DETERMINANTS OF ENVIRONMENTAL AWARENESS: A CASE STUDY

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Certificate

This is to certify that the dissertation entitled "Determinants of Environmental Awareness: A Case Study", submitted by me in partial fulfillment of the requirement for the award of Master of Philosophy has not been previously submitted for any other degree of this or any other university.

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We recommend that this dissertation be placed before the examiners for evaluation.

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To

Ma & Baba

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Contents

List of Tables

List of Boxes

Chapter I

1.1 Introduction:

In Vienna, during the late 1840's, the death rate for women during childbirth was very high. Then a physician working in a local hospital discovered that a major cause of death was the transfer of a toxic substance from the hands of medical students who had worked on cadavers and then attended the women in the maternity ward. Then he informed the students and educated them to wash their hands after working on cadavers. After this the death rate during child delivery decreased drastically. [1]

This incident highlights two things. First, better information helps people to protect themselves and others from environmental health hazards. Second, education is very important in enabling people to obtain and process information productively.

1.2 Conventional View

It is generally believed that the emergence of environmental awareness is positively correlated with affluence. In other words, the demand for environmental amenities, such as clean air, clean water, sanitation, safe drinking water, etc., is presumed to be lower in developing countries due to poverty and illiteracy. This is one of the explanatory factors behind the Environmental Kuznets Curve hypothesis. The EKC hypothesis says that the relationship between economic well-being and environmental degradation has an inverse U-shape, that is, environmental damage first increases, but after a 'turning point' declines with increasing per capita income. One reason for this inverted U-shaped relation is the

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[1] Jalan and Somanathan, 2004.

1

so-called 'scale effect' which says that more output, ceteris paribus, results in greater environmental degradation. In other words, during the first stage of development, as industrialization increases, per capita income increases and the environmental quality decreases. At higher levels of development, the information intensive service sector sees increased growth. This structural change, coupled with increased environmental awareness, better enforcement of environmental regulations, improved technology and higher environmental expenditures result in leveling off and then gradual decline of environmental degradation.

Empirically, we see that as the western economies have entered the post-industrialization phase, they have become increasingly concerned with post-materialist values and have adopted a pro-environmental stance with a focus on achieving a better quality of life rather than material gain alone. Citizens of poor nations are less likely to exhibit positive environmental attitudes and behavior as they lack the resources necessary to meet their basic needs. There are very few studies done on environmental awareness. Most studies look at the relation between economic growth and environmental pollution.

The debate on the relationship between economic growth and environmental quality started around the late 1960's. The basis of the EKC hypothesis lies in the income distribution theory of Simon Kuznets (1955). This theory says that income inequality at first increases with the increase in economic growth. After economic growth reaches a threshold level, income inequalities start decreasing.

Grossman and Kruger (1991) did the first EKC study to measure the impact of NAFTA on the environment. They used the GEMS[2] dataset for sulfur dioxide (SO_2), dark matter (fine smoke) and suspended particles (SPM). The dataset was panel data measured from a number of locations in cities around the world. The

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[2] Global Environmental Monitoring System.

2

regression equations included a cubic function in levels of PPP (purchasing power parity) per capita GDP and various site related values, a time trend and a trade intensity variable. The relation for all the environmental indicators with per capita GDP was an inverted U shape. The results show that the turning point for SO_2 and dark matter appear at around \$4000-5000 though for SPM, it appeared later.

Shafik and Bandyopadhyay (1992) estimated EKC for ten different indicators like lack of clean water, lack of urban sanitation, ambient levels of suspended particulate matter between 1961-1986, the annual rate of deforestation, dissolved oxygen in rivers, fecal coliforms in rivers, municipal waste per capita and carbon emissions per capita for 149 countries during 1960-1990. Per capita income was defined in purchasing power parity terms. The results show that access to clean water and urban sanitation improve with higher per capita incomes. For SO_2 and SPM, the results show a quadratic relation with per capita income. The case for deforestation was complex in the sense that the regressions showed no relation between income and deforestation. River quality tended to worsen with increasing income. Finally, the two global environmental pollution indicators, municipal waste and CO_2 emissions per capita increased unambiguously with rising income.

In another study, Seldon and Song (1994) estimated EKCs for four emissions series: SO_2, NO_x, SPM and carbon monoxide (CO). They used longitudinal data from World Resources, mainly from the developed nations. They also obtained an inverted U relationship between these indicators and per capita income.

Grossman and Kruger (1995) did another study using data from Global Environment Monitoring systems on sulfur dioxide (SO_2) and suspended particulate matter (SPM) for air pollution, biological oxygen demand (BOD) and chemical oxygen demand (COD) for water pollution. For SO_2, oxygen and smoke

3

the EKC hypothesis holds true, but the turning point of the EKC appears later for the water quality indicators compared to the air quality indicators. For most of the indicators, economic growth brings an initial phase of deterioration followed by a subsequent phase of improvement. The turning points generally occur when a country reaches the per capita income of $8000.

Cole et. al. (1997) extended the earlier empirical studies. The environmental indicators used were carbon dioxide (CO_2), suspended particulate matter (SPM), carbon monoxide (CO), nitrates, municipal waste, energy consumption and traffic volumes. Their model was a simple OLS one, adjusted for heteroscedasticity and autocorrelation. Nitrogen dioxide, SO_2, SPM and CO showed an inverted U-shaped EKC. Per capita CO_2 monotonically increased with income. Total energy used per capita also showed the same result

Contrary to these studies, Magnani (2000) has argued that the income elasticity condition (a high income elasticity of the demand for environmental quality) may not be a strong basis for the EKC to formulate fiscal policies in the presence of heterogeneous individuals. In developed nations, the demand for a better environment depends both on the absolute income effect and a relative income effect, which in turn determines the ability to pay and willingness to pay for environmental care. He validated this hypothesis using data for public environmental expenditure of OECD countries between 1980 and 1991. According to his study, income inequality shows a negative correlation with environmental care. But he argued that public concern for the environment grows with per capita income.

There are many theoretical criticisms of EKC also. Many studies have challenged the conventional survey results, which support the EKC hypothesis, mainly for the local pollutants.

4

Arrow et al. (1995) challenged the conventional EKC hypothesis by questioning its basic assumption of income to be an exogenous variable. The assumption is that environmental damage does not lessen economic activity sufficiently to decrease the growth rate.

From the econometric side, Stern et al. (1996) raised the point that there may be a problem of heteroscedasticity in the context of cross-sectional regressions of grouped data.

In 1998, Schmalensee et al., found that there exists heteroscedasticity problem with smaller residuals associated with countries with higher total GDP and population in regression residuals from OLS, as predicted by Stern et al.

Suri and Chapman (1998) found that an effort to reduce some environmental impacts might negatively affect other environmental indicators.

On the other hand, both Arrow et al. (1995) and Stern et al. (1996) argued that effects of trade on distribution of polluting units must have an effect on the EKC type relation. The developed nations may specialize in human capital where as the developing nations may specialize in the production of goods, which use natural resources intensively.

1.3 Non-Conventional Views

There are other views, which hold that environmental behavior is not solely correlated with economic factors. It depends on demographic, psychological, educational and cultural variables also.

First, let us analyze the demographic factors. One of the major problems of the developing countries is the rapid population growth. This coupled with increasing economic activity increases the demand on the natural system to absorb the negative externality of economic activity while the per capita availability of

natural resources decreases. Thus, the stress on the natural resources increases which leads one to be aware about the environment (Dasgupta, 2001).

Secondly, there is a biological need for human beings to live in harmony with nature. The increased population pressure and growing urbanization are likely to make people aware of their distance from the natural environment. This psychological reason increases environmental awareness.

Next comes the question of how education affects environmental awareness. It has been argued that the people of developing countries are more aware about the local environment while the developed nations are more concerned about the global environment. In poor countries people depend on natural resources. Their livelihood is much more attached to the environment compared to the rich nations. So, when environmental degradation threatens their basic needs, they become aware about the environment (Duroy, 2005).

From a survey result in Istanbul, it was seen that people with materialist values are much more aware about the local environment while those with post materialist values were concerned about the global environment (Goken, Adaman and Zenginobuz, 2001).

One example is the Chipko Movement in India. In the 1970s and 1980s the resistance of the people to the destruction of forests spread throughout India and became organized and known as the Chipko Movement. This movement was the result of hundreds of decentralized and locally autonomous initiatives. Its leaders and activists were primarily village women, acting to save their means of subsistence and their communities. These village people became conscious as it was affecting their livelihood. They did not know much about the laws and regulations. It is the educated persons from outside the area who interacted with them and informed them about the rules and regulations, using which the villagers protected the forest.

Another example is the case of the Yamuna River. The persons, who are using the Yamuna Water, are not much aware about the water quality and its effects. It is the educated people who are raising their voice to protect the Yamuna river. They are informing the mass located along the riverbank about how dangerous is its water.

In both the cases, it is the educated people who are more aware about the environment and not necessarily the economically well to do persons.

Very few studies have been done in the area of determinants of environmental awareness.

Khasnabis (1997) has done a survey on environmental awareness in Greater Calcutta. He surveyed 186 households in Bagmari and Bagkhal area. To measure environmental awareness, he asked questions relating to the perception about pollution, respondents' views regarding closure of polluting units and some other questions, such as, if the respondents knew about important laws and regulations. In the next step, by indexing the answers he divided the respondents into two groups, environmentally aware and unaware. The dependent variable was environmental awareness and the independent variables were income, education, religion and sex. After running logistic regressions, he found an interesting result: the income as the categorical variable was statistically insignificant in every estimated model while education was statistically significant in every model as a determinant of environmental awareness.

Jalan, Somanathan and Chaudhuri (2003) used the National Family Health Survey of India for twenty-five Indian states. In this study education of the adult members was taken as the proxy for health awareness as it was presumed that the adult members are the decision makers of the family. They found that higher level of schooling, exposure to mass media and wealth help to increase awareness regarding drinking water quality, that is, these have statistically significant effects

on adoption of different home purification methods of drinking water and hence on willingness to pay. Exposure to media of the adult female member of the family was positively related with health awareness with high significance.

In another study, Jalan and Somanathan (2004), using a sample survey from Gurgaon in Haryana, have shown that the households, which were informed that their drinking water was contaminated, changed their behavior towards purifying the water significantly. On the other hand, households, which were not informed about their drinking water quality, did not change their behavior. This means that being informed about the drinking water quality is important in for determining the demand for water quality.

Duroy (2005) used sample survey data from the World Values Survey for forty countries. The questionnaire consists of different environmental questions based on which the countries were indexed by principle component analysis. The independent variables were per capita GDP, income inequality represented by the Gini coefficient, democracy score as an indicator of political freedom, education, population, people's subjective well-being and urban population. He used OLS with environmental awareness as the dependent variable. The results show that economic affluence has a marginal direct influence on environmental awareness and no direct impact on environmental behavior. It was also shown that the degree of urbanization, level of subjective well-being and the level of income inequality have direct effects on awareness while education, population pressure and happiness are significantly correlated with environmental behavior.

Again, Dasgupta (2001) has also argued that, due to rapid population growth, the pressure on the ecosystem is increasing which increases people's awareness about environmental problems. Pollution increases the incidence of illness in workers and thus results in loss of wages. To prevent this loss, defensive

expenditure increases, which makes people more aware about environmental pollution.

But contrary to these results, Ehrlich, Wolff, G. Daily, Hughes, S. Daily and Goulder (1999) showed that though knowledge growth can help to reduce future environmental problems, it might not fully offset the adverse effects of increasing population growth and increasing per capita consumption on environment. Again, there is a limit on the ability of knowledge to substitute for key natural resources.

1.4 Micro Level

Now let us come to the household level. According to the EKC hypothesis, as household income increases, the ability of households to change consumption and production patterns improves. One example of the changing consumption pattern is: Rising incomes may first increase demand for fuel wood, but at higher income levels, fuel wood will be replaced by modern environmentally friendly energy sources. On the production side, similar effects are expected. After meeting its basic needs, a household can think of investing to get better environment in the form of better air, water etc. These along with many other environmental goods and services are non-marketed commodities. A common method for imputing monetary value is to take a survey in which the respondents are asked to put a value to the commodity under reference according to their willingness to pay (WTP) or willingness to accept (WTA). This is called the contingent valuation method. Because of inequality in access to information on general environmental issues and other socio-economic factors, there is a wide variation in perception about environmental commodities. Therefore it is to be expected that the dispersion among individual contingent values for the commodity under reference would be very high. The main problem is that low levels of awareness about the

9

environmental issues and low-income levels result in 'under pricing' of environmental commodities.

Thus, getting a fix on the awareness levels becomes important in the context of policy related issues in environmental management, such as, setting the allowable level of emissions or the amount of taxation, the government should apply for a resource to maintain the desirable quality. Higher the level of awareness of the people, better is the prospect of voluntary tax compliance. The control instruments also work better if the people become aware about their usefulness.

1.5 Objectives and the Research Question

The objective of this dissertation is to look at what factors influence people's level of awareness regarding environmental quality. As mentioned earlier, conventional wisdom states that with an increase in economic affluence, environmental awareness of the people increases. In developing countries, where per capita income is very low, what can be the other variables, which may increase environmental awareness. I have tried to look at the environmental awareness determining factors using survey data.

Based on the empirical findings, I will try to derive meaningful implications about what should be the policy focus to improve the environmental awareness in a developing country like India.

1.6 Methodology

A sample survey was done to collect the data. An empirical analysis of the primary data was then conducted to study the different aspects of the determinants of the environmental awareness. The aid of descriptive and quantitative tools has been taken to analyze the data. The data was analyzed using simple regressions, as

the quality of the data did not permit logistic regression. The problem of quasi-complete separable data set was arising.[3]

1.7 Scheme of the Dissertation

The dissertation is divided into four chapters. This, the first chapter presents the motivation for the research in the context of the existing literature and outlines the structure of the dissertation. Chapter two will present the data collection procedure and a description of the data. The indexing procedure used will also be described. Chapter three will give a detailed analysis of the models used and independent variables and the empirical findings. Concluding remarks will be made in the last and fourth chapter.

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[3] See chapter III for detailed explanation.

Chapter 2

2.1 Introduction

The traditional economics literature emphasizes the relation between income level and environment rather than the environmental awareness issue. But policy makers in developing countries are nowadays focusing more on the environmental awareness campaign. For successful policy implementation, estimation of the existing level of environmental awareness and the factors that improves this awareness is necessary. In this dissertation, an attempt has been made to measure environmental awareness and its determinants.

2.2 Data Source for Other Studies

No readymade data is available for studying the environmental awareness issue. The existing work in this area is mainly based on primary surveys. As mentioned in the previous chapter, Khasnabis (1997) did a survey in Bagmari and Bagkhal area in Greater Kolkata. For the study on awareness about water quality, Jalan et al. (2003) used primary data, from the National Family Health Survey collected by the International Institute for Population Studies in 1998-99. In another study to find how information affects the demand for environmental quality, Jalan and Somanathan (2004) conducted a household survey in Gurgaon, Haryana. To find the determinants of environmental awareness, Duroy (2005) used survey data collected by the Health of the Planet Survey in 1992 for twenty-four countries and the World Values Survey in 1995-1997.

In my case also I was forced to conduct a survey to obtain the necessary data for the study.

2.3 The Field Area

Two adjacent areas were selected in the South Delhi district, Jawaharlal Nehru University (JNU) and Munirka. JNU is a less-polluted area as compared to Munirka and has large areas of greenery and natural forest. I choose these two areas for the reason that though JNU consists mainly of highly educated people, Munirka houses a combination of all types of people. In some sense, there is heterogeneity in the sample from both the economic and educational points of view.

The survey was conducted during September and October 2004. An experimental questionnaire was used at the very first stage to judge the responses of the households and the validity of that questionnaire. Initially information about the socio-economic conditions of the households was solicited. In the second stage the level of environmental awareness was investigated and a senior member of the household was polled.

2.4 Sampling Procedure

Between the two locations, chosen for the sample survey, JNU people are more educated compared to that of Munirka area. In Munirka, Munirka DDA Flats and Munirka Vihar are a preferable residential location for the upper middle class population, who has better access to basic facilities compared to that of Munirka Village. Munirka Village area is a mix of middle class, lower middle class and lower class households. From both, the educational and the economic point of view, JNU people are in an advantageous position compared to Munirka. So, when drawing the sample, a stratified sampling procedure was adopted. The households were chosen in a 1:5 ratio, that is one household from JNU against five households from Munirka were surveyed. Thus among 124 households surveyed, 20 were from JNU and the remaining 104 were from Munirka. Again, from Munirka, fifty

percent of the households surveyed were from Munirka Village and the rest from the Munirka DDA Flats and Munirka Vihar areas. From the second category, 27 households and 25 households were randomly chosen from the DDA Flats and Munirka Vihar areas respectively.

2.5. Sample

In the survey procedure, a total of 126 households were visited initially. Two households, one from Munirka and the other from JNU were dropped due to insufficient response. Among the final 124 households, 104 were from Munirka and 20 households were from JNU. From the total households of Munirka, 52 were from Munirka Village, 27 from DDA Flats and 25 from Munirka Vihar. 83.87 percent of the total sample was chosen from Munirka and the rest was from JNU. In JNU, 12 households were from the faculty quarters and 8 from staff quarters. Of the total 124 households surveyed, 73 were from MCD area and 51 were from Panchayat.[4] The distribution of the households over the whole survey area is shown in Table 2.1.

Table 2.1: Distribution of Sample over Field Area

Area	Frequency	Percent
DDA Flats	27	21.77
Munirka Vihar	25	20.16
Munirka Village	52	41.94
JNU Faculty Quarters	12	9.68
JNU Staff Quarters	8	6.45
Total	124	100.00

Source: Field Survey, 2004

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[4] Munirka Village is a Panchayat (Laldora) area.

14

2.6 The Respondents

2.6.1 Religion

The majority of the sample households are Hindu families. Out of 124 households 5 households are Muslim (4.03 percent) and 3 are Sikh (2.42 percent). The number for other religions, which includes Jain and Buddhist, is also 3. Only one household was Christian. There is no household in JNU, which belongs to Christian or Jain faiths. Of the total 112 Hindu families, 94 are from Munirka and 18 are from JNU. Among the Muslim households, only one is from JNU, 4 are from Munirka. Both the JNU and Munirka areas are Hindu

Table 2.2: Distribution of Households by Religion

Religion	Frequency	Percent
Hindu	112	90.32
Muslim	5	4.03
Christian	1	0.81
Sikh	3	2.42
Others	3	2.42
Total	124	100.00

Source: Field Survey, 2004

dominated. Similarly, in the sample, there is only one Sikh family in JNU. Table 2.2 describes the distribution of households according to their religion.

2.6.2 Caste

In all, 113 respondents belong to the general category according to caste. In terms of the percentage distribution, only 6.45 percent belong to scheduled caste (8 out of 124). The figures for scheduled tribes (ST) and other backward classes (OBC) are 0.81 (1 household) and 1.61 percent (2 households) respectively. All the twenty families in JNU belong to the

Table 2.3: Caste Composition of the Households

Social Group	Frequency	Percent
General	113	91.12
SC	8	6.45
ST	1	0.80
OBC	2	1.61
Total	124	100

Source: Field Survey, 2004

general category. In Table 2.3, the caste composition of the respondents is described.

2.6.3 Income

As an exact income figure is difficult to get, a wealth index for the households is used. The wealth index has been constructed on the basis of the house size and the household durable goods ownership profile. Respondents were asked if the house in which they reside is owned or rented. They were also asked about the durable goods, which they possess, like refrigerators, air coolers, irons, air conditioners, music systems, televisions, washing machines, cable connections, computers, phones etc. Based on this information, the households were given points. These points were aggregated and based on the total grade; they were ranked as high, medium and low-income family. The procedure is explained in Appendix I. Among the households, 42 are from the low-income family, 42 are from the medium-income group and 40 are from the high-income group.

Table 2.4: Distribution of Income Category of the Households

Income Rank	Frequency	Percent
Low	42	33.87
Medium	42	33.87
High	40	32.26
Total	124	100.00

Source: Field Survey, 2004

It shows that the income status of the households is fairly evenly distributed. Among the households from JNU, 40 percent are low-income families (8 out of 20), 45 percent are from high-income group (9 households) and only 15 percent are from medium-income category (3 families). In the case of Munirka, the income distribution is much more uniform. 32.69 percent households are from low-income category, 37.5 percent are medium-income group and 29.81 percent belong to high-income class. The income distribution of the respondents is shown in Table 2.4. In case of the score of income status, the standard deviation is 4.35.

16

2.6.4 Gender

15 of the respondents, that is, 12.1 percent were women. The remaining 109 were male. Of the male respondents, 95 are from Munirka and 14 are from JNU. These figures for female respondents are 9 and 6 respectively. The percentage of female respondents is very small and therefore the study cannot draw any meaningful conclusions in this regard. However we think it interesting that the percentage of female respondents was much higher in JNU as compared to Munirka. Whether this can be connected to education status or female status within the household is

Table 2.5: Sex Composition of the Respondents

Sex	Frequency	Percentage
Male	109	87.90
Female	15	12.10
Total	124	100.00

Source: Field Survey, 2004

something we plan to explore in further research. In most cases the households were visited during the morning hours of a holiday so that all members might be available. The sex composition of the respondents is shown in Table 2.5.

2.6.5 Age

Table 2.6 describes the age specific distribution of the respondents. It is already mentioned that the available adult member of the household was polled during the survey. The smallest group is the age group 71-80. Only 2 respondents are from that group. Among the JNU households, maximum respondents belong to the age group 51-60 (7 respondents) whereas in Munirka, the modal group is 41-50. Because of the dominance of households from the Munirka region, in aggregate, maximum

Table 2.6: Age Composition of the Respondents

AGE	Frequency	Percent
21-30	14	11.29
31-40	29	23.38
41-50	49	39.51
51-60	23	18.54
61-70	7	5.64
71-80	2	1.61
Total	124	100.00

Source: Field Survey, 2004

17

respondents are from the age group 41-50. The youngest group consists of 11.29 percent of total respondents. As expected there is no respondent in the oldest group from JNU. In aggregate, the second largest age group is 31-40, which consists of 29 respondents.

2.6.6 Education

Among the 124 respondents there is no illiterate person. The minimum level of education is 'middle', that is persons who have completed 8th standard. In Munirka, 50 out of 104, that is 48.08 percent are graduates and three have a PhD. In JNU, 8 out of 20 (40 percent) have a doctoral degree. Overall, 43.55 percent of the respondents are graduates and 18.55 percent have a Masters degree. Table 2.7 describes the educational distribution of the respondents.

Table 2.7: Distribution of Education of the Respondents

Education	Frequency	Percent
Middle	9	7.26
Secondary	8	6.45
Higher Secondary	19	15.32
Graduate	54	43.55
Masters	23	18.55
PhD	11	8.87
Total	124	100.00

Source: Field Survey, 2004

18

2.6.7 Employment Status

Table 2.8 describes the employment status of the respondents. Only 3 respondents are housewives, 7 are pensioners, 4 respondents are unemployed and only 1 is a student. The remainders all are gainfully employed. All the pension holders and the student are from Munirka. 56.45 percent of the sample works in the formal sector, that is, they are regular salaried employees. Casual labourers accounted for only 5.65 percent of the total sample. They are all from the Munirka region. These casual labourers are engaged in the construction sector. 53.85 percent of Munirka residents and 70 percent of JNU residents are regular salaried. One fourth of the total samples, that is, 25.81 percent are self-employed.

Table 2.8: Employment Status of the Respondents

Employment	Frequency	Percent
Self-employed	32	25.81
Regular Salaried	70	56.45
Casual Labour	7	5.65
Unemployed	4	3.23
Student	1	0.81
Old	7	5.65
Housewife	3	2.42
Total	124	100.00

Source: Field Survey, 2004

2.6.8 News Paper

Newspapers often report on the current issues of environmental problems. Government agencies sponsor different advertisements of social awareness relating to the environmental hazards. So, the newspaper is an important source of information on the environmental problems and help in increasing awareness about these problems. 92.74 percent of the respondents read either an

Table 2.9: Exposure to News Paper of the Households

Newspaper	Frequency	Percent
No	9.00	7.26
English	67.00	54.03
Hindi	48.00	38.71
Total	124	100.00

Source: Field Survey, 2004

19

English or Hindi newspaper regularly. In the sample, there is no respondent who reads any other language newspaper. 54.03 percent reads an English newspaper. In both JNU and Munirka, more than 50 percent of the respondents subscribe to an English daily. Only 9 respondents, one from JNU and 8 from Munirka, do not read any newspaper. A detailed description of the newspaper exposure is given in Table 2.9.

2.6.9 Television

In a metropolitan city, like Delhi, where people lead a very fast life, television plays a crucial role as a source of information access. Many environmental related news items and advertisements are publicized on television. Table 2.10 gives a detailed description of television exposure of the respondents. In our sample, 93.55 percent of the total households watch television regularly.

Table 2.10: Exposure to Television of the Households

Television	Frequency	Percent
No	8	6.45
Yes	116	93.55
Total	124	100

Source: Field Survey, 2004

Only 8 households (6.45 percent) do not have any television exposure. Three households from JNU and 5 from Munirka do not own a television.

2.6.10 Health Status

Majority of the households (71.8 percent) suffer from low-level respiratory ailments such as cough and cold. The most striking feature is that only 4.8 percent of the households have reported suffering from breathing trouble, which is a direct effect of air

Table 2.11: Types of Diseases of the Respondents

Disease	Frequency	Percent
Breathing Problem	6	4.8
Cold, Cough, Fever	89	71.8
Viral Fever	21	16.9
Stomach Upset	3	2.4
No	5	4.0
Total	124	100.0

Source: Field Survey, 2004

pollution. Only 2.4 percent of the respondents suffer from stomach upset, which is caused by water pollution. 46 percent of the sample, on an average suffers once in a year from some kind of disease. 9.7 percent of sample suffers more than twice in a year. Only 5 out of 124 respondents did not suffer from any kind of disease in the given year. Table 2.11 shows the types of diseases from which the respondent usually suffers.

2.7 Environmental Awareness in the Field Area

In this section, discussion of the environmental awareness in the field area is done. The respondents were asked questions about general environmental issues. Some were related to their knowledge about legal aspects while others were on general environmental status. The questionnaire used is given in Appendix III.

2.7.1 Opinion on the Medium of Pollution

During the field survey, a set of information on the nature of pollution as professed by the respondents, was collected. Majority of the respondents (71 out of 124 – 57.26 percent) think that air and water are the main medium of pollution. There is no disparity regarding the main affected medium between respondents from Munirka and JNU. However there appears income related bias with respect to the view about the medium of pollution. 40.48 percent of respondents from the low-income group consider air and water as the main polluted medium whereas 64 – 68 percent in the medium and high-income group respondents think so. Overall, 37.9 percent (47 out of 124) consider air as the main medium of

Table 2.12: Opinion Regarding Main Medium of Pollution

Polluting Medium	Frequency	Percent
Air	47	37.90
Water	1	0.81
Land	1	0.81
Air & Water	71	57.26
All	4	3.23
Total	124	100.00

Source: Field Survey, 2004

pollution. 4 persons believe that all the major environmental mediums are polluted; they are all from Munirka. Table 2.12 describes the different views of the respondents regarding the main polluted medium.

2.7.2 Opinion Regarding the Pollution Situation During Last 5 Years

Respondents were asked, their opinion regarding the pollution situation in Delhi during last five years. 85.48 percent of the respondents think that, the overall pollution has decreased during this period. 75 percent and 87.5 percent of the respondents from JNU and Munirka respectively have expressed this opinion. As the main reason, they have argued in favour of the introduction of Compressed Natural Gas (CNG). Only 3.23 percent of the sample (10 percent from JNU and 1.92 percent from Munirka) said that there is no change in the level of environmental pollution. According to them, CNG has helped in reducing the air pollution. But other kinds of pollution like water pollution, land pollution, noise pollution etc had increased. Again the number of two wheelers and four wheelers, which use petrol and diesel, has seen a major increase during the last five years. This has finally resulted in no

Table 2.13: Opinion about Pollution Situation in Delhi During last 5 Years

Opinion	Frequency	Percent
Decreased	106	85.48
Increased	14	11.29
No Change	4	3.23
Total	124	100.00

Source: Field Survey, 2004

change in the over all pollution levels. The same logic has been given by the respondents, who believe that pollution during the last five years has actually increased (11.29 percent of the respondents). Table 2.13 gives a detailed description of the respondents' opinion regarding this issue.

2.7.3 Environmental Awareness: Some Greater Issues

Do the respondents know about the specific laws and regulations, which protects the environment? Do they know the Act, using which the affected persons can get compensation from the polluting units? The respondents were asked some questions related to these issues. The specific questions are:

1. Knowledge about Section 21 of the Indian Constitution, which recognizes citizen's right to pure water, air and healthy environment (A1);

2. Knowledge about the Indian Pollution Tribunal Act, 1995 according to which the environment, property and people affected by pollution should be compensated (A2);

3. If the respondent know about the existence of Delhi Pollution Control Department (A3);

4. If he or she is aware about the Supreme Court's order regarding closure down of the polluting units in Delhi (A4);

5. What is the respondents opinion regarding the closure down of the polluting units (A5);

6. What does the respondent think regarding the pollution if the shopping mall near Vasant Kunj starts operating (A6);

7. What does the respondent think regarding the introduction of CNG (A7);

The main problem faced by the respondents here was that though they had a vague idea about the law, they did not know details. In many cases, their answer were not convincing.

In Table 2.14, the awareness pattern of the households is described based on the respondents answer to the questions A1 to A7. As described in this table, it is clear that not many households are aware about their constitutional rights (29.8 percent) or the Indian Pollution Tribunal Act (29 percent). Again from the low-income category, only 9.5 percent households know about their constitutional

23

right, whereas about 40 percent people from middle and high-income group are informed about this right. For the state level issues (question A3 and A4), sample families are much more aware compared to the larger environmental issues (question A1 and A2). On aggregate 59.7 percent of the families are aware of the existence of the Delhi Pollution Control Board (DPCB) and 75.8 percent of the households know about the Supreme Courts order regarding the closure of the polluting units in Delhi. Regarding the shutting down of the polluting units,

Table 2.14: Awareness Pattern of the Respondents (According to Income)

Income Group	A1 Yes	A2 Yes	A3 Yes	A4 Yes	A5 Closed	Transferred	No Views	No Response	A6 Yes	A7 Yes
Low	4	8	13	22	4	21	10	7	27	31
	9.5	19.0	31.0	52.4	9.5	50.0	23.8	16.7	64.3	73.8
Middle	17	10	28	37	12	30			40	42
	40.5	23.8	66.7	88.1	28.6	71.4			95.2	100
High	16	18	33	35	17	23			40	40
	40.0	45.0	82.5	87.5	42.5	57.5			100	100
Total	37	36	74	94	33	74	10	7	107	113
	29.8	29	59.7	75.8	26.6	59.7	8.1	5.6	86.3	91.1

Source: Field Survey, 2004
* The figures in the second row in each category are the percentage figure.[5]

majority of the families (59.7 percent) opt for transfer of those units. 26.6 percent households want to close down those polluting units. 13.7 percent of the respondents have 'no opinion' on the issue. One reason for this decision is that some respondents were unable to resolve their own conflicting desire to have a better environment without depriving others of their livelihood.

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[5] The percentage figure for each group has been calculated with respect to the total number of samples in the respective income group.

One respondent from JNU argued that he would support transfer of the units only when they use better technology. Otherwise, he felt, there is no point in transferring the polluting unit, as pollution will affect the new location. Ironically, no person from the middle and high-income group has chosen the third and fourth option in this regard. From all the three income groups, the majority of the households favor transferring the polluting units. Opinion regarding the effect of the Vasant Kunj shopping mall on pollution was less varied. 86.3 percent think that the environmental situation will worsen. All the households from the middle and high-income classes think that CNG has helped in reducing pollution.

In Table 2.15, the environmental awareness of the respondent has been described in the context of his or her educational attainment. No respondent, who has studied upto the middle level has any idea about the larger environmental issues and state level issues. From the table below, it is clear that as education level increases, the awareness levels are improved. Regarding the greater issues in environment (A1 and A2), people who are at least graduates, are aware. However, even here, the knowledge about question A1 and A2 is only 25.9 percent compared to those who are postgraduates (52.2 and 47.8 percent respectively). All the respondents with a PhD degree are aware of the constitutional right and the Indian Pollution Tribunal Act. For the state level issues, again the less educated section has no idea. Only one person, who has completed his secondary education, knew about the Supreme Court's order to shut down the polluting units and 31.6 percent of the respondents, who have passed 12th standard, have heard about DPCB. For the graduates and postgraduates, the awareness increases significantly regarding the state level

Table 2.15: Awareness Pattern of the Respondents (Education Level wise)

Education Level	A1 Yes	A2 Yes	A3 Yes	A4 Yes	Closed	A5 Transferred	No Views	No Response	A6 Yes	A7 Yes
Middle							5	4		
							55.6	44.4		
10th				1			5	3	2	6
				12.5			62.5	37.5	25	75
12th			6	13		19			18	19
			31.6	68.4		100			94.7	100
Graduate	14	14	34	46		54			53	54
	25.9	25.9	63.0	85.2		100			98.1	100
Masters	12	11	23	23	22	1			23	23
	52.2	47.8	100	100	95.7	4.3			100	100
PhD	11	11	11	11	11				11	11
	100	100	100	100	100				100	100
Total	37	36	74	94	33	74	10	7	107	113
	29.8	29	59.7	75.8	26.6	59.7	8.1	5.6	86.3	91.1

Source: Field Survey, 2004
* The figures in the second row in each category are the percentage figure.[6]

issues. All respondents with at least Masters degree have knowledge about the Supreme Court's order and DPCB.

Regarding the closing down of the polluting units in Delhi, all the respondents from higher secondary and graduate group, have opted for transferring the polluting the units while only one from postgraduate and none from PhD group has chosen it. The highly educated persons voted for closing down the polluting units. According to them, it's better to close down these units rather than increase the pollution in another place. The less educated section (passed middle school and 10th standard) could not give any specific view regarding this matter. Majority

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[6] The percentage figure for each group has been calculated with respect to the total number of samples in the respective education group.

of the persons from each education group have the view that the upcoming shopping mall near Vasant Kunj will aggravate the pollution in this area.[7] Regarding the introduction of CNG, on an average, everybody shares the view that it has helped to reduce the pollution to some extent.

2.7.4 Measurement of Environmental Awareness

The next question that comes is how the households will be graded according to their environmental awareness. The indexing procedure of the families is given in Appendix 2. Majority of the families (44.35 percent) belong to the medium environmental awareness group. If we analyze from the educational distribution side, it is clear that as educational qualification of a person increases, the total score of environmental awareness also improves. In the lower awareness group, the respondents' maximum qualification is higher secondary. 18 out of 36 respondents in this category, who have graded 6, have passed the higher secondary. In the middle awareness group, except one with Masters degree, all are graduates. All the PhD qualified respondents are highly aware about environmental issues. Except one postgraduate respondent, all are in the highly aware group of environmental awareness. Table 2.16 describes the environmental awareness composition of the respondents.

Table 2.16: Scores of Environmental Awareness

Awareness Score	Frequency	Percent
0-6	36	29.03
7-12	55	44.35
13-18	33	26.61
Total	124	100.00

Source: Field Survey, 2004

On the other hand if we look from income point of view, in the low awareness group, 75 percent of the respondents are from low-income group. In the medium and high aware group, proportion of the low-income persons is less compared to

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[7] Except the middle and 10th education group (25 percent).

27

the other two income groups. In the medium aware group, middle-income category is dominant, while the highly aware group is high-income persons.

Chapter III

3.1 Introduction

Each individual's objective is to maximize his or her utility. The utility of an individual depends on two things initially, which are the individual's consumption of tangible and intangible goods and also the health status of that person. If the consumption of tangible and intangible goods increases, the individual gets more satisfaction. Illness or wellness is an intangible 'good'. If illness increases, the individual's overall utility decreases. The person's income is also reduced due to illness and that affects consumption of tangible goods. Now, illness of a person depends on two things. First, how much he or she is exposed to environmental pollution and second, what health related precautionary measures the individual is taking. This is where the environmental awareness issue enters. His level of environmental awareness directly and positively affects an individual's defensive activity against illness. The main emphasis of this dissertation is to find out what are the determinants of environmental awareness.

As mentioned in Chapter I, it is often assumed that environmental awareness improves with increases in income. Such improvements are facilitated by a rise in the standard of living.

In this study, an attempt has been taken to find out, what factors affect environmental awareness at the household level and what factors the policy maker should focus on to improve environmental awareness, using cross section data.

3.2 Hypothesis

It has been stated earlier that an individual's utility depends on his or her health status, which in turn is affected by his or her environmental awareness level. In this study it is hypothesized that environmental awareness depends mainly on education. In our opinion, the causation works as follows: Improved education results in higher income and awareness levels. In addition, higher income levels generate demand for environmental amenities and education. Consequently, income and education are highly correlated in our sample. It is expected that income will not be a significant explanatory variable. In addition, we do not expect newspaper reading and watching television to be a significant determinant of environmental awareness. Socio-economic factors, effects of social group (caste), religion and type of local governing body are also not expected to have statistically significant impact.[8] Gender and age of the respondent are not being included in the regression as this is a household level analysis. In sum our hypothesis is environmental awareness is determined by education level, that is,

Environmental awareness $= f$ (education).

3.3 Model

In this analysis, we have assumed a linear relation between the dependent and the independent variable. That is, the regression procedure is a simple bivariate ordinary least square (OLS) model. We can explain it as:

$$Sc\_ea = \beta_0 + \beta_1 (yr\_edu) + \varepsilon$$

Where, sc_ea is score of environmental awareness and yr_edu is total year of education. The error term is described by ε.

We have to test the null hypothesis, H_0 against the alternative hypothesis H_1, where H_0 and H_1 are described as:

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[8] Explanation of this hypothesis is given in section 3.5.

$$H_0: \beta_0 = 0 \text{ versus } H_1: \beta_0 \neq 0.$$

$$H_0: \beta_1 = 0 \text{ versus } H_1: \beta_1 \neq 0$$

3.3.1 Assumption

The assumptions of this multivariate OLS model are:

1. The error terms are normally distributed.

2. Mean of the error terms is zero, that is, $E(\varepsilon) = 0$.

3. Variance of the error terms is constant.

4. Error terms are uncorrelated.

3.4 Explanation of the Bivariate Regression Result:

In the bivariate OLS regression analysis, the dependent variable, score of environmental awareness, is regressed upon education.

3.4.1 Dependent Variable: Score of Environmental Awareness

In order to determine, what factors affect environmental awareness, the first step is to measure the environmental awareness. It is a qualitative variable. In the questionnaire, there are questions regarding greater environmental issues, like environmental laws and regulations, state level environmental problems and some local and general environmental issues. The respondents were also asked to give their opinion regarding some general environmental problems.[9] Based on the answers, the households were given different grades.[10] The grades of all the questions were added to get the total grand score. In our model, this score of environmental awareness was taken as the dependent variable.

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[9] See Appendix III.
[10] See Appendix II.

3.4.2 Independent Variable: Education

Education is expected to be the most significant determinant of environmental awareness. When a person's education increases, he or she is being exposed to greater issues, like environmental problems, rather than very basic problems of material gain. If we look at the environmental movements, we can see that education is a key determinant of success. In the case of the Chipko Movement in India, the local people of became aware of the need to preserve forests, as their livelihood was dependent on the forests. However, they succeeded in protecting the forests only with the help of educated persons from outside who were aware of the laws and regulations and helped the locals to use them effectively to protect the forests. Again, as mentioned earlier, in the case of the Yamuna river pollution, the persons, using the river regularly, are not really aware of the dangers or level of it's pollution level. It is the educated persons, who are raising their voice against the pollution of the Yamuna. So, education is playing a very crucial role in determining environmental awareness.

As stated earlier, our hypothesis in this study is that education is the most important determinant of environmental awareness. We have collected data on individuals living in a posh locality of the nation's capital. The choice of population was dictated by considerations of time and finance. Urban residents are on average more affluent than rural residents and have greater exposure to newspapers, television and other sources of information. As noted earlier, practically all respondents, in the sample studied, read the newspaper and watch television. Urbanites are also less likely to observe segregation along caste and religion divides in daily life. Therefore, we did not expect these variables to be statistically significant and indeed they were not. A preliminary analysis of the

raw data indicated that income would also not be statistically significant. Box 3.3 shows this was indeed the case.[11]

In this analysis, education level and score of environmental awareness is highly correlated. The Pearson correlation coefficient value is 0.97414 with high significance level (0.0001). The p value is small indicating the population correlation coefficient (Rho) is significantly different from zero. The correlation result is given in box 3.1.

Box 3.1: Correlation Coefficient Result between Score of
Environmental Awareness and Years of Education

Variable	N	Mean	Std. Dev.	Sum	Minimum	Maximum
Sc_ea	124	8.73	4.29	1083	0	16
Yr_edu	124	16.7	3.41	2071	10	24

Pearson Correlation Coefficients/ Prob> |R| under H_0: Rh_0=0/N=124

	Sc_ea	Yr_edu
Sc_ea	1.0000	0.9741
	0.00	0.0001
yr_edu	0.9741	1.0000
	0.0001	0.00

In our final model, we have included education as the sole determinant of environmental awareness. The education level of the respondent explains the score of environmental awareness. The result is given in Box 3.2.

The R square value of this model is 0.9489 that is the sample is representing 95 percent of the total variation in the population. The F value is naturally high and is 2267.32. The magnitude of the coefficient of education

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[11] A multivariate regression was done to show if any variable, other than education, has any effect on the environmental awareness. The result is shown in Box 3.3 and the result is analyzed in Section 3.5.

variable is quite large (1.227097) and positive. The intercept has a negative value (-11.760626). This suggests that the persons with very low levels of education or illiterate persons are likely to have incorrect information or beliefs about the environment. The model finally comes to:

Score of environmental awareness = -114.760626 + 1.227097 (Year of education).
A detailed explanation of the terms of Box 3.2 is given in Appendix IV.

Box 3.2: Bivariate OLS Regression Result of Education as Explanatory Variable

Dependent Variable: Sc_ea					
Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F-Value	Prob. > F
Model	1	2156.1972	2156.1972	2267.32	0.0001
Error	122	116.02053	0.95099		
C Total	123	2272.2177			

	Root MSE	0.97519	R-Square	0.9489	
	Dep. Mean	8.73387	Adj R-sq	0.9485	
	C.V.	11.16557			

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H_0: Parameter=0	Prob. > | t |
Intercept	1	-11.760626	0.4392271	-26.776	0.0001
Yr_edu	1	1.227097	0.0257705	47.616	0.0001

34

3.5 Effect of Income, Information Access, Health Status and Socio-economic Variables on Environmental Awareness

As mentioned in section 3.4.2, a multivariate regression analysis was done to check whether income, information access, health status and socio-economic variables like caste, religion and type of local governing body has any impact or not on environmental awareness. This estimation was done to support our hypothesis that education is the sole determinant of environmental awareness. The result is given in Box 3.3. The explanation of this multivariate OLS regression is given in the following section.

3.5.1 Description of Variables

The dependent and the explanatory variables in the above model are:

Sc_ea	Score of environmental awareness
Yr_edu	Total year of education of the respondent
D_np_y	household members read newspaper (English or Hindi)
D_np_n	household members do not read newspaper (English or Hindi)
D_tv	household members watch television
D_tv_n	household members do not watch television
D_hs_1	on an average, respondent suffers from any kind of disease once in a year
D_hs_2	on an average, respondent suffers from any kind of disease twice or more in a year
D_hs_3	respondent does not suffer from any kind of disease in a year
D_rin_1	households of lower-income group
D_rin_2	households of middle-income group
D_rin_3	households of high-income group
D_sg_1	households, which belongs to general category

35

D_sg_2	households, which belongs to schedule caste (SC), schedule tribe (ST) and other backward caste (OBC)
D_rlgn_1	households, which are Hindu families
D_rlgn_2	households, which are non-Hindu like Muslim, Sikh, Jain and Christian
D_sect_1	households, which are in MCD area
D_sect_2	households, which are in Panchayat (Laldora) area
ε	error term

In the regression analysis, d_np_n, d_tv_n, d_hs_3, d_rin_2, d_sg_2, d_rlgn_2 and d_sect_2 were dropped.

Box 3.3: Multivariate OLS Regression Result

Dependent Variable: Sc_ea

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F-Value	Prob. > F
Model	10	2165.1745	216.5174	228.566	0.0001
Error	113	107.04325	0.94729		
C Total	123	2272.21774			

Root MSE	0.97329	R-Square	0.9529		
Dep. Mean	8.73387	Adj R-sq	0.9487		
C.V.	11.14381				

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob. > | t |
Intercept	1	-11.953450	1.1001647	-11.934	0.0001
Yr_edu	1	1.198970	0.0353913	33.878	0.0001
D_np_y	1	0.441870	0.3796898	1.164	0.2470
D_tv	1	-0.179703	0.4053017	-0.443	0.6583
D_hs_1	1	0.405750	0.4476682	0.906	0.3667
D_hs_2	1	0.443620	0.4579084	0.969	0.3347
D_rin_1	1	-0.542040	0.2645921	-2.049	0.0428
D_rin_3	1	-0.238158	0.2327054	-1.023	0.3083
D_sg_1	1	0.210571	0.3529024	0.579	0.5519
D_rlgn_1	1	0.165073	0.3029632	0.545	0.5869
D_sect_1	1	-0.103378	0.2173365	-0.476	0.6352

3.5.2 Analysis of the Result

In this multivariate OLS regression analysis, the R^2 is 0.9528. But the only significant parameter is year of education. In the previous section, justification of education being a significant explanatory variable of environmental awareness is given. Explanation of the other variables is given below.

Newspaper

Newspaper plays an important role as an information source to learn about the environmental problems. Also government agencies publish different advertisements regarding environmental issues in newspaper. So, reading newspaper helps a person to increase his or her awareness about environmental problems. We can say that newspaper plays a vital role as a determining factor of environmental awareness of a person. Our sample is taken from an urban metropolitan area. Here, people have other sources of information, such as television, internet, non-government organizations.

From Box 3.3, we can see that the coefficient for newspaper is statistically insignificant.

Television

Television is an important source of information about environmental problems. In an urban set up, especially in a metropolitan city like Delhi, where people lead a very hectic life, there is not much time to read newspapers. Television, gives access to information in a short time. For these reasons, government agencies and many non-government organizations (NGOs) are choosing this medium to inform people about the environmental problems. In our analysis, we do not see it as significant because almost all have access to it.

Health Status

It is plausible that a household's perception about environmental problems is influenced by its health status. That is households learn from a bad health experience and their environmental awareness improves after that. During the survey, the respondents were asked about their health status, like on an average, how many times in a year they fall ill and what are the types of ailments they suffer from. More than 70 percent of the households reported episodes of frequent cough and cold, viral fever etc. We expected that visits to a medical practitioner would improve awareness of pollution related hazards. For our sample we do not expect health status to be statistically significant because pollution related ailments would impact all respondents and the information 'gain' from these experiences would be more or less uniform across households. In our analysis also, the coefficient value of health status is insignificant.

Income

Income is considered a major determining factor of environmental pollution. The Environmental Kuznets Curve hypothesis says that as per capita income of a country increases, environmental pollution at first increases, but after a certain level, it starts to fall. For the Western countries, as they have entered in the post-industrialization phase, they have become more concerned about environmental quality. They demand better quality life in addition to material gain as compared to developing nations. However, I do not think that income will be statistically significant in my study. This is because within a country willingness to pay (WTP) or willingness to accept (WTA) will depend on income levels but to see this we would need a larger and more heterogeneous sample. Also, I believe that income does influence WTP or WTA but the initial demand for a better environment comes with better education. From box 3.3, we can see that the coefficient values

of two income dummies, d_rin_1 and d_rin_3 are statistically insignificant. To check whether income has any effect on environmental awareness, we run a regression as the score of income[12] as the explanatory variable on the score of environmental awareness as dependent variable. Income turned out an insignificant determinant of environmental awareness. the result is described in box 3.4. So, we have dropped the income variable as a determinant of environmental awareness.

Box 3.4: Bivariate OLS Regression Result of Income as
Explanatory Variable

Dependent Variable: Sc_in

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F-Value	Prob. > F
Model	1	733.7649	733.7649	58.188	0.0001
Error	122	1538.453	12.6427		
C Total	123	2272.218			

Root MSE	3.55109	R-Square	0.3229	
Dep. Mean	8.73387	Adj R-sq	0.3174	
C.V.	40.65888			

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob. > | t |
Intercept	1	0.823649	1.084912	0.759	0.4492
Sc_in	1	0.562102	0.303688	0.628	0.1591

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[12] Explained in Appendix I while indexing the income status of the households.

Caste

Environmental behavior is not only correlated with economic factors, but it is also associated with demographic, psychological, cultural and educational factors. It is believed that culturally, the general category people are in an advantageous position compared to the backward caste population. However, our sample is drawn from an urban metropolitan area with a high cosmopolitan behavior. People are not much concerned about the caste problems. Again 91.12 percent of the sample belongs to the general category. Hence, it's not likely to be a considerable determinant of environmental awareness. In the multivariate regression also, its parametric value of the caste variable (d_sg_1) is not significant. Therefore, caste is not an explanatory variable to determine environmental awareness.

Religion

Like caste, religion is also a cultural factor. In our sample, 90.32 percent of the households were Hindu families. Less than ten percent of the sample belongs to the other religions like Muslim, Sikh, Jain and Christian. As Hindu is the dominant religion in the sample, the variation is very less. Again, in an urban area like the South Delhi, religion is not expected to be a determining factor for the environmental awareness. In the regression result in box 3.3, the religion *Religion* variable has turned out to be insignificant.

Municipal Sector

In the sample area, the Munirka Village is a Panchayat area where as other areas; JNU, Munirka DDA Flats and Munirka Vihar are under Municipal Corporation of Delhi (MCD). In comparison to the Munirka Village, which is a Panchayat area, the MCD areas are in an advantageous position with respect to the basic facilities like garbage collection etc. As mentioned earlier, regarding information access,

education facilities, availability of basic amenities etc., the Panchayat area is not much different from the MCD area. This area is surrounded by the MCD area. So, municipal body is not expected to be a significant determinant of environmental awareness. The result in box 3.3 also supports our hypothesis.

3.6 Problem with Logistic Regression

In this analysis, the dependent variable is score of environmental awareness. But environmental awareness is a qualitative variable. At the initial stage of analysis, bivariate and multivariate logistic regression was applied. In the bivariate model, the households were grouped as aware and non-aware. The set of independent variables was same as the current model. But the problem arising was of quasi-complete separate data set. Quasi-complete separation is a situation when there is a linear combination of the explanatory variables that perfectly predicts the dependent variable. It happens when all (or most) of the responses at one of the levels of the categorical variables are success and all (or most) of the responses at another level are failures. For better explanation, let us take an example from the sample dataset. If we analyze the environmental awareness

Table 3.1: Educational Distribution according to Environmental Awareness

Education Level	Environmental Awareness		
	Unaware	Aware	Total
Middle	9		9
Secondary	8		8
Higher Secondary	19		19
Graduation	1	53	54
Post Graduation		23	23
More than PG		11	11
Total	37	87	124

Source: Field Survey, 2004

according to the educational level of the respondents, then we can see that except for one person, who has done his graduation, all the other persons with minimum of graduation, are environmentally aware. Rests of the respondents, who have at the most done graduation, are not very concerned about the environmental

problems. The two sets, environmentally aware and unaware, are almost disjoint set. In Table 3.1, the educational distribution of the respondents according to their environmental awareness is shown. Same problem was faced when a bivariate probit regression or a multinomial logistic regression was tried to analyze the data. There is a theoretical treatment, which can solve this problem of quasi-complete separation, named exact logistic regression.

3.7 Problem Faced During the Analysis

When the survey was conducted, a major difficulty was faced while interviewing the respondents. In many cases, regarding the environmental issues, the respondent had a vague idea and he or she did not reply properly.

In computation of the income index, it was enquired whether the house, they reside in is an own house or a rented house. In many cases for rented house, the households have their own house in the suburbs of Delhi, like Nazafgarh etc. They are staying in a rented house in these areas to solve the problem of commuting between the work place and their residence. In such cases, the income index, which categorizes households as low, medium or high-income group may be faulty.

Again, when the respondents were asked about their caste, they refused to answer or did not answer properly. So, the dummy may give some erroneous result.

Even for education level, some respondents' answer was not convincing.

All these factors may drive the error term.

Chapter IV

The purpose of this dissertation is to analyze the role of education, health status and information access as determinants of environmental awareness. In contrast to the conventional view, I believe that education is the prime determinant of environmental awareness, not income. We have conducted an empirical investigation on the determinant of environmental awareness.

Using survey data from two South Delhi localities, Munirka and JNU, a simple OLS regression was run. From this analysis, it is clear that the level of awareness about environmental pollution is quite high in the surveyed households. Overall the results seem to point towards the importance of the education level of the respondents. To test the hypothesis, the score of the environmental awareness of the households was taken as the dependent variable. Here, a wealth index is used, based on the ownership of consumer durables by the households, to proxy their income levels. The independent variables were; total years of education of the respondent, exposure to newspapers and television, health status of the respondent, wealth index of the household, caste, religion and local governing body. Education turned out to be the only significant determinant of environmental awareness. No other variables have any significant effect on environmental awareness. This suggests that the common presumption that demand for better environmental quality is positively and significantly correlated with income needs to be questioned.

Poor environmental quality can lead to households facing health problems. To prevent this, the households must be aware of the environmental issues. Environmental awareness is improved more by education rather than income status, as has been shown in this analysis in the context of general environmental problems.

This indicates that for a successful campaign against environmental degradation, education policy is an important tool. Education will provide awareness and the will to respect and enforce the laws and regulations preserving and protecting the environment.

Appendix I

Income Indexing

Step 1:

The households are given different grades according to their possession of different consumer durable goods according to their weightage. The grades for different goods are shown in the following table:

Table 1: Different Grades for Different Consumer Durables

Serial No.	Assets/Consumer Durable	If "Yes" then the grade	If "No" then the grade
1	If the house they live is an own house	2	1[13]
2	Refrigerator	1	0
3	Air Cooler	1	0
4	Iron	1	0
5	Air Conditioner	2	0
6	Music System	1	0
7	Computer	2	0
8	Printer	2	0
9	Television	1	0
10	Cable Connection	1	0
11	Washing Machine	2	0
12	Phone	1	0

Step 2:

After giving grades, grand total is calculated.

Step 3:

The households are divided into groups according to their total grade like high-income group, medium income and low-income group.

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[13] In this case the household type is a rental house.

46

Appendix II

Indexation of Environmental Awareness

Step 1: The households are given different grades according to their answers to different environmental questions- greater environmental issues, state level issues and general environmental questions according to their weightage. The grades for different questions are shown in the following table:

Table 1: Different Grades for Different Environmental Awareness Questions

Serial No.	Assets/Consumer Durable	If "Yes" then the grade	If "No" then the grade
A1	Knowledge about Section 21 of the Indian Constitution, which recognizes citizen's right to pure water, air and healthy environment	3	0
A2	Knowledge about the Indian Pollution Tribunal Act, 1995 according to which the environment, property and people affected by pollution should be compensated	3	0
A3	If the respondent know about the existence of Delhi Pollution Control Department	3	0
A4	If he or she is aware about the Supreme Court's order regarding closure down of the polluting units in Delhi	3	0
A6	What does the respondent think regarding the pollution if the shopping mall near Vasant Kunj starts operating	2	0
A7	What does the respondent think regarding the introduction of CNG	2	0

For question A5, which is, what is the respondent's opinion regarding the closure down of the polluting unit; grades are given as shown below:

'Closed'- grade is 2;

'Transferred'-grade is 1;

'No view'- grade is 0;

'No response'- grade is 0.

Step 2: After giving grades, grand total is calculated, which is called the score of environmental awareness.

Appendix III

Environmental Awareness

Survey Conducted by: Arpita Chakraborty
MPhil, CESP, SSS,
JNU.

Block: 1 (Covers the Socio-Economic Factors)

1.1   Household No.   [_____]

1.2   Address   _____

                      _____

1.3   Religion   [_____]   [Hindu-1, Muslim-2, Christian-3, Shikh-4, Others-99]

1.4   Social Group   [_____]   [General-1, SC-2, ST- 3, Others- 99]

1.5   Sector   [_____]   [MCD-1, NDMC-2, Panchayat-3, Others-99]

1.6   Household Type [_____]   [Own-1, Rental-2, Mess-21, Hostel-22, PG-23, Others-99]

1.7   Consumer Durable

Durable Good	Yes/No	Durable Good	Yes/No	Durable Good	Yes/No	Durable Good	Yes/No
Fridge		AC		TV		Computer	
A.Cooler		Printer		W.Machine		Phone	
Iron		M.System		Cable		None	

1.8   Number of Rooms in the Household   [_____]

1.9   Household Description

Sl No.	Name	Relation to the Head	Age	Sex	Education	Employment Status	News Paper

[Self-21, Wife- 22, Others-23, Son-31, Daughter-22, Other-39 (niece etc.), Father-11, Mother-12, Others-19 (uncle etc.)]

[Male-1, Female-2]

[Illeterate-1, Literate through Education Programe-2, Below Primary-3, Primary-4, Middle-5, Secondary-6, Higher Secondary-7, Graduate-8, Postgraduate-9, Above PG-10, Others-99]

[Self-emploed-1, Regular Salaried-2, Casual Labour-3, Unemployed-4, Student-5, Out of Labour Force-6 (Child- 61, Sick-62, Old-63, Housewife-64)]

[English-11, Hindi-12, Others-19, No-0]

Block 2: (Covers the Environmental Awareness Area)

2.1   Do You Know about Section 21 of the Indian Constitution which Recognizes Citizen's Right to Pure Water, Air & Healthy Environment?

☐   [Yes-1, No-2]

2.2   Do You Know about the Indian Pollution Tribunal Act, 1995 according to which the Environment, Property & People Affected by Pollution should be Compensated?

☐   [Yes-1, No-2]

2.3   Do You Know about the Existence of Delhi Pollution Control Department?

☐   [Yes-1, No-2]

2.4 Do You Know about the Order of the Supreme Court Regarding Closure of Some Polluting Units in Delhi?

[_____] [Yes-1, No-2]

2.5 What is Your Opinion Regarding the Operation of the Polluting Units?

[_____] [Closed-1, Transferred-2, No Views-3, No Response-4]

2.6 Do You Think the Upcoming Shopping Mall Near Vasant Kunj will Increase the Pollution?

[_____] [Yes-1, No-2]

2.7 Do You Think the Introduction of CNG has Helped to Reduce the Pollution?

[_____] [Yes-1, No-2]

2.8 According to You, What is the Main Medium of Pollution?

[_____] [Air-1, Water-2, Land-3, Air & Water-4, Air & Land-5, Water &Land-6, All -99]

2.9 Pollution During Last Five Years:

[_____] [Decreased-1, Increased-2, Did not Change-3]

2.10 How Many Times in a Year You Fall ill?

[_____] [Once-1, Twice-2, Thrice-3, Four-4, Five-5, Others-99]

2.11 Type of Disease: _____

2.12 Remarks:

[_____]

Appendix IV

Description of Result of Bivariate Regression of Score of Environmental Awareness on Total Year of Education

Analysis of Variance

Model DF[14]   is 1, the number of parameters minus one.[15]

Error DF   is 122, total number of observation (124) minus number of parameters in the model.

Corrected Total DF   is 123, the number of observations minus one.

Model Sum of Squares   is the variation in the Y explained by the model. Here this value is 2156.19721.

Error Sum of Squares   is the variation in the Y not explained by the model. In this case, it is 116.020253.

Corrected Sum of Squares   is the total variation in the Y, which is 2272.21774 fir this study.

Model Mean square   is the model Sum of Square divided by the model DF $\{(2156.19721/1) = 2156.19721\}$.

F Value   is the (mean square model/mean square error). Here it is 2267.323 $\{(2156.19721/0.95099) = 2267.323\}$.

Pr>F   is small (0.0001); therefore, we reject H_0: $\beta_1 = \beta_2 = 0$ and conclude that at least one $\beta_i \neq 0$.

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[14] DF: Degrees of Freedom.
[15] Here we have one dependent and one independent variable.

Root MSE	the root mean square error is an estimate of the standard deviation of the response variable at each value of the predictor variable. It is the square root of MSE. In this case, root MSE is 0.97519.
Dependent Mean	the overall mean of the response variable. For this analysis, the dependent mean value is 8.73387.
C.V.[16]	the coefficient of variation is the size of the standard deviation relative to the mean. CV is
	▪ Calculated as (Root MSE / $\bar{Y}$) * 100
	▪ A unit less measure, so it can be used to compare data that has different units of measurement or different magnitudes of measurement. Here CV is 11.16557.
R Square	the coefficient of determination, usually referred to as the R^2 value. This value is
	▪ Between 0 and 1.
	▪ The proportion of variability observed in the data explained by the regression line. In this example, the value is 0.9489, which means that the regression line explains 95% of the total variation in the response values.
	▪ The square of the Pearson correlation coefficient.

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[16] C.V.: Coefficient of Variation.

Adj. R Square	the adjusted R^2 is the R^2 that is adjusted for the number of parameters in the model. The adjusted R^2 value for this study is 0.9485.
DF	represents the degrees of freedom associated with each term in the model. Here DF, for both intercept and year of education (yr_edu) is one.

Parameter Estimates

Parameter Estimates	for intercept, it is -11.760626 (β_0) and for years of education is 1.227097 (β_1), which means as total years of education increases, the environmental awareness also improves.
Standard Error	is the standard error of each parameter estimate. For intercept, this is 0.43922713 and for year of education, it is 0.02577046.
t-value	is the t statistic, which is calculated by dividing the parameters by their corresponding standard errors.
Pr> | t |	is the p-value associated with the t-statistic. It tests whether the parameter associated with each term in the model is different from 0. Here for both the cases, this value is 0.0001, which means that both the parameters are significantly related with environmental awareness.

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