to reduce GHG emissions, India is being called upon to decrease its GHG emissions, which are expected to increase. A perusal of India's official documents and policies on climate change and environment indicates that India is not ready to accept quantitative restrictions on its per capita GHG emissions which are much lower than that of developed countries. India also argues that it must continue on the path of development and growth for some years in order to reach the same level of development as that of the rich countries. India asserts that even while pursuing economic growth and development, its per-capita GHG emissions will not exceed those of developed countries which it considers responsible for much of the current global warming (Prime Minister's Office, 2007). Like other developing countries, India perceives global warming as a problem caused chiefly by wasteful energy use by developed countries. Therefore it would be

difficult for India to promote domestic measures to prevent global warming unless it held benefit for the country (Nomuri Research Institute, 2004).

India is aware that global climate change will have an adverse impact on the country's ecosystems, agriculture, forests, disease vectors, and marine resources. The Prime Minister's Council on Climate Change oversees the integration of climate change concerns into the national development planning through a "relatively GHG benign sustainable growth path" which includes diffusion of renewable energy, energy-efficiency, forest and water resources management, and environmental education (National Environment Policy, 2006). India is also implementing sector-specific GHG reduction programs in partnership with multi-lateral organizations and under bilateral programs with developed countries.

Global warming needs a multi-pronged approach which involves changes in technology, energy prices, business practices, consumer behavior, and other activities affecting people's daily lives (Sterman & Sweeney, 2007). Since a low level of awareness about climate change in developing countries is one of the impediments to global warming mitigation, it is necessary to promote and facilitate education, training, and awareness programs in such countries (Chatterjee, 2002).

Since public support for and participation in global warming mitigation are crucial for successfully addressing this issue, this research ascertained the level of public awareness and knowledge about global warming in India. A stratified survey of 851 respondents was done in the year 2007 in Hyderabad, India's fifth largest metropolis, to

learn about public perceptions on energy and environment, causes and effects of global warming, and willingness to take action to reduce GHGs.

India's Efforts to Promote Environmental Awareness

India is making efforts to enhance environmental protection in general, although these initiatives are not specifically focused on global warming in particular. The Ministry of Environment and Forests (MOEF) promotes environmental awareness and education through the Centre for Environment Education (CEE), and an annual National Environment Awareness Campaign (NEAC) on select environmental issues (MOEF, 2007). The Ministry of Human Resource Development supports initiatives for environmental education undertaken by civil-society organizations (CEE, 2007).

Think tanks like the Tata Energy Research Institute (TERI) are undertaking sector-specific GHG mitigation studies some on request of developed countries and multilateral organizations. Climate Change Centre under the aegis of the NGO, Development Alternatives, carries out research on climate change and provides consultancy to the corporate sector on climate change mitigation projects (Chatterjee, 2002). The World Wildlife Fund (WWF)'s "India Climate Witness Program" raises public awareness about climate change through a website about causes and impacts of climate change in two regions, the Sunderbans in East India and Ladakh in North East India (WWF, 2008).

Although India has a free press, media coverage of environmental issues is neither adequate nor comprehensive. Environmental curriculum is gradually being introduced in schools. Some universities offer academic courses on environmental issues, although

there are no academic and research programs specific to climate-change or global warming. While there are several non-governmental organizations (NGOs) working towards environmental conservation, not many are known to focus exclusively on global warming awareness.

Theories about Global Warming Awareness

The importance of environmental awareness for addressing environmental issues like global warming has been highlighted by several researchers. The “Information-Deficit Model” proposes that ignorance about environmental issues may result in apathy, little change in personal behavior, and reliance on government action (Bulkeley, 2000). Awareness and knowledge about global warming play a crucial role if people are to adopt pro-environmental or conservation behavior (Frick, Kaiser, & Wilson, 2004; Kaiser & Fuhrer, 2003). Seriousness judgments about global warming are influenced by beliefs about existence of global warming, human responsibility for causing global warming; and their ability to reduce it (Krosnick, Holbrook, Lowe, & Visser, 2006). People will support GHG mitigation initiatives if they do not require a significant alteration of lifestyle, understand the scientific basis for such programs, consider the issue a very serious societal or ecological problem, or one that affects them personally (Bord, Fisher & O’Connor, 1998; Cohen, 1999; Lorenzoni & Pidgeon, 2006; Sterman & Sweeney, 2007).

Stamm’s Problem-Solution Path Model

Stamm, Clark, and Eblacas (2000) studied the effect of media on people’s knowledge and awareness of global warming, with a theoretical model, the Problem-

Solution Path, which states that the three major elements of an environmental problem are its causes, consequences, and solutions. An individual's engagement with an issue is represented as a series of stages along a path (see Figure 1) beginning with awareness of an environmental problem and ending with an understanding of solutions. In Stage 0, a person is not aware of the issue. People in Stage 1 know about the problem, but have not focused their attention on it. People in Stage 2 have assessed the importance of the issue. In Stage 2a people have decided that the situation is not a problem. Those in Stage 2b have decided that global warming is a problem and are aware of causes, consequences, and solutions. Those in Stage 3 have thought about possible solutions. In Stage 4, people have a good idea of what needs to be done to address the issue.

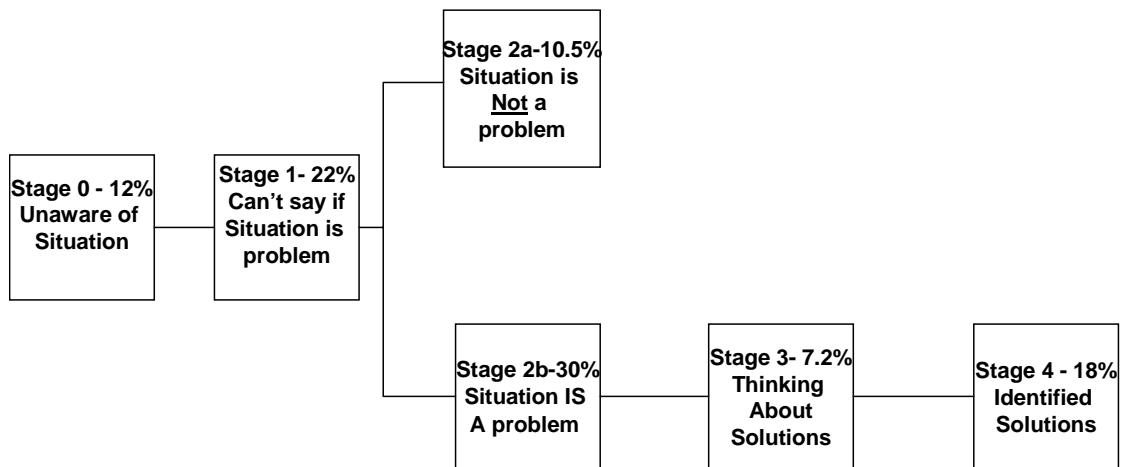


Figure 1. Global Warming Awareness Along Stamm's Problem-Path (Reprinted with permission. Stamm et al., 2000)

Stamm et al. (2000) concluded that public understanding of global warming was a communication problem as people have a limited understanding of causes, consequences,

and solutions of global warming. In 1997, Stamm et al. (2000) tested this model in Washington and found that 30% had decided that global warming is a problem but had not yet given serious thought to solutions. Twenty-two percent (22%) had heard something about the issue but not enough to decide whether global warming was a problem. Eighteen percent (18%) were in the last stage of the path, feeling fairly certain about actions to be taken to solve this problem. Seven percent (7%) had thought seriously about solutions. The study concluded that increased media coverage about global warming, would provide more information about the issue, which in turn would result in increased participation by people in mitigation efforts. There are no known studies that used Stamm et al.'s model to categorize public awareness about global warming.

Research about Global Warming Awareness in Developed Countries

Public awareness about global warming has been studied since the early 1990s especially in developed countries where the issue was first highlighted and discussed. In the early 1990 people's understanding of the issue of global warming was nascent. People linked the hole in the ozone layer with global warming, although both are distinct phenomena, which have separate causes, effects, and solutions (Ungar, 2000). Studies in the U.S. and Australia found that there is more understanding and concern about the hole in the ozone layer, as opposed to the issue of climate change (Bostrom, Morgan, Fischhoff & Read, 1994; Bulkeley, 2000). In the U.K., public awareness about global warming was found unsatisfactory, as 70% were not able to name CO₂ as the gas that makes the biggest contribution to the GHG effect (Norton & Leaman, 2004).

Popular misconceptions arise as people attempt to understand global climate change. They use cultural models and link global warming to air pollution, consider ozone depletion as a cause of global warming, and believe that preventing deforestation is a solution for global warming (Willet, 1997).

Research has also focused on the role of media in promoting public awareness about global warming. Although public opinion about global warming in the U.S. had polarized along party lines, media attention led the public to think more about the issue and to be more certain of their opinions (Krosnick, Holbrook, Lowe, & Visser, 2000). In Germany, global warming was often politicized and reduced by politicians to emission reduction targets, and projected by the media as a catastrophe that required immediate action (Weingart, Engels, & Pansegrau, 2000).

Climate change is associated by people with events like hurricanes, which are not seen as evidence of an impending global warming or a “hot crisis” (Ungar, 2000). “Mental models” research, found that most people in the U.S. believe that GHG reduction can be deferred until there is further evidence that GHGs are harmful for climate change (Sterman & Sweeney, 2007). Although people are more exposed to consequences of global warming, they may not react strongly because global warming and its consequences are often portrayed in an abstract and statistical manner (Weber, 2006).

Research about Environmental Awareness in India

India’s environmental problems have been attributed to “a lack of political commitment, lack of a comprehensive environmental policy, poor environmental awareness, functional fragmentation of the public administration system, and prevalence

of poverty” (Bowonder, 1986, p. 599). Poor environmental awareness among India’s politicians, citizens and bureaucracy could be due to low levels of literacy, socio-economic disadvantages, and a poor media concern for environmental issues and policies.

A study in rural East India during 1994 and 1995 explored association of age, social category (caste and tribal status), education, residence, and income with environmental concern at the local level. It found that people in India, associate environmental problems with deforestation, soil erosion, displacement of indigenous people, drought, flood, sanitation, health; and air and water pollution. The study found positive correlations between environmental concern, variables such as education, residence (urban vs. rural), and income. It concluded that environmental concern remains to some extent an elitist issue as “better educated, well-heeled, upper-caste urban people show greater concern for the quality of the environment” (Chatterjee, 2008, p. 24).

The World Values Surveys in 1990, 1995, and 2001, which polled public opinion in India on a range of issues including the environment, provide baseline data about changing environmental perceptions. In 1990, more than 50% of the subjects felt that environmental problems had to be accepted if unemployment was to be addressed. At the same time, 40% considered pollution as a problem that needed urgent action. Thirty-four and two-tenths percent (34.2%) were in favor of protecting the environment in 1995 as opposed to 23% who highlighted the need for creating more employment. In 2001, in an indication of enhanced environmental awareness, 73.9% were in favor of humans co-existing with nature (World Values, 2007).

Research about Global Warming Awareness in India

There are no known academic or peer-reviewed studies regarding public awareness of global warming in India. Climate change is an emerging issue in developing countries, where there is very little awareness of this subject (Chatterjee, 2008). People in rural India do not clearly understand the effects of human behavior on the physical environment and are almost completely ignorant about global environmental issues such as ozone depletion and climate change (Chatterjee, 2008). Air and water pollution, garbage disposal, and low energy efficiency are considered real and critical problems as they are tangible, whereas issues like global warming, loss of bio-diversity, and hazardous waste pollution are discounted as they are not directly perceptible and do not have short-term consequences (Bowonder, 1986).

A study of 58 apple growers in Northwestern India from 1994 to 2004 ascertained perceptions about climate change in the context of local knowledge. Vedwan concluded that perceptions of climate change are shaped by traditional, local, and ecological knowledge of crop-climate linkages and a historical relationship with the environment. Most significantly, while climate change was a relatively unknown concept in 1996, farmers, local policy makers and scientists had accepted in 2004 that climate change was happening due to growing evidence of low crop production and failures caused by abnormal weather conditions (Vedwan, 2000).

Some global polls and surveys have recently been done in India about public global warming awareness in the backdrop of an ongoing debate about increasing global GHG emissions in developing countries. A *Global Attitudes Project* by the Pew Center

on Global Climate Change in 2006 ascertained public opinion in 15 nations including India on 51 global issues, one of which was global warming. The survey of 2,029 people in India revealed that 57% had “heard about” global warming and 65% “worried a great deal” about the problem (Pew Center, 2006).

In 2006, the World Public Opinion (WPO) and the Chicago Council of World Affairs conducted a survey of 18 countries on “Climate Change and the Environment”, including India. The six-question survey of 1,452 subjects in India found that people in India are very skeptical about the need for action against global warming. Only 49% favored taking steps to address the issue. Of these, 19% felt the problem is pressing enough to merit immediate, costly measures, and the other 30% believed that only gradual, low-cost steps are needed. Nearly 24% said that costly action should be avoided until there is certainty that global warming is really a problem. A significant number, 78%, said that global warming could threaten India’s “vital interests” within the next decade. Fifty-one percent (51%) believed it could become a “critical threat.” Forty-eight percent (48%) said they would support a deal under which developing nations could limit GHG emissions with assistance from developed countries. Twenty-nine percent (29%) were against the proposal (WPO, 2006).

In the year 2007, polling firm GlobeScan and the University of Maryland undertook for the British Broadcasting Service (BBC), a global warming survey of 21 countries including India. A total of 1,521 subjects in India participated in the survey which showed that 48% had “heard or read” about global warming and 47% agreed that human activity was a significant cause of climate change. Thirty-seven percent (37%)

avored “major steps very soon” and 26% preferred “modest steps over the coming years” to control global warming. Twenty-four percent (24%) said that less wealthy countries should not be expected to limit their GHG emissions, because they produce relatively low emissions per capita. Thirty-three percent (33%) said that as emissions from less wealthy countries are substantial and growing, they should limit their GHGs along with wealthy countries. Forty-seven percent (47%) supported the proposal under which wealthy countries could provide financial assistance and technology to less wealthy countries to limit their GHGs. Nineteen percent (19%) opposed the proposal and 34% said “don’t know” or didn’t answer. The survey concluded that compared to other countries, people in India are less aware about global warming (BBC, 2007).

A 20-question poll in the year 2007 by Global Market Insite (GMI) was a part of their 14-country World Environment Review. Fifty-three percent (53%) in India were very concerned about climate change and 62% were “very concerned” about global warming. In measures they had taken so far to fight climate change, people highlighted energy-conserving measures such as switching off lights while leaving a room (89%) or installing energy saving light bulbs (67%). People felt that the government should make it easier for them to purchase solar panels (78%) and hybrid or electric cars (75%). They felt the government was too reliant on non-renewable fossil fuels (72%), and should do more to increase solar energy (93%), wind energy (86%), and nuclear energy (40%). An overwhelming number said that the Government should do more to address climate change (92%), and promote public transportation (91%). Ninety-four percent (94%) were in favor of a ban on use of plastic bags (GMI, 2007).

In summary, these studies indicate that there is a low level of awareness about causes and consequences of global warming in India although people are concerned about the problem. Findings of previous investigations show that more than 50% of the population do not consider human activities as being responsible for global warming. Public opinion is also not in favor of immediate action to address global warming, and there is a tendency to procrastinate until there is further proof that global warming is a serious issue. Less than 50% favored actions aimed at GHG reduction in developing countries funded by more wealthy nations.

Gaps in Research and Justification for Present Study

Recent global warming awareness studies in India do not provide comprehensive data regarding public awareness. The studies were global and not specific to India as public opinion was polled, in 15 to 20 countries each. The studies addressed a few core issues such as public awareness and concern, responsibility of human actions, and whether people perceive the need for action to curb global warming. In surveys, data was not obtained about people's understanding of causes and impacts of global warming and their willingness to support initiatives to reduce global warming. Public awareness and understanding on issues related to energy, which are closely linked with global warming and GHG reduction were not examined. These studies did not examine whether awareness levels vary according to gender, age, level of income, education, and occupation. Lastly, some of the terminology and questions used were more specific to developed countries where global warming is considered a relatively more important

issue, environmentally friendly products are easily available, and environmentally friendly behaviour is in practice.

Purpose and Research Objectives

The overall goal of the study is to find out whether people in Hyderabad understand the causes, impacts, and seriousness of the issue of global warming. Using Stamm et al.'s (2000) Problem-Solution Path, subjects will be grouped into different stages of awareness along the path. Issues related to global warming, on which there is confusion or a lack of understanding will be identified. The study assesses the degree of public support for initiatives to reduce global warming.

A survey about public awareness and knowledge about global warming in one of India's cities would provide detailed data about public awareness on this issue, including variations across demographic variables. Hyderabad, India's fifth largest metropolis was chosen as the study-site as the city is facing environmental problems such as air and water pollution, water scarcity, erratic rainfall, and reducing greenery. There is considerable scope for enhancing global warming awareness and GHG reduction in Hyderabad given the city's growing population, industrialization, urbanization, construction, and the rising number of vehicles.

This research will address the address the following hypotheses:

- I. Residents of Hyderabad are likely to have a low level of awareness and knowledge about causes and impacts of global warming, and the link between energy and environment. They are likely to show a lesser degree of support (<50%) for environmentally friendly products and habits.

- II. The level of awareness, understanding about global warming, and willingness of residents of Hyderabad to support global warming mitigation, is likely to vary according to their age, gender, education, occupation, and level of income.
- i. *Gender*: Due to varying rates of literacy and access to information among males and females, awareness and understanding of issues like global warming could be higher among males as compares to females.
 - ii. *Age*: Older persons may be more aware about environmental issues such as global warming, as they are likely to read more about these issues and understand its implications for society in the long-term.
 - iii. *Income*: Lower income groups are more likely to view other issues as serious problems (e.g., inflation, unemployment, health) as compared to global warming. Income may influence people's support for actions and initiatives that may reduce global warming.
 - iv. *Education*: Higher education may give greater access to information about and an enhanced ability to understand global environmental issues such a global warming.
 - v. *Occupation*: Persons in certain occupations (government, media and NGOs) are more likely to be aware about global warming, as these sectors are more closely involved in addressing issues like global warming.
- III. Perception of residents of Hyderabad about seriousness of global warming, concern about impact of global warming on their lives, and the influence of environmental

concerns on their daily activities, would be linked to their willingness to support initiatives and programs that would reduce global warming.

Method

Study-Site

Located in South India, Hyderabad is the capital of the State of Andhra Pradesh (see Figure 2). Average literacy rate is 78.8% and average work participation rate of total employable population is 29.2%. A majority of the work force, 98.3%, are engaged in non-agricultural activities in government organizations, private sector, educational institutions, hospitals, and the software industry (Directorate of Economics and Statistics [DES], 2007).

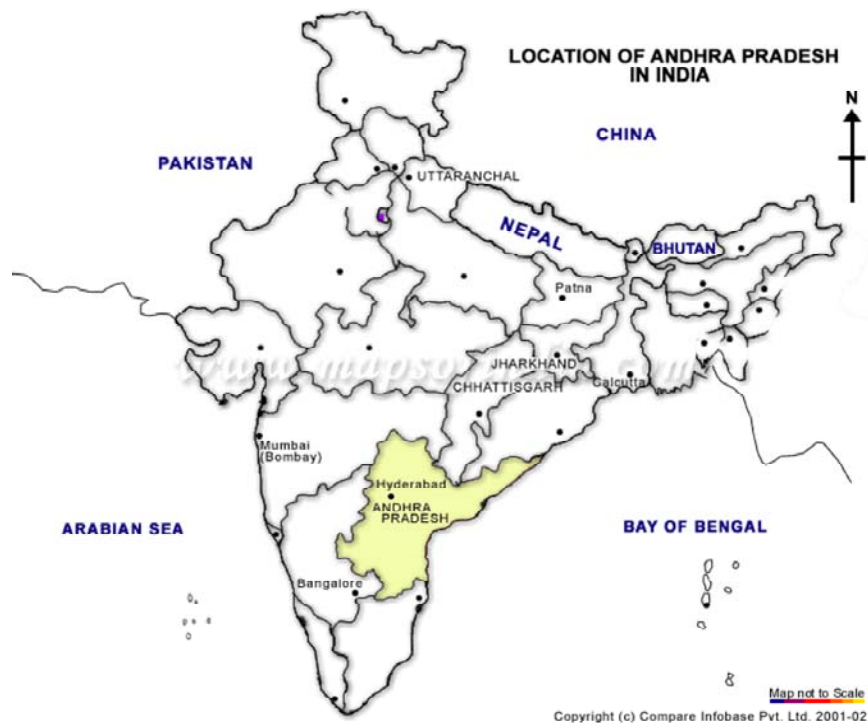


Figure 2. Location of Hyderabad in India (Compare Infobase Limited, 2007)

Hyderabad's 3.9 million people are spread across 23,000 hectares, with a very high density of 19,149 per square kilometer (Office of the Registrar, 2001). As population grew 12.8% during 1991-2001, urbanization deprived Hyderabad of

agricultural land, pastures, grasslands and lakes. There is chronic water scarcity as water supply depends on level of annual rainfall, which had a -19% deviation from normal during 2004-2005 and +50% deviation from normal during 2005-2006 (DES, 2007).

From 1993 to 2002, there was a 140% increase in the number of cheaper, more polluting two-wheelers and a 176% increase in the number of cars in Hyderabad (Environment Protection and Training Research Institute [EPTRI], 2006). A majority of vehicles, 56.2% are two-wheelers, 19% are trucks, and 12% are four wheelers (Andhra Pradesh Transport Department, 2006). Although there is no coal-based power plant in the vicinity, there are 548 industries in the city, which emitted 768,816 metric tons of CO₂ in the year 2001. Due to the cumulative effect of all these factors, the city is considered one of the most polluted in India (EPTRI, 2006).

The Pollution Control Board implements the Air Pollution Act (1981), the Environment Protection Act (1986), and ensures industrial compliance with National Ambient Air Quality Standards. EPTRI prepared Hyderabad's first inventory of GHGs and particulate matter (PM₁₀) emissions that warned that vehicle emissions that caused 63% of GHGs and air pollutants in 2001, may increase if unchecked, to 75% by 2021. EPTRI's hypothetical GHG mitigation scenarios showed that effective bus transit mitigation results in greatest reductions in PM₁₀ and GHG emissions. EPTRI designed an Industrial Sector Outreach Campaign to get industry's voluntary support for GHG reductions; and the Hyderabad Air Campaign to increase citizens' awareness about Hyderabad's pollution problems (EPTRI, 2006).

Instrument

Data was collected through a written, self-administered questionnaire in English, which had 43 questions. Of these, 38 were in multiple-choice format and five were open-ended, seeking written and detailed responses. The first section sought biographical information, without any personal identifying information. The second section was about fuel and energy-related issues, closely linked with global warming. The third segment obtained people's perceptions and knowledge about causes and impacts of global warming. The fourth section ascertained influence of environmental concerns on daily activities and degree of support for eco-friendly habits and programs. The last section was related to the source and adequacy of information with regard to global warming (see Appendix A).

Data Collection

As Hyderabad's population according to the 2001 census was nearly 3.9 million, the recommended sample size with a confidence level of 95%, response distribution of 50% and a margin of error of 5% is 385. Nearly 1,700 printed questionnaires were distributed, of which 890 were completed and returned to the researcher. Each subject signed an agreement to participate prior to answering the questionnaire (see Appendix B). After discarding questionnaires less than 60% complete, data was collected from 851 questionnaires. This study's sample of 851 subjects is much larger than the recommended sample size and provides a margin of error of 3.36%. A pilot study was not done due to time and resource constraints.

Participants

Subjects were drawn from a stratified sample of nine occupational segments, in order to look for variations of awareness and knowledge (see Table 1). A list of organizations that allowed their employees to participate in the survey is in Appendix C.

Table 1

Distribution of Sample on Basis of Occupation

Segment	Number of Subjects	Number of Organizations that Participated
Students	167	Eight colleges
Government	119	Seven organizations
Corporate sector	112	Five organizations
Information Technology (IT) sector	109	Four companies
Academia	86	Six schools and colleges
Non-profit organizations (NGOs)	74	Four NGOs
Educated Professionals	72	Five organizations
Media	57	Five organizations
Homemakers	55	Different regions of city

The demographic profile of participants shows that 63% of the subjects were male (see Table 2). Persons below 35 years of age form almost 60% of population in Hyderabad and were well represented in the sample at 61%. Nearly 50% held Bachelor's degrees and 34.9% had Master's degrees. In urban India, most adults pursue education at least up to the Bachelor's degree because a Bachelor's degree is the minimum pre-requisite for most employment positions. Literacy rates are also higher in metropolitan

cities due to presence of many educational institutions. Thirty-three percent (33%) were from the middle-income group (\$271 to \$616 a month). Seventeen percent (17%) who did not have any income included most of the retired, homemakers, students, and some unemployed. All occupational sectors were well represented. The IT sector (12.8%) was considered distinct from the corporate sector for purpose of data collection, as the IT sector is primarily a service-oriented industry. The corporate sector is associated primarily with traditional manufacturing activities.

Table 2

Demographic Characteristics of Participants

Demographic Variable	N	Percentage of Subjects
Gender		
Male	538	63%
Female	313	37%
Age group		
18-25 years	289	34%
36-50 years	232	27.4%
26-35 years	233	27.4%
Above 50 years	95	11.2%
Education		
Bachelors degree	430	50.5%
Masters degree	297	34.9%
High-school and below	74	8.7%
Doctorate and above	47	5.5%

Table 2 continued

Demographic Variable	N	Percentage of Subjects
Approximate Monthly Income		
Middle-income group	281	33%
Low-income group	203	23.9%
No-income group	145	17%
Upper-middle income group	140	16.5%
High-income group	46	5.4%
Occupation		
Students	167	19.6%
Government employees	119	14%
Corporate sector employees	112	13.2%
Information Technology sector	109	12.8%
Academia	86	10.1%
NGO employees	74	8.7%
Educated Professionals	72	8.5%
Media employees	57	6.7%
Homemakers	55	6.5%

Procedure

Within each segment, 10-15 organizations were contacted by the researcher prior to the site visit, to seek their willingness to participate in the study. Some organizations expressed willingness to allow their employees or members to participate in the study, on an individual and voluntary basis. During a visit to Hyderabad from 1 June to 31 August

2007, the researcher handed over 30 to 50 questionnaires to a nodal person in each organization, who distributed questionnaires at different levels in hierarchy, while attempting to maintain gender equity. Along with the questionnaire, participants were handed over a one-page document with information about the survey and its purpose (Appendices A and B). Completed questionnaires were returned to the researcher either on the same day or within a period of 2-10 days. For homemakers, respondents were chosen in different geographical locations of the city. Subjects were not given any compensation for their participation in the study.

Coding

Answers to 38 multiple-choice questions were coded numerically from “1” to “5,” including for “did not respond.” For open-ended responses, significant terms or keywords were identified and coded. For instance, when subjects said that pollution was the most significant global environmental issue, the word pollution was identified as a keyword, coded as “PLTN.” When subjects gave multiple keywords in their open responses, all keywords were coded and entered as responses for that question.

Gender groups, male and female were coded as “1” and “2,” respectively. For purpose of data analysis, the four different age groups were aggregated into two groups. Those between 18 to 35 years of age were coded “1” and those above 35 ears of age were coded “2,” respectively. The four educational levels in the survey were aggregated into two groups. Those who had basic education (studied until Bachelor’s) were coded “1” and those who had higher education (Master’s and above) were coded “2,” respectively. The four income groups were aggregated into two groups. The “low income” group

coded “1” had an approximate monthly income up to \$617. This group included those with no-income such as students, the unemployed and homemakers. The “high income” group earned upwards of approximately \$640 and was coded “2.”

The variable “seriousness judgment” was coded from “1” to “5” representing “Not a problem,” “slightly serious,” “very serious,” “don’t know,” and “no response,” respectively. Responses for degree of concern about global warming, and influence of environmental concerns on daily activities, were coded from 1 to 5, representing “very worried,” “worried,” “not worried,” “don’t know,” and “no response,” respectively. Variables regarding degree of support for purchasing CFLs and green products, had responses coded from “1” to “5” beginning with “strongly agree,” “agree,” “disagree,” “strongly disagree,” “don’t know,” and “no response,” respectively.

Data Analyses

Statistical Program for the Social Sciences (SPSS) was used for data entry and analysis. Since SPSS does not quantify data or calculate descriptive statistics for open-ended responses, these responses were aggregated by researcher and then percentages calculated for the most predominant response. Descriptive Statistics was used to summarize data, and obtain the mean and standard deviation for all responses to multiple-choice format questions.

Cross-tabulations examined how awareness and knowledge varied across gender, age, education, income, and occupation. Independent samples t-tests looked for statistically significant differences across gender, age, education, income, and occupation. To determine if there are differences in awareness and knowledge among the nine

occupational groups, one-way Analysis of Variance (ANOVA) tests were done with occupation as the independent variable. In the next step of analysis, linear regression analysis compared occupational groups for significant differences in their perceptions and knowledge. Multinomial logistic regression looked for significant relationships between perceptions about global warming and degree of support for environmentally friendly products and programs. Multiple linear regression analysis looked for significant relationships between the independent variables (gender, age, education, income, and occupation) on the one hand, and perceptions about global warming and degree of support for environmentally friendly products and initiatives on the other.

Results

Descriptive Statistics

Using descriptive statistics, percentages, mean, and standard deviations were calculated for the responses to each multiple-choice question. Any variable, for which less than 50% of the subjects gave the correct response, was considered an indication of “low level” of awareness. Similarly, a variable for which more than 60% of the subjects gave the correct response was considered an indication of “good level” of awareness. A summary of responses for all questions in the survey is in Table 3.

Table 3

*Descriptive Statistics for all Survey Variables**

Most Predominant Response Given by Subjects	Percentage of Subjects who Selected Response
I undertake natural outdoor activities once in a year	50.0%
I notice 2 to 4 species of birds in my neighborhood	34.7%
Pollution is Hyderabad’s most important environmental problem	71.0%
Pollution Control Board is responsible for pollution control in Hyderabad	67.0%
Hyderabad Air Campaign is about pollution awareness	44.2%
<u>Energy and Environment</u>	
Two-wheeler is my principal mode of transportation	39.2%
Diesel is the most polluting fuel	54.3%
Solar energy is a source of renewable energy	62.5%

Table 3 continued

Most Predominant Response Given by Subjects	Percentage of Subjects who Selected Response
Coal and petroleum are also known as fossil fuels	68.0%
I purchase unleaded petroleum for my vehicle	77.4%
GHGs are heat-trapping atmospheric gases	50.0%
<u>Global Warming</u>	
I have thought a lot about global warming recently	46.0%
I have a moderate amount of knowledge about global warming	48.9%
Global warming is a very serious problem	78.6%
Global warming will cause extreme changes in global climate	53.2%
Global average temperature will rise significantly in future	57.5%
I don't know by how much global average temperature increased in last century (correct answer 0.6 C was given by 7.5%)	31.7%
Global warming affects every place on earth	60.0%
Global warming is not caused by satellites in space	70.6%
Global warming does not cause skin cancer	58.4%
<u>Willingness to Take Action</u>	
I am very worried that global warming will affect my way of life in future	61.2%
Environmental concerns influence some of my daily activities	45.2%
Global warming can be controlled through personal actions	47.5%
I agree to pay more for eco-friendly products	51.8%

Table 3 continued

Most Predominant Response Given by Subjects	Percentage of Subjects who Selected Response
I agree to pay a tax for pollution control	55.5%
I agree to pay more for Compact Fluorescent Lamps	46.2%
I agree to support building of a nuclear power plant near Hyderabad	42.9%
I strongly agree to support a ban on use of plastic bags	70.9%
Society and people should take action to control global warming	44.1%
<u>Information about Global Warming</u>	
I do not know which recent documentary was about global warming	65.0%
(Correct answer <i>An Inconvenient Truth</i> was given by 18.1%)	
Print media provide most of my information about global warming	56.6%
Some information about global warming is available from print media	42.3%

*Estimated Margin of Error for Sample of 851 subjects: 3.36%

To an open-ended question about the most significant global environmental issue, more than 60% said pollution. Other issues were population explosion, global warming, ozone depletion, indiscriminate use of chlorofluorocarbons (CFCs) and plastics, loss of bio-diversity, environmental degradation, deforestation, water scarcity, garbage disposal, and absence of environmental awareness and responsibility.

In open-ended responses about changes in local climate in the last 10 years, 60-65% of the subjects pointed out an increase in temperature, long summers, increasing humidity, fluctuating temperatures, erratic seasons, extreme weather, less rain, dry spells, and shorter winters. Perhaps due to these perceptions, the subjects said that every place

on the earth was getting warmer (60%) and that global average temperature rose by 5 or 10° C (degrees centigrade) in the last 100 years (40%).

Seventy-one percent (71%) considered air pollution as Hyderabad’s most important environmental issue (see Figure 3). This perception could be due to an understanding of global warming within the pollution model characterized by a concern about contaminated air and water, loss of biodiversity, awareness of population pressures, and a concern for dwindling natural areas (Willet, 1997; Bord et al., 1994). Most of these concerns were reflected by respondents in open-ended answers.

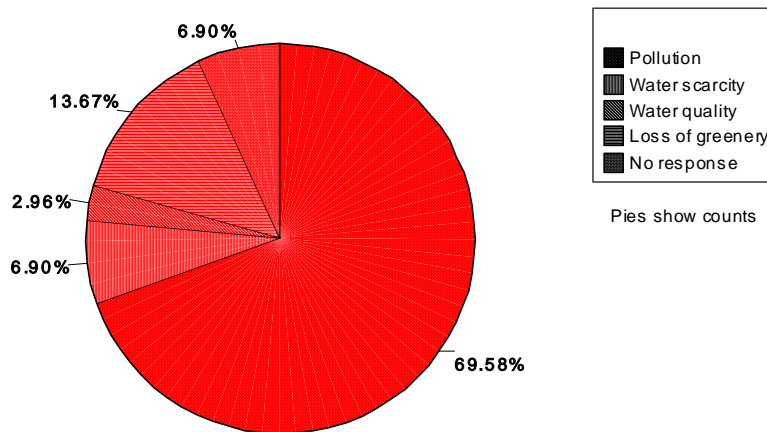


Figure 3. Hyderabad’s Most Significant Environmental Issue

Significantly, 78.6% of the subjects said that global warming is a “very serious” problem that could result in “extreme or major” changes in global climate (92.1%) and a significant rise in global average temperature in future (57.5%). A majority, 61.2%, were worried that global warming may affect their way of life in the future. Opinion was evenly split among those who felt that global warming could be controlled through personal actions (47.5%) and those who called for drastic measures (44%).

Understanding about causes of global warming was limited as 23.5% thought that global warming was not caused by vehicle emissions, deforestation, or industrial pollution (see Figure 4). Forty-two percent (42%) said that global warming would not cause melting glaciers, extreme weather or a rise in sea level, showing that there is not much understanding about effects of global warming (see Figure 5). Similarly 50% were ignorant about GHGs and thought that GHGs were industrial gases and agricultural chemicals (see Figure 6).

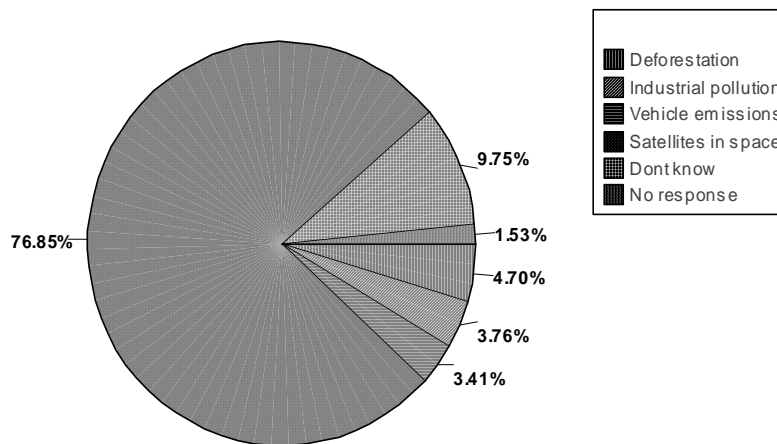


Figure 4. Which of These Do Not Cause Global Warming?

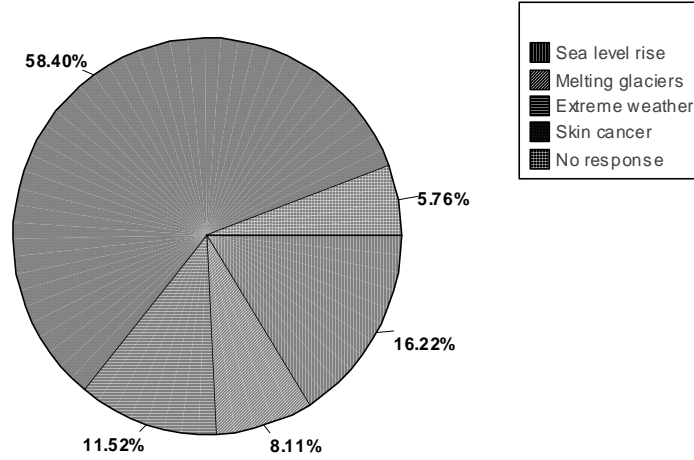


Figure 5. Which of these is Not an Effect of Global Warming?

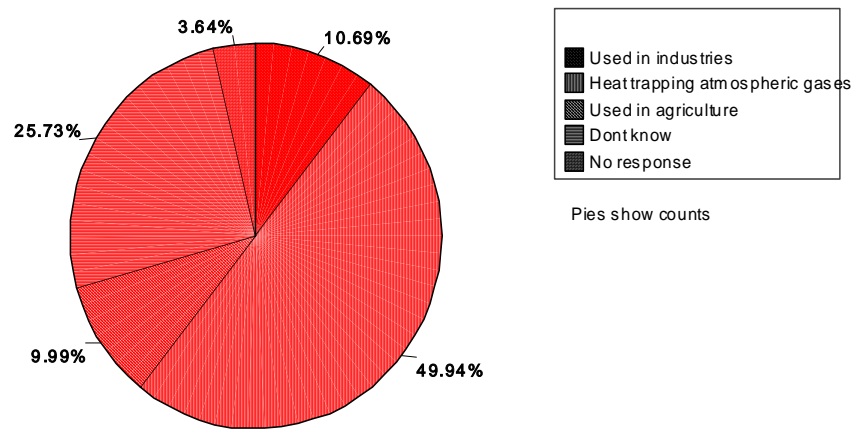


Figure 6. What are Greenhouse Gases?

It is worrying to note that 19.7% either did not have any environmental concern and or did not allow such concerns to influence their daily activities (see Figure 7).

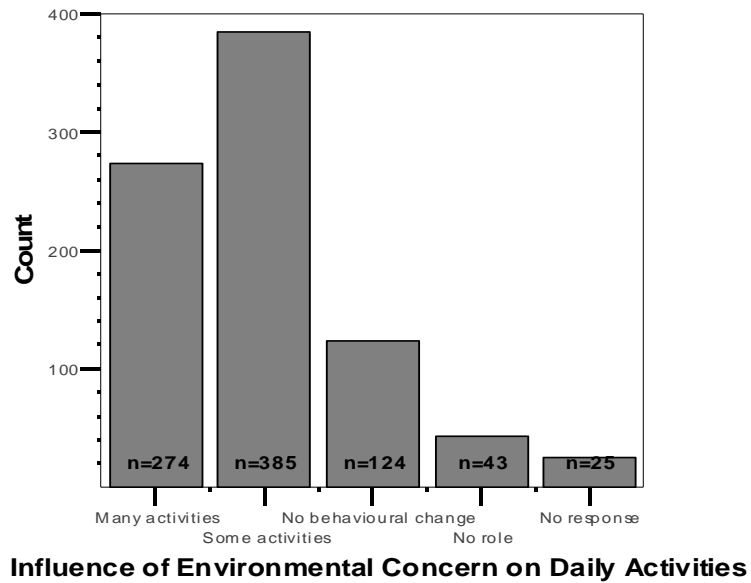


Figure 7. Influence of Environmental Concerns on Daily Activities

A proposal for building a nuclear plant near the city to supply energy evoked mixed response with 26.8% against. Surprisingly, government and NGOs together provided only 4.9% of respondents with information about global warming because newspapers and magazines were the main source of information (56.6%).

Significant Findings of Research

A brief summary of significant findings of research for the three hypotheses is given in Table 4.

Table 4

Summary of Significant Findings for Tests of Hypotheses

Research Hypothesis	Tests of Hypotheses	Significant Results	Supported or Refuted
There is a low level of awareness in Hyderabad about global warming.	Categorization of respondents along Stamm's Problem-solution Path using percentage data for predominant responses	78.6% aware about problem 20-25% identified solutions People are aware about problem and its seriousness, but not clear about its causes, effects, and solutions. Good support for GHG mitigation.	Partially supported
Global warming awareness would vary across age, gender, education, occupation, and income.	Independent samples t-tests, one-way ANOVA and linear regression analysis. Awareness is likely be higher among male, older, highly educated, high-income subjects from government, media and NGOs Multiple linear regression tests	Education significant for four dependent variables. Occupation was significant for nine dependent variables Students, media and academia were different from other groups. No single independent variable is significant. Education influenced two of five dependent variables	Gender was refuted. Age, education and income were partially supported. Occupation was mostly supported. Partially supported

Table 4 continued

Research Hypothesis	Tests of Hypotheses	Significant Results	Supported or Refuted
Public perceptions about global warming will be linked to their degree of support for environmentally friendly products and initiatives	Multinomial Logistic Regression	Seriousness judgment was most significant independent variable	Supported

Tests and results of hypothesis I. The first hypothesis stated that residents of Hyderabad are likely to have a low level of knowledge and understanding about global warming, its seriousness, causes and impacts, the link between energy and environment, and a low willingness to support programs and initiatives for reduction of global warming.

Descriptive statistics were used to calculate frequencies, mean and standard deviation for variables related to global warming and energy. Using percentage data for responses, the subjects were categorized into different stages of awareness about global warming, along Stamm's Problem-Solution Path (see Figure 8). Answers to multiple-choice questions about how much people had thought about global warming recently, their perceptions about seriousness of the issue, and whether they thought the problem can be solved, were used to group the subjects along Stages 0 to Stage 2b of Stamm's Problem-Path. Responses to open ended questions about actions that people, society and government could take to reduce global warming were used to place the subjects in either Stage 3 or Stage 4 of Stamm's model.

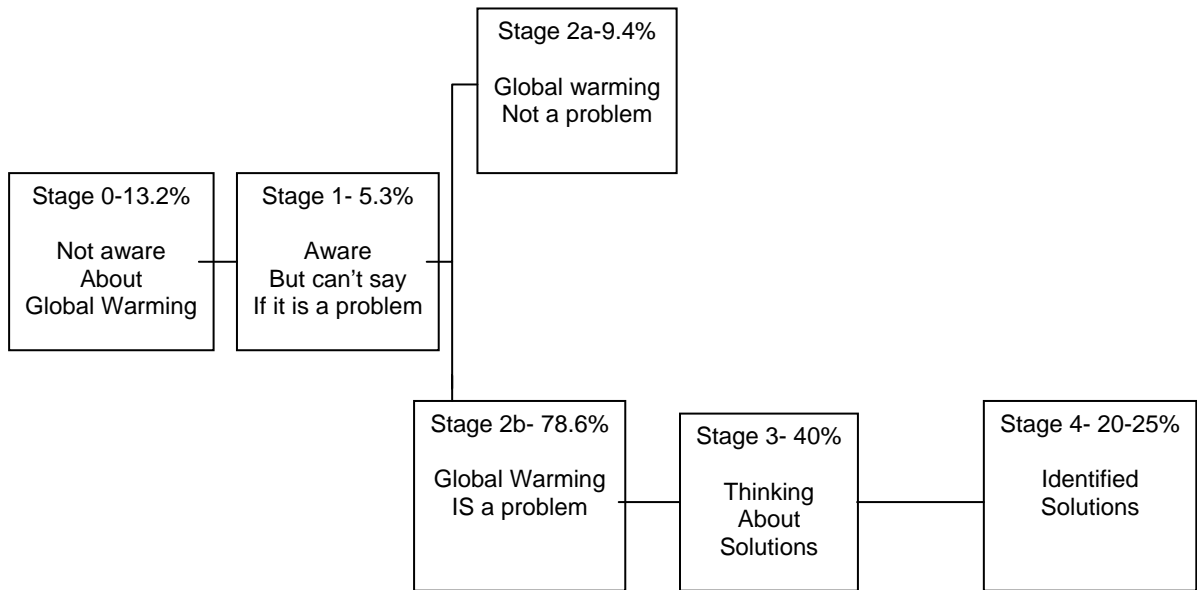


Figure 8. Global Warming Awareness in Hyderabad along Stamm’s Problem-Path (Rao, 2008)

This study found that 13.2% were in Stage 0 and not engaged with the problem. In Stage 1 were 5.3% who did not know whether global warming was a serious issue or not. In Stage 2a were 9.4% who said that global warming was not a problem. A significant number, 78.6%, were in Stage 2a as they acknowledged that global warming was a very serious problem. Sixty-one and two tenths percent were very concerned about the effect of global warming on their way of life in future (Figure 9). Open-ended responses about actions to be taken to reduce global warming showed that nearly 40% of the subjects were in Stage 3 as they had given some thought to personal actions that could reduce global warming. In Stage 4, only 20-25% had actually identified (in open-ended responses) clear, specific personal actions that could reduce global warming. This study showed that most subjects in Hyderabad had accepted that global warming was a very

serious environmental issue but had not moved to the next logical stage where they had thought about ways of addressing the issue.

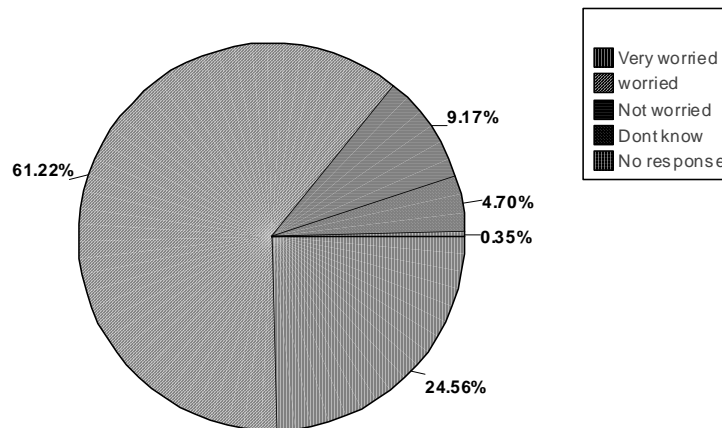


Figure 9. Concern about Effect of Global Warming on Way of Life

The first hypothesis was partially supported as a majority of respondents were aware of global warming and its seriousness and its impact on their way of life in the future. However, their level of awareness was lower concerning causes and impacts of global warming, as well as terms such as fossil fuels and GHGs. Opinion was split almost evenly among those who felt that global warming could be addressed through personal actions and those who thought that more drastic measures were needed. Although there was a satisfactory level of support for eco-friendly products and programs, there was a lack of clarity about ways of addressing global warming. A majority of solutions proposed were about increasing green cover in cities, following pollution control rules, and increasing global warming awareness.

Tests and results of hypothesis II. The level of awareness and understanding about global warming among the residents of Hyderabad is likely to vary according to age, gender, education, occupation and level of income of respondents.

Gender. To examine differences among males and females, an independent samples t-test was done, with gender as independent variable and 26 variables regarding global warming, as dependent variables. It was assumed that female respondents, by virtue of their lower levels of literacy and access to information, would have a lower level of awareness and understanding about global warming, as compared to males. Data about mean and standard deviation for the 26 variables for male and female respondents is in Appendix D. There was only one statistically significant difference with regard to perceptions of and awareness about global warming (see Table 5).

Table 5

Significant T-test Results for Groups Based on Gender

Variable	T-test Result	Value of Mean, Standard Deviation for Male Subjects	Value of Mean and Standard Deviation for Female Subjects
Support for	$t(678)=2.62, p=0.009$	$M= 2.4$	$M=2.2$
Nuclear Energy		$SD = 1.22$	$SD = 1.16$

On the proposal of building a nuclear power plant near the city to provide energy without pollution, the t-test result was significant, $t(678)=2.62, p=0.009$ as women were more opposed to the idea as compared to men (see Figure 10).

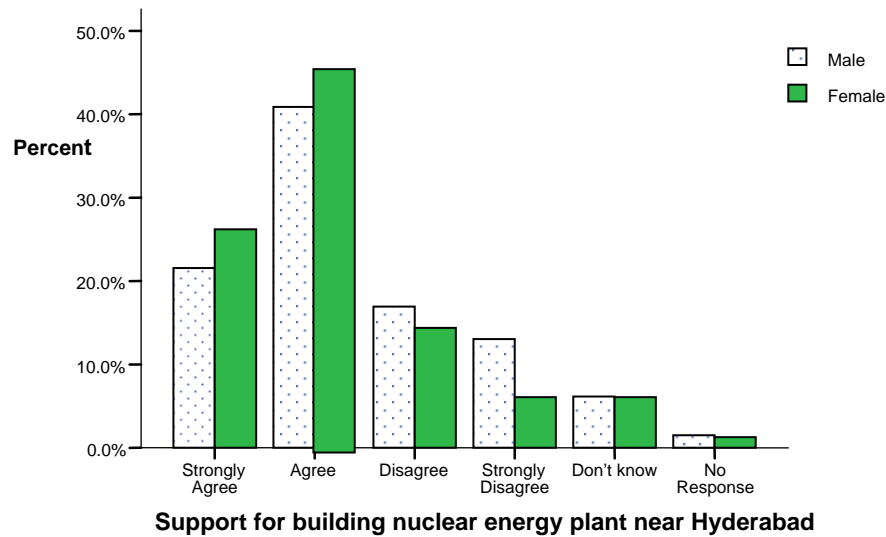


Figure 10. Support for Nuclear Energy Based on Gender

Although not statistically significant, women lagged behind men on awareness about energy, global temperature rise, causes and effects of global warming, and seriousness of the problem. They were more willing to pay for green products, and support a ban on plastic bags. Men were more supportive of a pollution control tax and worried that global warming would affect their way of life in the future. Women thought that global warming “can be controlled” through personal actions and men called for “more drastic measures.” While women felt that society should take action to control global warming, men thought that the government should take the lead.

Age. To examine differences in levels of awareness across age groups, independent samples t-tests were done with age as independent variable. The assumption

was that those between 18-35 years would be less aware about global warming than those above 36 years. 26 variables related to global warming and energy were dependent variables. Values of mean and standard deviation for the two age groups, for dependent variables, are in Appendix E. A summary of statistically significant t-test results is given in Table 6.

Table 6

Significant T-test Results for Groups Based on Age

Variable	T-test Result	Value of Mean, Standard Deviation for 18-35 year olds	Value of Mean and Standard Deviation for those above 36 years
I. Environmental concerns in daily activities	$t(847)=2.46, p=.014$	$M= 2.0$ $SD = .97$	$M=1.9$ $SD= .94$
Geographical impact of global warming	$t(723)=2.2, p=.027$	$M=1.8, SD=1.14$	$M=1.6, SD=1.08$
Degree of support for CFLs	$t(847)=4.17, p=0.001$	$M=1.8, SD=1.07$	$M=1.6, SD=.83$

There were three statistically significant differences between age groups. Global warming would “affect every place on the earth” said 8% more of those above 35 years as compared to those below 35 years ($p<0.05$). Environmental concerns influenced “some or many” daily activities of 6% more of those above 35 years than those below 35 years, ($p<0.05$). Twelve percent more of those above 35 years “strongly agreed” to pay more for CFLs as compared to those below 35 years ($p<0.005$).

Although other differences were not statistically significant, those above 35 years were more aware about energy issues, thought a lot about global warming; were worried

that global warming would affect every place on earth and their way of life, called for government to take action, and felt that personal actions could curb global warming. They were more willing to support a ban on use of plastic bags, pay a tax for pollution control and oppose nuclear energy. Those below 35 years had thought a little about global warming, were more willing to buy green products, support nuclear energy, and called for society to take action on global warming.

Education. To determine if education influences awareness and knowledge about global warming, an independent samples t-test was performed, with education as the independent variable. The subjects were aggregated into two educational levels, those who had studied until Bachelor's and those who held Master's and higher degrees. This was based on the assumption that those who have basic education would be less aware about global warming as compared to the highly educated as they are likely to have less access to information and a greater capacity to understand implications of such problems. Twenty-six (26) variables related to global warming and energy were considered as dependent variables. Data regarding values of mean and standard deviation of the educational groups, for the relevant variables is presented in Appendix F. A summary of statistically significant results is in Table 7.

Table 7

Significant T-Test Results for Groups Based on Education

Variable	T-test Result	Value of Mean, Standard Deviation for those with Basic Education	Value of Mean and Standard Deviation for those with Higher Education
How much have you thought about global warming recently?	$t(846)=-3.88, p=.001$	$M=2.5, SD=.97$	$M=2.7, SD=.84$
How much do you know about global warming?	$t(783)=4.68, p=.001$	$M=2.3, SD=.79$	$M=2.1, SD=.71$
Causes of global warming	$t(790)=3.067, p=.002$	$M=3.8, SD=.90$	$M=3.9, SD=.90$
Degree of support for CFLs	$t(846)=3.086, p=.002$	$M=1.8, SD=1.07$	$M=1.6, SD=.96$

Figure 11 shows that more of those who had basic education had “thought a little” about global warming recently as compared to the other group which had “thought a lot” about the issue ($p=.001<0.005$). While those who had basic education claimed “some or moderate” amount of knowledge about global warming those who had higher education claimed a “lot of knowledge” ($p=.001<0.005$). On the causes of global warming, those who had higher education were more aware than the other group, ($p=0.002<0.005$). Figure 12 shows that more of those who had higher education “strongly agreed” to pay more for CFLs and those who had basic education disagreed ($p=0.002<0.005$).

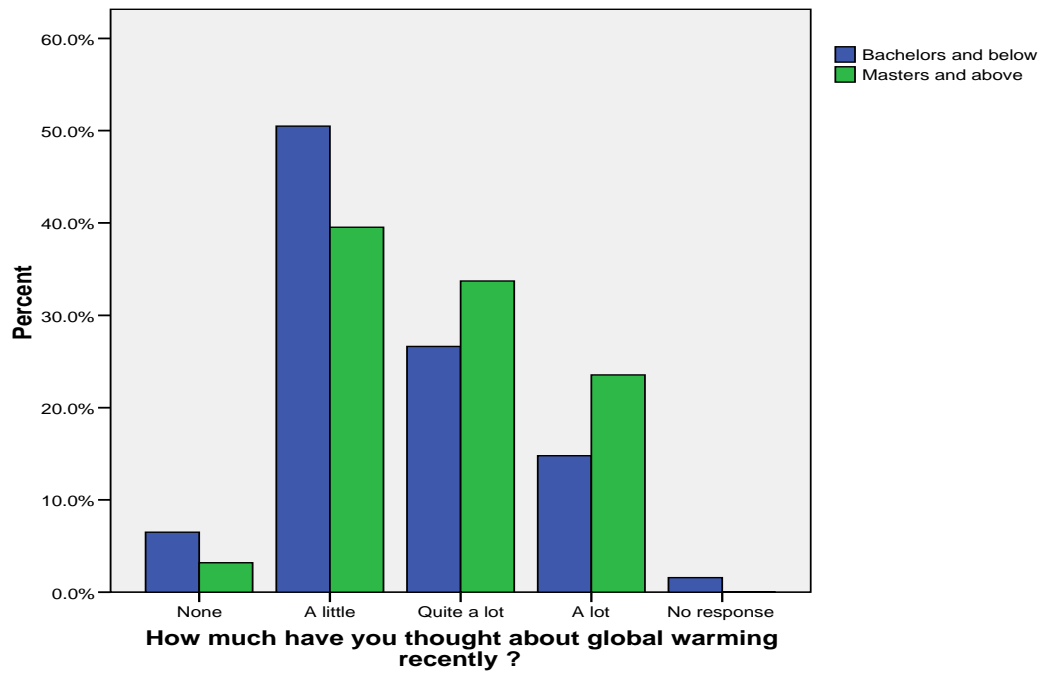


Figure 11. How Much Have You Thought about Global Warming Recently? (Based on Education)

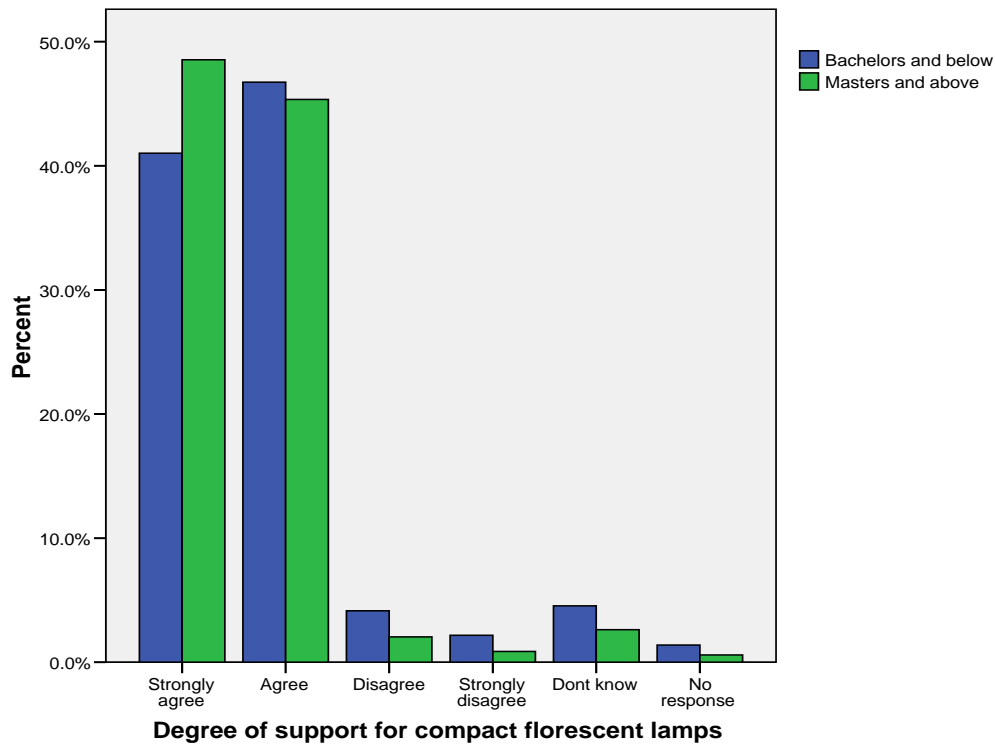


Figure 12. Degree of Support for CFLs Based on Education

Although other differences were not statistically significant, more among those who had higher education thought that global warming was a very serious problem, were aware about causes and impacts of global warming and called for more drastic measures to address it. They were more willing to pay for eco-friendly initiatives and more likely to oppose nuclear energy. Those who had basic education said that global warming was a slightly serious problem, were opposed to paying tax for pollution control, inclined to support nuclear energy and called for society to take action to control global warming.

Income. To determine variations across income groups, independent samples t-tests were done with income as independent variable and 26 variables regarding global warming as dependent variables. The subjects were grouped into two levels of income.

Those who had incomes up to \$617 a month were considered the low-income group. Those who earned more than \$640 a month were considered the high-income group. It was assumed that subjects with low income are likely to be less aware and less concerned about environmental issues like global warming, which does not have tangible effects on their daily lives. Subjects with a higher income are also more likely to be supportive of GHG reduction initiatives, which may require an extra expenditure on their part. Data regarding values of mean and standard deviation of the two income groups, for 26 variables is presented in Appendix G. Statistically significant results are in Table 8.

Table 8

Significant T-test Results for Groups Based on Income

Variable	T-test Result	Value of Mean, Standard Deviation for low-income subjects	Value of Mean and Standard Deviation for high-income subjects
Causes of Global Warming	$t(254) = 2.451, p = .015$	$M = 3.9, SD = .81$	$M = 3.7, SD = 1.03$
Effect of global warming on temperature in future	$t(379) = 2.256, p = .025$	$M = 1.6, SD = .94$	$M = 1.4, SD = .73$

There were two statistically significant differences among income groups. More subjects among the high-income group said that global average temperature would rise significantly in the future as compared to the low-income group ($p = 0.025 < 0.05$). Subjects in the low-income group knew more about causes of global warming ($p = 0.015 < 0.05$). Although there were no statistically significant differences, those who

earned a higher income were more aware about energy, GHGs, impacts of global warming, felt that global warming could be controlled through personal actions, were unwilling to pay tax for pollution control, willing to buy CFLs, and support nuclear energy. The lower income group worried that global warming would affect their way of life in future was more willing to buy green products, and pay tax for pollution control.

Occupation. Subjects were drawn from nine occupational groups namely government, media, NGOs, corporate sector, IT, academics, students, homemakers, and educated professionals. To examine variations across occupational groups, one-way Analysis of Variance (ANOVA) tests were done with occupation as the independent variable. The assumption was that global warming awareness would be higher among subjects from sectors such as government, media and NGOs, which are directly involved in addressing issues like global warming. Significant ANOVA test results are summarized in Table 9.

Table 9

ANOVA Test Results for Groups Based on Occupation

Variable	ANOVA test result	Lowest Mean and occupational group	Highest Mean and occupational group
Greenhouse Gases	$F(8, 842)=2.6, p<.008$	IT sector ($M=1.73$)	Homemakers ($M=2.93$)
Influence of environmental concerns	$F(8, 842)=4.2, p<.001$	Academia ($M=1.73$)	Students ($M=2.34$)
How much have you thought about global warming recently?	$F(8, 842)=4.0, p<.001$	Corporate sector ($M=1.73$)	Media ($M=3.07$)
How much do you know about global warming?	$F(8, 839)=6.1, p<.001$	Educated Professionals ($M=1.94$)	Homemakers ($M=2.55$)
Impact of global warming	$F(8, 842)=3.4, p<.001$	Academia $M=1.33$	NGO sector ($M=1.91$)
Causes of global warming	$F(8, 842)=2.8, p<.004$	Academia ($M=4.09$)	Media ($M=3.51$)
Rise of global average temperature in future	$F(8, 842)=3.1, p<.002$	Media ($M=1.32$)	Students ($M=1.80$)
Extent of rise of global average temperature in past	$F(8, 842)=5.3, p<.001$	Academia ($M=1.40$)	NGOs ($M=2.18$)
Geographical impact of global warming	$F(8, 842) =5.3, p<.001$	Academia ($M=1.4$)	NGOs ($M=18$)
How can we control global warming?	$F(8,842)=2.5, p<.011$	Academia ($M=1.49$)	Students ($M=1.86$)
Effect of global warming on people's lives	$F(8, 842)=2.4, p<.015$	Media ($M=1.72$)	Students ($M=2.13$)

Table 9 continued

Variable	ANOVA test result	Lowest and occupational group	Mean and occupational group	Highest and occupational group	Mean
Degree of support for pollution control tax	$F(8, 842)=2.1, p<.030$	Media ($M=1.81$)		IT Sector ($M=2.24$)	
Degree of support for CFLs	$F(8, 842)=5.7, p<.001$	Educated Professionals ($M=1.56$)		Students ($M=2.16$)	
Degree of support for nuclear energy	$F(8,842)=2.2, p<.024$	IT Sector($M=2.06$)		Media ($M=2.72$)	
Degree of support for a ban on plastic bags	$F(8,842)=3.9, p<.001$	Academia ($M=1.3$)		Students ($M=1.71$)	

ANOVA results showed that students stood out by virtue of their perceptions and level of understanding. They claimed the least influence of environmental concerns on daily activities, and 22.2% did not have environmental concerns at all in daily activities. They were highest among those who had not thought about global warming recently. On whether global average temperature would rise significantly in the future, and the geographical impact of global warming, students were least aware and gave highest number of “don’t know” responses. Some of the students, 8.4% of students thought that personal actions would have no effect on global warming and were highest among those who did not respond. Students were least supportive of the proposal for a ban on use of plastic bags in the city (61.1%) and the most disapproving (15%). These results point to the fact that global warming is not a serious environmental issue for students.

Academia was the other group that consistently and statistically differed from other subjects. On the impact of global warming on global climate, most among academia (70.9%) said that global warming would result in extreme changes in global climate in the future. They were most aware about the causes of global warming (86%). They were most supportive about nuclear energy for Hyderabad (47.7%) and a ban on use of plastic bags (77.9%). The IT sector (87.5%) claimed “some or moderate” knowledge about global warming and had least support for a proposed tax for pollution control (43.1%). Most among the corporate sector were worried that global warming would affect their way of life in the future (64.3%). Largest degree of support for a pollution control tax was in the NGO sector (70.3%). The proposal for a nuclear energy plant near Hyderabad got the highest disapproval from educated professionals (41.7%).

Linear regression analysis: To statistically confirm the differences among occupational group further, a linear regression analysis was performed with occupation as the independent variable. Each occupational group was compared against all other eight groups combined as the other group. For example, students were coded “1” and all other groups were coded “0.” This coding was repeated for all groups, so that each occupational group was pitted against all other groups combined. Sixteen (16) variables related to global warming awareness were considered as dependent variables. Statistically significant results of linear regression analysis for the four groups, students, media, academia, and educated professionals are summarized in Table 10.

Table 10

Significant Results of Linear Regression

Variable	Name of Occupational Group and P Value			
	Students	Media	Academia	Educated Professionals
How much have you thought about global warming recently?	-	0.001	0.018	-
How much do you know about global warming?	-	-	0.005	0.001
Perceived seriousness of global warming	-	0.014	-	-
Nature of changes in global climate caused by global warming	0.049	-	0.001	-
Will global average temperature rise significantly in future?	0.002	0.011	-	-
Extent of global average temperature in past	0.025	0.041	-	-
Causes of global warming	-	0.001	0.015	0.035
Geographical impact of global warming	0.001	-	0.001	-
Concern about effect of global warming	0.001	0.011	-	0.001
How can global warming be controlled?	0.001	-	0.028	-
Support for eco-friendly products	0.033	-	-	0.031
Support for pollution control tax	0.021	0.019	-	0.028
Support for nuclear energy	-	0.026	-	-
Support for ban on plastic bags	0.001	-	-	-
Support for Compact Florescent Lamps	0.001			0.046

Linear regression analysis demonstrated that when compared with other groups combined together, students showed statistically significant differences for 10 out of 16 variables. Media differed from other groups on nine dependent variables and academia differed on eight variables respectively.

Multiple Linear Regression Analysis: This test looked for significant relationships between demographic variables on the one hand and seriousness judgment, degree of concern, extent of support for eco-friendly products on the other. Demographic variables (age, gender, education, income, and occupation) were independent variables. Dependent variables were seriousness judgment, degree of concern, and degree of support for purchasing green products and CFLs. Support for eco-friendly products and CFLs would have a more direct impact on GHG mitigation, as compared to other measures.

Regression analysis did not highlight any one independent variable as the most significant factor in determining level of awareness of or knowledge about global warming. Among all demographic variables, level of education was most significant as it influenced seriousness judgment about global warming ($t=2.088$, $p=0.037$, <0.05) and the degree of support for purchasing CFLs ($t=-2.40$, $p=0.016$). Adjusted R-square values for all the above dependent variables, were insignificant (ranging from 0.001 to -0.029) showing that gender, age, education, income and occupation had a negligible combined effect on perceptions about global warming and degree of support for environmentally friendly products and initiatives. Significant results of multiple linear regression analysis are summarized in Table 11.

Table 11

Significant Results of Multiple Linear Regression

Variable	Beta	P value	Correlation
Perceived seriousness of global warming			
Education	0.093	0.009**	0.082
Degree of concern about global warming			
Occupation	0.269	0.001***	0.252
Extent of support to buy CFLs			
Age	-0.152	0.001***	-0.142
Education	-0.083	0.016**	-0.107

Dependent Variable is in Boldface

*Key: ** $P = < 0.05$, *** $P = 0.005$*

Occupation had a significant effect only on the degree of concern about global warming affecting their way of life in the future ($t=7.649$, $p=0.001<0.05$). A negative correlation between education and degree of concern shows that subjects with less education are less likely to be worried about global warming affecting their way of life in the future. Negative correlations also show that younger subjects are less likely a very serious issue ($p=-0.008$) and male subjects are more likely to consider global warming as a very serious issue.

Tests and Results of Hypothesis III. Hypothesis III stated that people’s perception about seriousness of global warming, impact of global warming on their lives in future, and environmental concerns on daily activities will be linked to their degree of support for environmentally friendly products and GHG reduction initiatives.

To test this hypothesis, multinomial logistic regression tests were done. Dependent variables were degree of support respondents expressed for five GHG reduction initiatives. Independent variables were seriousness judgment, degree of concern about global warming, and the influence of environmental concerns on daily activities. The results of these tests are presented in Appendix H. Statistically significant results are presented in Table 12.

Table 12

Significant Results of Multinomial Logistic Regression

Variable	P Value
Degree of support for purchasing green products	
Role of environmental concern	<0.05
Seriousness Judgment	<0.005
Degree of concern	<0.005
Degree of support for paying tax for pollution control	
Role of environmental concern	<0.005
Seriousness Judgment	<0.005
Degree of concern	<0.005
Degree of support for purchasing CFLs	
Seriousness Judgment	<0.005
Degree of concern	<0.005

Table 12 continued

Variable	P Value
Degree of support for proposed nuclear energy plant	
Seriousness Judgment	<0.005
Degree of support for a ban on plastic-bag use	
Role of environmental concern	<.05
Seriousness Judgment	<0.005
Degree of concern	<0.005

Dependent Variable is in Boldface

Reference Category for Dependent Variable: Strongly Disagree

Seriousness judgment about global warming was the most significant independent variable with regard to the degree of support for environmentally friendly actions and initiatives, as it had influenced all five dependent variables. This variable distinguished those who “strongly agree” ($p=0.001<0.05$) and “agree” ($p=0.001<0.05$) from those who “disagree” to pay more for environmentally friendly products. Those who considered global warming a serious issue were more likely to “agree” to pay a pollution control tax ($p=0.001<0.005$), “strongly support” CFLs ($p=0.001<0.005$), “agree” ($p=0.001<0.005$) and “strongly agree” to support ($p=0.02<0.05$) the proposal for nuclear energy for Hyderabad and support a ban on use of plastic bags in the city. The significance of seriousness judgment as found in this study, is in consonance with previous research, which proves that people will take measures to curb global warming, if they believe that the problem is serious in nature.

The next significant variable was the degree of concern about the effect of global warming on way of life in the future. This variable influenced four out of five independent variables. Subjects who worried that global warming would affect their way

of life in the future were more likely to “strongly agree” to pay a pollution control tax ($p=0.001<0.005$), pay more for CFLs ($p=0.02<0.05$), support a ban on use of plastic bags, and support the purchase of environmentally friendly products ($p=0.001<0.005$).

The independent variable, influence of environmental concerns in daily activities had the least impact, as it influenced three out of five independent variables, namely degree of support for purchasing environmentally friendly products ($p=0.025 <0.05$), tax for pollution control ($p=0.001<0.005$), and a ban on use of plastic bags in the city ($p=0.04<0.05$).

Subjects’ Suggestions Regarding GHG Mitigation

Through open-ended questions this study sought suggestions from residents of Hyderabad regarding measures, initiatives and policies that could be adopted by themselves, society and government to address the problem of global warming. A significant number, 50 to 55% of subjects did not give any responses to these open-ended questions, including 10 to 15% who said that they did not know what could be done to address the issue. Among those who responded, 45 to 50% of subjects said that global warming could be controlled (at all three levels) by planting more trees and controlling deforestation. This could be due to a perception that reducing greenery, problems of local pollution, and global warming are related. Incidentally, the government also states that through carbon sequestration, forests can play a major role in GHG mitigation and adaptation to climate change (Planning Commission of India, 2007; Suganthi & Williams, 2000).

Perhaps based on the perception that vehicular pollution is a major contributor to GHG emissions in Hyderabad, 35% of the subjects suggested that the government must implement strict laws and regulations to reduce vehicular emissions, ban use of old vehicles, and fine or impound polluting vehicles. Since three-wheelers (vehicles for hire, like taxicabs) and two-wheelers using diesel were perceived as the main source of vehicular pollution, subjects suggested that these vehicles be restricted or be regulated to use clean fuels exclusively such as compressed natural gas.

Although industrial emissions are a not significant component of GHGs in Hyderabad, the subjects called for stricter implementation of industrial pollution, imposing fines on polluting industries, and even closure of polluting industries. Many remarked that the government must enforce current laws and regulations for industrial pollution rather than drafting new regulations. Recommendations were also made about ensuring the location of industries in the suburbs and away from residential areas, as there is no “zoning” policy in Hyderabad with regard to segregated location of industries, residences, and farms.

Open-ended responses show that the subjects were aware about the need to adopt eco-friendly initiatives such as using mass transportation, opting for cycling and carpooling, and switching to clean and renewable fuel for their vehicles. They also suggested that the government could invest in and promote research and development on clean, alternative, renewable energy (solar energy and bio-diesel).

Other significant responses indicated a willingness to use energy-efficient lighting in homes, conserve energy at home, and conserve fuel for vehicles. People also showed

interest in participating in and supporting global warming awareness programs in their neighborhoods. Open-ended included more elaborate suggestions about how society, government, and NGOs can reduce global warming rather than about actions subjects themselves could take to reduce global warming.

Responses about the main source of information about global warming indicated that the government was the main source of information for only 2.8% of the subjects. Many subjects suggested that the government can implement global warming-awareness programs for children in particular and at all levels of education through introduction of environmental curriculum.

As only 2.1% obtained their information about global warming from NGOs, subjects felt that NGOs could play a more active role in increasing global warming awareness by forming a network with those in power and generating a consensus for public action. They said that NGOs can focus on enhancing awareness among the illiterate, self-employed, and homemakers. It was also proposed that NGOs can coordinate formation and functioning of neighborhood pressure groups to promote global warming-awareness and encourage residents to adopt an environmentally friendly behavior. Since the print media provided most information about global warming (56.6%), respondents suggested proposed that television and radio must enhance their coverage of global warming issues to educate people about causes, consequences, and solutions for global warming.

Discussion

Comparison of Past and Present Findings

The results of this study are significantly differently from that of Stamm's 1997 study in Washington. While 30% in Stamm's study had decided that global warming is a problem, the study in Hyderabad found that 78.6% considered global warming a problem. In Stamm's study, only 18% were in the last stage of the path, feeling fairly certain about actions to be taken to solve this problem. This is much smaller than this study's 47.5% who had thought about ways in which they could address global warming. While only 7% in Stamm's study had identified specific actions to reduce global warming, in this study, 20 to 25% had outlined specific actions that could address this issue. The different findings could be due to the fact that the present study took place almost 11 years after Stamm's research in the backdrop of global discourse and increased availability of information regarding global climate change.

This research confirmed findings of previous studies that found that people are confused about issues related to global warming (Bulkeley, 2000). Subjects of this study did not have a clear understanding about the causes of global warming, the terms fossil fuels and greenhouse-gases. Nineteen percent (19%) were not aware about or did not understand the term fossil fuels. Twenty-six percent (26%) did not know what GHGs were and 21% said that GHGs were used in agriculture.

According to the current study, 61.2% in India were "very worried" about global warming, a result comparable with that of the Pew survey (65%) and the 2007 Global Market Insite (62%). This research found that 47.8% had thought "a lot or quite a lot"

about global warming recently, a finding comparable to that 48% in BBC-GlobeScan's survey (BBCNews, 2007). This study found that 51.2% had thought "a little or nothing at all" about global warming recently, higher than BBC-GlobeScan's 36%. As compared to BBC-GlobeScan's 37% who favor "major steps very soon," this research found that a higher number of people in India (43.8%) favor "more drastic steps" to curb global warming. These findings are significantly different from the World Public Opinion's 2006 survey in which only 19% in India felt the need for costly and immediate measures to reduce global warming.

The BBC-GlobeScan study concluded that people in India are less aware about global warming as compared to people in other countries. The findings of this research indicate the contrary, as subjects are aware that global warming is a very serious issue (78.6%), that will result in extreme (53.2%) or major (38%) changes in global climate in the future, and are worried that it will have an impact on their way of life in the future (61.2%).

Previous research indicates that people from poorer nations like India are less willing to support environmental protection although more willing to pay for it (Gelissen, 2007). This study ascertained people's degree of support for a tax for pollution control, on a scale where "1" was "strongly agree" and "4" was "strongly disagree." A significant number, 79.4% of subjects in Hyderabad were willing to pay tax for pollution control, a result significantly higher than findings of World Values Survey (World Values Survey Association, 2001) in which willingness to pay tax to prevent environmental pollution was 20% in 2001. The increased degree of support for pollution control tax could be due

to availability of more information and awareness since 2001 about global warming, and rising income, bolstered by India's continuing economic growth. In spite of the support for a pollution control tax, open-ended responses indicated people's skepticism that government would channel tax revenues to implement environmental programs.

The findings of this research are also comparable to that of the Global Market Insite survey (2007) in which subjects recommended that the government should do more to increase solar energy (93%) and promote public transportation (91%). In open-ended responses, many subjects in Hyderabad recommended incentives for promotion of solar energy and strengthening public transportation. The overwhelming support for a ban on use of plastic bags in Hyderabad (92%) was similar to the findings of Global Market Insite study in 2007 (94% in favor).

Implications of Study

It is important to note that although most of the findings were not statistically significant, they were in the expected direction. Based on the findings of this study, since public understanding about fossil fuels, greenhouse gases, and renewable energy shows some confusion, global warming awareness campaigns could address the direct connection between fossil fuels and global warming. To ensure that people who are aware about global warming move on to the Stage 4 in the problem-path, awareness campaigns could focus on environmental benefits of clean fuels, renewable energy, fuel and energy conservation, recycling, CFLs, energy efficient homes, eco-friendly products, public transportation, bicycles and carpooling.

Although differences in global warming awareness on the basis of gender were not statistically significant, women did not perceive global warming as a serious issue and lagged behind on awareness about energy; and causes and impacts of global warming. Therefore global warming awareness programs could make special efforts to educate women. Age was a factor for statistically significant differences on effects of global warming, tax for pollution control, ban on use of plastic bags, paying more for CFLs and the impact of environmental concern on daily activities. Age-appropriate awareness programs could focus on educating people about environmental benefits of eco-friendly behavior and life-styles.

Educational levels accounted for several statistically significant differences including on seriousness of global warming, causes of global warming, and willingness to take action. Global warming awareness programs could be made specific to educational levels and designed in local languages for those with basic education. More comprehensive and informative awareness initiatives could be aimed at those with higher education.

The study found that occupation was the most significant factor for different levels of awareness and knowledge about global warming. Students were the least aware and academia was the most aware about the issue of global warming. This finding was contrary to the study's assumption that subjects from government, media and NGOs would be better informed about the issue of global warming, by virtue of their exposure to and involvement in issues that have diverse impacts. Based on this finding, global warming awareness programs may be specifically designed by each sector, to increase

awareness levels especially among subjects in the government media and NGOs that have a direct role to play in addressing issues like global warming.

The study showed that people's support for eco-friendly products and programs depends on their perceptions about seriousness of global warming. Based on this finding, it is suggested that awareness initiatives could convey to the public the seriousness of global warming, specifically regional impacts. There is a high degree of support for eco-friendly products (70.5%), energy efficient lamps (90.3%), and a ban on use of plastic bag in the city (93.3%). The overwhelming support for a proposed ban on plastic bags and for switching to CFLs could be due to the small financial cost these changes require. Global warming awareness programs could capitalize on these favorable findings to promote use of CFLs and discourage use of plastic bags by stores and public.

Respondents showed a good level of awareness about renewable energy (77.4%) and called for large-scale adoption of solar energy. India, although richly endowed with renewable energy sources has no commercial solar thermal power plant in operation, perhaps due to the capital-intensive nature of solar technology (Beerbaum & Weinerbe, 2000; Suganthi & Williams, 2000). In partnership with natural gas refineries, fuel suppliers etc the government could enable easy and reliable access to clean fuels, vehicle technology and components, at prices 40-50% below fossil fuels (Yeh, 2007).

Nuclear energy accounts for only 2.4% of India's electricity generation and the government is considering its expansion (Planning Commission, 2007). Although 75.8% were willing to support nuclear energy for Hyderabad, 26.7% disagreed indicating that there could be public opposition to the construction of nuclear energy plants.

Public perception of pollution as the city's most significant environmental issue and understanding of global warming through the pollution model, indicate that measures that indirectly reduce GHG emissions such as pollution control, efficient energy-use, and resource conservation would be more practical than those aimed directly at reduction of global warming (Nomuri Research Institute, 2004).

Strengths of Study

Due to differences in environmental perceptions between people of developed and developing countries, measuring environmental concern in India needs a different approach, a different set of presumptions, and a flexible and exploratory research design (Chatterjee, 2008). Therefore the study did not replicate recent studies on global warming awareness by Pew Center, BBC-GlobeScan, World Survey, and others although their surveys provided a broad framework for the questionnaire.

The questionnaire was designed specifically for this study, keeping in mind the fact that global warming is not a prominent environmental issue in India, as compared to developed countries. Use of terminology such as recycling bins, insulated homes, hybrid cars, and energy efficient homes was avoided based on the assumption that people in a developing country like India are not yet familiar with such environmentally friendly practices and products.

Compared to previous surveys, the current research was more comprehensive as it posed 43 questions and obtained detailed information about people's attitudes and awareness on diverse issues related to global warming and energy use. Data obtained from a stratified sample of nine occupational groups, tapped the dynamic pulse of

Hyderabad about global warming, and identified variations of awareness across age, gender, income, and education. A city-specific study also enables a study of linkages between environmental concerns and people's willingness to adapt actions to mitigate environmental problems.

Limitations of Study

Gender distribution is not equal in the current research as there are more male respondents (63%) than females (37%). The imbalance is partly because most respondents were accessed through organizations, such as schools, colleges, and offices. Although the number of women in Hyderabad's workforce is under 10%, the survey had 37% female respondents, a significantly higher proportion of females engaged in the work force.

The questionnaire was in English and answered mostly by those who are well versed with the language. Since the average literacy rate in Hyderabad is 78.8%, the survey was administered only in English and not in any of the local languages (Telugu and Hindi). In addition, terms like fossil fuels, GHGs, and renewable energy would have been used in their English version, even in a local language survey, as these terms have not yet been translated into local language.

If the survey was in local language and answered by subjects in lower economic strata and lower educational level, the findings may have shown a lower level of awareness about global warming. The results of the study may not be applicable to the metropolitan population as a whole, because illiterate or self-employed persons are under-represented in the sample.

A random survey selecting subjects through computer generated telephone numbers would not have been feasible as the questionnaire had 43 questions that would have taken more than 30 minutes to administer on telephone. Since employed respondents may not have been able to spare so much time, subjects would have comprised of a very high proportion of homemakers and females. As a result the sample would have been biased and skewed, and not representative of a cross-section of society. Although the current study provides a good overview of public awareness about global warming in the city of Hyderabad, it may not be possible to extrapolate the results of the study to other metropolitan cities in India, due to the different demographic composition of other cities.

Suggestions for Further Research

For further research, a global warming awareness survey on this issue could be designed specifically for India, with addition of variables regarding impact of human actions on global warming, and regional impacts of climate change. Research could ascertain public opinion about activities that people consider responsible for global warming and which ones they would be willing to modify, for mitigation efforts.

Given that we are living in an age information explosion, future research could look into the role of media in shaping public opinion about the problem of global warming. Specifically, the study could ascertain which media sources provide most information about each aspect of global warming, such as seriousness of the issue, causes and impacts of global warming, and the ways in which people can reduce global warming.

Since vehicular emissions are an important source of GHGs in cities in India, research could analyze data about use of fossil fuels by people, and their willingness to switch to clean fuels and public transportation. This study could specifically focus on what factors influence people with regard to adoption of clean fuels, reducing vehicular emissions and energy conservation.

Future studies could collect data through a survey in local languages administered by the researcher(s) in regions where literacy rates are low. Inclusion of more self-employed persons, women and homemakers could provide valuable data regarding global warming awareness levels.

Conclusions

India's current policy-making processes do not provide adequate avenues for public participation in policy-making. Voluntary public participation in environmental issues is limited, unless the proposal or project directly threatens the livelihood of the people, their land, and dwelling. In recent times, active environmental NGOs, decentralization at the village level, right to information, public litigation, and e-governance have enhanced people's role in policy-making to a small extent.

The absence of strong and active environmental conservation and citizen groups in India is also a reason for poor environmental awareness and public participation in environmental decision-making (Bowonder, 1986). Unlike developed countries there is no institutionalized mechanism to seek inputs during the policy making process from the public, interest groups, non-governmental organizations, and experts. Policy-making on a holistic issue like global warming could benefit immensely by institutionalizing a

tradition of an informed public and open debate, public hearings, systematic analysis, and integration prior to policy-making.

Public participation could be improved by advertising regional impacts of global warming on rainfall, soil moisture, agriculture, tourism, fisheries, and other activities. The programs can also promote public awareness about what the people can do about the situation (Kellogg, 1997).

This study shows that even in developing countries like India, people are aware of the issue of global warming and its seriousness. However, they do not have a clear understanding of the causes and impacts of this environmental issue and what they can do to mitigate global warming. Since global warming has wide-ranging impacts, awareness about the problem and effective solutions must be enhanced through concerted efforts by stakeholders in the government, the corporate sector, the media, the NGOs, and educational institutions. Public participation in global warming mitigation programs could be enhanced significantly by increasing people's understanding of and knowledge about all aspects of global warming.

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Appendix A

Awareness about Environmental Issues and Global Warming in Hyderabad: A Survey

1. GENDER	2. OCCUPATION	3. PLACE OF RESIDENCE
Male		
Female		

Please choose only one answer

No:	Question	Answer
4.	Your age a. 18 -25 years b. 26-35 years c. 36-50 years d. 51 and above	
5.	Your educational qualification a. Intermediate and below b. Graduate c. Post-Graduate d. Doctorate and above	
6.	Your principal mode of transportation in the City a. Car, van, jeep b. Two-wheeler c. Bus, Train d. Auto e. Bicycle f. Other	
7.	Your monthly income is a. Upto Rs 10,000 b. Rs 11,000 -25,000 c. Rs 26,000-50,000 d. Rs51,000 & above	
8.	In a year, how often do you go on natural outdoor activities (trekking, visiting gardens and forests) a. Once b. Two times c. Three-four times d. More than four times e. Never	
9.	How many kinds of birds do you see in your neighborhood (for eg. crows, sparrows) a. 2-4 b. 5-7 c. 8-10 d. More than 10 e. Don't know	
10.	In your opinion the most important environmental problem in your city is a. Pollution b. Water scarcity c. Water quality d. Loss of greenery e. _____	
11.	Which organization is responsible for controlling pollution in Hyderabad? a. Pollution Control Board b. Municipal Corporation of Hyderabad c. Road Transport Corporation (RTC) d. Don't know	
12.	The Hyderabad Air Campaign is related to a. Parasailing b. Cloud-seeding c. Pollution awareness d. FM Radio e. Don't know	

No:	Question	Answer
	13. Which of these is the <u>most</u> polluting fuel for vehicles? a. Petrol b. Diesel c. Compressed Natural Gas (CNG) d. Don't know	
	14. Which of these sources of energy and electricity is <u>renewable</u> (never runs out)? a. Oil b. Nuclear c. Solar d. Coal e. Don't know	
	15. Coal, petroleum and natural gas are also known as a. Greenhouse gases b. Aerosols c. Fossil Fuels d. Don't know	
	16. What kind of fuel do you purchase for your vehicle? a. Unleaded petrol b. Regular petrol c. Diesel d. Compressed Natural Gas (CNG) e. Liquified Petroleum Gas (LPG)	
	17. To what extent does your concern for the environment influence your everyday behavior (e.g commuting, disposing garbage)? a. It plays a direct role in many of my daily activities b. It plays a direct role in some of my daily activities c. I think about it during some daily activities but it doesn't change my behavior d. It plays no role in any of my daily activities	
	18. How much have you thought about global warming before today? a. None b. A little c. Quite a lot d. A lot	
	19. How much do you know about global warming? a. A lot b. A moderate amount c. A little d. Nothing	
	20. In your opinion, how serious of a problem is global warming? a. No problem at all b. Slightly serious c. Very serious d. Don't know	
	21. In your opinion, if global warming does not reduce in the next 50 years, how would it affect world climate and weather? a. Extreme changes b. Major changes c. Minor changes d. No changes e. Don't know	
	22. In your opinion, will the world's average temperature rise significantly in the future? a. Strongly agree b Agree c. Strongly Disagree d. Disagree e. Don't know	
	23. In the last 100 years average global temperature has increased by a. 10 degrees C b. 5 degrees C c. 2 degrees C d. 0.6 degrees C e. Don't know	
	24. Is every place on the earth getting warmer with global warming? a. Yes b. Some countries only c. Some continents only d. Don't know	
	25. Global warming was highlighted in this recent documentary a. An Inconvenient Truth b. Darwin's Nightmare c. Our Time is Up d. Don't know	

No:	Question	Answer
	<p>26. Greenhouse gases are a. Used in factories b. Heat trapping atmospheric gases c. Used in agriculture d. Don't know</p>	
	<p>27. One of the following <u>does not</u> cause global warming a. Destroying forests b. Industrial pollution c. Vehicle emissions d. Satellites in Space e. Don't know</p>	
	<p>28. Global warming will result in all of these, <u>except</u> a. Rising sea-levels b. Melting glaciers c. Extreme weather d. Skin cancer</p>	
	<p>29. Are you worried that global warming will affect your way of life? a. Very worried b. Worried c. Not worried d. Don't know</p>	
	<p>30. Do you think the effects of global warming can be controlled if most people drive less, use solar energy and switch-off unnecessary lights? a. Can be controlled b. Need more drastic measures c. Have no effect d. Don't Know</p>	
	<p>31. Are you willing to pay a higher price for a product (for e.g. A car or a motorcycle) which is better for the environment? a. Strongly agree b. Agree c. Disagree d. Strongly disagree e. Don't know</p>	
	<p>32. Would you be willing to pay extra tax, if the money was used to control environmental pollution? a. Strongly agree b. Agree c. Disagree d. Strongly disagree e. Don't know</p>	
	<p>33. Would you be willing to pay more for fluorescent bulbs which provide the same amount of light but use less electricity compared to incandescent bulbs? a. Strongly agree b. Agree c. Disagree d. Strongly disagree e. Don't know</p>	
	<p>34. Would you support building of a nuclear power plant near your city which can provide electricity without pollution? a. Strongly agree b. Agree c. Disagree d. Strongly disagree e. Don't know</p>	
	<p>35. Do you think the government should ban use of plastic bags which are harmful for the environment? a. Strongly agree b. Agree c. Disagree d. Strongly disagree e. Don't know</p>	
	<p>36. In your opinion, what kind of organization should take action about global warming? a. Government b. NGOs c. People/Society d. Industries e. United Nations</p>	

No:	Question	Answer
	37. Your information about environmental issues comes mainly from a. Newspapers & Magazines b. TV and Radio c. Government d. NGOs e. Society	
	38. How much information is available about global warming on T.V, radio, newspapers, magazines? a. None b. Very little c. Some d. A lot e. Don't know	

39. In your opinion the most important global environmental issue is (please describe)

40. Have you noticed any changes in weather patterns of your city in the last ten years? If yes, please describe?

41. What actions are you willing to take to reduce global warming? Please describe

42. In your opinion, what action should society or others take to reduce global warming? Please describe

43. In your opinion what action should the government take to address global warming? Please describe.

Appendix B

AGREEMENT TO PARTICIPATE IN RESEARCH

Responsible Investigator: Vani Rao, Graduate Student, Department of Environmental Studies, San Jose State University, California, U.S.A

Title of Protocol: Awareness about Environmental Issues and Global Warming in Hyderabad, India

You have been asked to participate in a research study investigating the awareness of environmental issues and global warming in the City of Hyderabad (India). During the survey, you will be asked to answer a written questionnaire that asks you about your attitude towards and awareness about general and local environmental issues (specific to the city of Hyderabad); and the causes, impacts and solutions to the problem of global warming. The questionnaire also asks for some basic demographic information. The survey does not ask for any personal identifying information like your name, designation and address. After storing and analyzing all the survey data, the survey questionnaires will be destroyed.

There is no foreseeable risk that we anticipate you will experience as a result of participating in this study. Other than the general feeling of reward that comes from being of help to research, there are no direct benefits to you from participating in this project. No service of any kind, to which you are otherwise entitled, will be lost or jeopardized if you choose to not participate in this study.

The information that you provide in the survey will be confidential. Although the results of the study may be published no information that could identify you will be included.

Questions about this study may be addressed to the study's researcher, Vani Rao (globalwarming.hyd@gmail.com) 09440266196 (India cell phone). Complaints about this research may be presented to Rachel O' Malley, Chair of the Department of Environmental Studies, San Jose State University, California (Tel: 001-408-924-5424). Questions about a research subject' rights or research related injury may be presented to Pamela Stacks, Ph. D., Associate Vice-President, Graduate Studies and Research, San Jose State University, California (Tel: 001-408-924-2480).

Your consent is being given voluntarily. You may refuse to participate in the entire study or in any part of the study. You have the right to not answer any questions you do not wish to answer. If you decide to participate in this study you are free to withdraw at any time without any negative effect on your relations with San Jose State University.

Appendix C

List of Organizations Whose Employees Participated in the Survey:

1) Government

- a. Hyderabad Metropolitan Water Supply and Sewage Board (HMWSSB)
- b. Department of Public Health, Municipal Corporation of Hyderabad
- c. Anti-corruption Bureau (Department of Home Affairs)
- d. Special Investigation Bureau, Police Department
- e. College of Air Warfare, Indian Air Force
- f. South Central Railways, Government of India
- g. Andhra Bank, Government of Andhra Pradesh

2) Private Sector Employees

- a. Eqic Dyes and Moulds Private Limited
- b. Adworld
- c. HSBC Private Bank
- d. Nagarjuna Construction Company Ltd
- e. Employees in Business Process Outsourcing centers (BPOs)
- f. Self-employed persons

3) Media

- a. TV9 – regional language Television
- b. Teja TV – regional language Television
- c. Maa TV – regional language Television
- d. Eenadu – regional language newspaper
- e. Deccan Chronicle – regional English newspaper

4) Educated Professionals

- a. Institution of Engineers Ltd
- b. Hyderabad Metropolitan Water Supply and Sewage Board
- c. Indian Institute of Chemical Technology
- d. Defence Research Development Laboratory, Government of India
- e. Research Center Imarat, Government of India

5) Students

- a. Medak College of Engineering and Technology
- b. Avanthi Degree College
- c. Sai Sudheer Degree College
- d. Vasundhara Women's Degree and PG College
- e. CVR College of Engineering
- f. Osmania University
- g. Koti Women's College
- h. Holy Mary Engineering College

6) Academia

- a. Takshasila Public School
- b. Dayanand Anglo-Vedic Public School
- c. Delhi Public School
- d. Le Meredian High School
- e. St. Andrews High School
- f. Narayana College

7) Information Technology (IT) Sector

- a. Infotech Enterprises group
- b. Mars Telecom
- c. Oracle Ltd
- d. TechTotal Soft Systems Private Ltd

8) Non-governmental Organizations

- a. Spandana Sphoorty Innovative Financial Services Limited (SSIFSL)
- b. Naandi Foundation Ltd
- c. World Education Foundation
- d. Byrraju Foundation

Appendix D

Values of Mean and Standard Deviation Based on Gender

Variable	Gender	M	SD
Diesel is most polluting fuel	Male	1.9	.69
	Female	2.0	.94
Understanding about renewable energy	Male	3.1	.79
	Female	3.2	.87
Understanding about fossil fuels	Male	2.9	.83
	Female	2.9	.84
Fuel purchased	Male	1.8	1.41
	Female	2.0	1.59
Impact of Environmental Concerns	Male	2.0	.98
	Female	1.9	.93
How much have you thought about global warming recently?	Male	2.6	.87
	Female	2.6	.86
Knowledge claimed about global warming	Male	2.2	.77
	Female	2.3	.77
Seriousness of global warming	Male	2.8	.51
	Female	2.8	.56
Nature of changes caused by global warming	Male	1.6	.91
	Female	1.6	.95
Global warming's effect on global temperature in future	Male	1.5	.84
	Female	1.6	.98
Extent of temperature rise in future	Male	3.1	1.53
	Female	3.2	1.55
Geographical impact of global warming	Male	1.7	1.11
	Female	1.8	1.13
Recent documentary about global warming	Male	3.2	1.23
	Female	3.4	1.19
Understanding of term GHGs	Male	2.6	1.11
	Female	2.6	1.03
Causes of global warming	Male	3.8	.83
	Female	3.8	.91
Specific effects of global warming	Male	3.2	1.20
	Female	3.3	1.21
Concern about global warming's effect	Male	1.9	.75
	Female	1.9	.73
Can global warming be controlled?	Male	1.6	.81
	Female	1.6	.75
Degree of support for green products	Male	2.1	1.06
	Female	2.0	1.08

Variable	Gender	M	SD
Degree of support for pollution control tax	Male	2.0	.97
	Female	2.1	1.05
Degree of support for CFLs	Male	1.7	.99
	Female	1.8	1.00
Degree of support for nuclear energy	Male	2.4	1.22
	Female	2.2	1.16
Degree of support for a ban on plastic bags	Male	1.4	.85
	Female	1.3	.76
Name organization to control global warming	Male	2.7	1.64
	Female	2.9	1.57
Main source of information about global warming	Male	2.1	1.96
	Female	2.1	2.02
Adequacy of information available through media	Male	2.8	.93
	Female	2.9	.89

Values appear in boldface when probability of difference due to source is less than 0.05 by t-test.

Appendix E

Value of Mean and Standard Deviation Based on Age

Variable	Age	M	SD
Diesel is most polluting fuel	18-35 years	3.9	1.14
	Above 36 years	3.8	1.15
Understanding about renewable energy	18-35 years	1.9	.82
	Above 36 years	2.0	.74
Understanding about term fossil fuels	18-35 years	3.2	.85
	Above 36 years	3.1	.78
Fuel purchased	18-35 years	2.9	.85
	Above 36 years	3.0	.80
Impact of Environmental Concerns	18-35 years	2.0	.97
	Above 36 years	1.9	.94
How much have you thought about global warming recently	18-35 years	2.6	.87
	Above 36 years	2.6	.86
Knowledge claimed about global warming	18-35 years	2.2	.75
	Above 36 years	2.2	.80
Extent of seriousness of global warming	18-35 years	2.8	.53
	Above 36 years	2.8	.53
Nature of changes caused by global warming	18-35 years	1.6	.95
	Above 36 years	1.6	.89
Global warming's effect on global temperature in future	18-35 years	1.6	.97
	Above 36 years	1.5	.75
Extent of temperature rise in future	18-35 years	3.2	1.54
	Above 36 years	3.1	1.53
Geographical impact of global warming	18-35 years	1.8	1.14
	Above 36 years	1.6	1.08
Recent global warming documentary	18-35 year	3.2	1.23
	Above 36 years	3.4	1.20
Understanding term GHGs	18-35 years	2.5	1.06
	Above 36 years	2.6	1.13
Causes of global warming	18-35 years	3.8	.87
	Above 36 years	3.9	.85
Specific effects of global warming	18-35 years	3.3	1.19
	Above 36 years	3.2	1.22
Concern about global warming's effect	18-35 years	1.9	.76
	Above 36 years	1.9	.70
Can global warming be controlled?	18-35 years	1.6	.79
	Above 36 years	1.6	.78
Degree of support for green products	18-35 years	2.1	1.06

Variable	Age	M	SD
Degree of support for pollution control tax	Above 36 years	2.0	1.08
	18-35 years	2.1	1.04
Degree of support for CFLs	Above 36 years	2.0	.93
	18-35 years	1.8	1.07
Degree of support for nuclear energy	Above 36 years	1.6	.83
	18-35 years	2.3	1.15
Degree of support for plastic bag ban	Above 36 years	2.4	1.26
	18-35 years	1.4	.87
Organization to control global warming	Above 36 years	1.3	.74
	18-35 years	2.9	1.59
Main source of information	Above 36 years	2.7	1.65
	18-35 years	2.1	1.95
Adequacy of information available	Above 36 years	2.1	2.03
	18-35 years	2.8	.88
	Above 36 years	2.9	.96

Values appear in boldface when probability of difference due to source is less than 0.05 by t-test.

Appendix F

Value of Mean and Standard Deviation Based on Education

Variable	Level of Education	<u>M</u>	SD
Diesel is most polluting fuel	Basic education	3.8	1.14
	Higher Education	3.9	1.14
Understanding about renewable energy	Basic education	2.0	.82
	Higher Education	1.8	.74
Understanding term fossil fuels	Basic education	3.2	.88
	Higher Education	3.1	.72
Fuel purchased	Basic education	2.9	.82
	Higher Education	2.9	.85
Impact of Environmental Concerns	Basic education	2.0	1.01
	Higher Education	1.9	.88
How much have you thought about global warming recently	Basic education	2.5	.87
	Higher Education	2.7	.84
Knowledge claimed about global warming	Basic education	2.3	.79
	Higher Education	2.1	.71
Extent of seriousness of global warming problem	Basic education	2.8	.59
	Higher Education	2.9	.41
Nature of changes caused by global warming	Basic education	1.6	.95
	Higher Education	1.6	.89
Global warming's effect on global temperature in future	Basic education	1.6	.93
	Higher Education	1.5	.84
Extent of temperature rise in future	Basic education	3.1	1.56
	Higher Education	3.3	1.49
Geographical impact of global warming	Basic education	1.7	1.10
	Higher Education	1.7	1.14
Recent documentary about global warming	Basic education	3.3	1.18
	Higher Education	3.2	1.28
Understanding of term GHGs	Basic education	2.6	1.10
	Higher Education	2.5	1.06
Causes of global warming	Basic education	3.8	.90
	Higher Education	3.9	.80
Specific effects of global warming	Basic education	3.2	1.20
	Basic education	3.3	1.20
Worried about global warming's effect on way of life	Basic education	1.9	.76
	Higher Education	1.9	.71
Can global warming be controlled?	Basic education	1.7	.85
	Higher Education	1.6	.69
Degree of support for green products	Basic education	2.1	1.11
	Higher Education	2.0	1.00

Variable	Level of Education	M	SD
Degree of support for pollution control tax	Basic education	2.1	1.04
	Higher Education	2.0	.94
Degree of support for CFLs	Basic education	1.8	1.07
	Higher Education	1.6	.86
Degree of support for nuclear energy	Basic education	2.3	1.17
	Higher Education	2.4	1.21
Degree of support for a ban on plastic bags	Basic education	1.4	.88
	Higher Education	1.3	.72
Organization to control global warming?	Basic education	2.8	1.55
	Higher Education	2.8	1.68
Source of information about global warming	Basic education	2.2	1.98
	Higher Education	2.0	1.95
Adequacy of information available through media	Basic education	2.9	.91
	Higher Education	2.9	.92

Values appear in boldface when probability of difference due to source is less than 0.05 by t-test.

Appendix G

Values of Mean and Standard Deviation Based on Income

Variable	Monthly income	<u>M</u>	SD
Diesel is most polluting fuel	Low income group	3.9	1.14
	High income group	3.7	1.15
Understanding about renewable energy	Low income group	1.9	.80
	High income group	1.8	.80
Understanding about fossil fuels	Low income group	3.2	.84
	High income group	3.2	.81
Fuel purchased	Low income group	2.9	.83
	High income group	2.8	.87
Impact of Environmental Concerns	Low income group	2.0	.97
	High income group	2.0	.97
How much have you thought about global warming recently	Low income group	2.6	.88
	High income group	2.6	.83
Knowledge claimed about global warming	Low income group	2.2	.77
	High income group	2.1	.76
Extent of seriousness of global warming	Low income group	2.8	.55
	High income group	2.9	.47
Impact of global warming	Low income group	1.6	.94
	High income group	1.6	.91
Global warming's effect on global temperature in future	Low income group	1.6	.94
	High income group	1.4	.73
Extent of temperature rise in future	Low income group	3.2	1.53
	High income group	3.1	1.60
Geographical impact of global warming	Low income group	1.8	1.14
	High income group	1.6	1.03
Recent documentary about global warming	Low income group	3.3	1.23
	High income group	3.3	1.15
Understanding of term GHGs	Low income group	2.6	1.11
	High income group	2.6	1.02
Causes of global warming	Low income group	3.9	.81
	High income group	3.7	1.03
Specific effects of global warming	Low income group	3.2	1.21
	High income group	3.3	1.19
Concern about global warming's effect	Low income group	1.9	.74
	High income group	1.9	.75
Can global warming be controlled?	Low income group	1.6	.79
	High income group	1.6	.78

Degree of support for green products	Low income group	2.0	1.07
	High income group	2.1	1.10
Degree of support for pollution control tax	Low income group	2.0	.99
	High income group	2.2	1.00
Degree of support for CFLs	Low income group	1.7	1.01
	High income group	1.7	.97
Degree of support for nuclear energy	Low income group	2.4	1.21
	High income group	2.2	1.14
Degree of support for ban on plastic bags	Low income group	1.4	.82
	High income group	1.3	.83
Organization to control global warming	Low income group	2.8	1.63
	High income group	2.9	1.56
Main source of global warming information	Low income group	2.2	2.04
	High income group	2.0	1.87
Adequacy of information in media	Low income group	2.9	.93
	High income group	2.9	.88

Values appear in boldface when probability of difference due to source is less than 0.05 by t-test.

Appendix H

Results of Multinomial Logistic Regression for Degree of Support for Environmentally Friendly Products and Initiatives

Variable	Model Fitting Criteria	Likelihood Ratio Tests		
	-2 Log Likelihood of Reduced Model	Chi- Square	Df	Sig.
Degree of support for purchasing environmentally friendly products				
Role of environmental concern	621.326	12.814	5	.025
Perceived seriousness of global warming	738.985	130.473	5	.000
Degree of concern about global warming	644.769	36.256	5	.000
Degree of support for p for pollution control				
Role of environmental concern	563.035	33.066	5	.000
Perceived seriousness of global warming	643.809	113.839	5	.000
Degree of concern about global warming	575.740	45.771	5	.000
Degree of support for purchasing compact florescent bulbs				
Role of environmental concern	544.902	6.487	5	.262
Perceived seriousness of global warming	703.514	165.099	5	.000
Degree of concern about global warming	576.286	37.872	5	.000
Degree of support for proposed nuclear energy plant near Hyderabad				
Role of environmental concern	576.906	4.465	5	.485
Perceived seriousness of global warming	611.247	38.806	5	.000
Degree of concern about global warming	582.272	9.831	5	.080
Degree of support for a proposed ban on plastic-bag use in the city				
Role of environmental concern	446.351	11.447	5	.043
Perceived seriousness of global warming	636.252	201.348	5	.000
Degree of concern about global warming	459.411	24.508	5	.000

Dependent Variable is in Boldface Reference Category for Dependent Variable: Strongly Disagree

Appendix I

Results of Multiple Linear Regression Analysis for Independent Variables and one Dependent Variable

Independent Variable	Beta	P value	Correlation
Perceived seriousness of global warming			
Gender	-0.043	0.925	-0.002
Age	-0.040	0.276	-0.008
Education	0.093	0.009**	0.082
Occupation	0.040	0.258	0.028
Occupation			
Degree of concern about global warming			
Gender	-0.017	0.621	0.006
Age	-0.061	0.087	0.018
Education	-0.017	0.613	-0.043
Income	0.019	0.569	0.027
Occupation	0.269	0.001***	0.252
Degree of willingness to purchase green products			
Gender	-0.029	0.402	-0.027
Age	-0.034	0.353	-0.034
Income	0.034	0.329	-0.023
Education	-0.019	0.590	0.034
Occupation	-0.005	0.896	-0.005
Extent of support to buy CFLs			
Gender	0.037	0.278	0.048
Age	-0.152	0.001***	-0.142
Education	-0.083	0.016**	-0.107
Income	-0.016	0.639	-0.011
Occupation	0.070	0.050	0.033

Dependent Variable is in Boldface

*Key: ** P= <0.05, ***P=<0.005*