Need to Increase Awareness about Environment Pollution to Augment its Prevention

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Abstract: "I don't understand why when we destroy something created by man, we call it vandalism, but when we destroy something by nature we call it progress" (Ed Begley Jr.). There is more energy conversation going on these days than energy conservation. The pyramid of life is on very tremulous ground. Saving and protecting the environment is not a subject anymore. It is survival veracity. No war machine, however strong, can repel the dangers to our ecological security. Furthermore, there is no technology available anywhere in the world, which can recreate soil, bring to life extinct species. With growing energy demand and concern for depletion of conventional fuel resources, there is an urgent need to increase awareness regarding usage of green energy. In this study emphasis has been placed on respondent's awareness and opinion on ecosystem, global warming, environment pollution, climate change and benefits of renewable energy. The sampling unit consists of different individual respondents of different gender and age of Amritsar city. The sample size of the study is three hundred and fifty seven respondents. Descriptive research using interview schedule was done, whereby the data was collected with the help of a questionnaire. The respondents were asked to rate the statements related to reasons behind environment pollution and degradation using five-point Likert scale. Descriptive and Exploratory Factor Analysis have been used to analyze the data. Percentages, graphs and diagrams also have been used for analysis of the study. The factor analysis has resulted in eight factors showing the reasons behind environment pollution. As per the results Lack of Awareness has come out to be a major reason behind environmental degradation and pollution. Lapse in implementation of law, haphazard urbanization, deforestation, increase in population, increase in use of vehicles and nuclear weapons are the other main reasons behind environmental degradation. The environment pollution cannot be prevented until and unless people are enlightened and appraised about the fact that the resources are their own and it is their duty to protect them. It has come to light that lack of awareness can result in a major lag between the time when decision-makers express their interest in going forward with a proposed initiative and the time the proposal wins acceptance by a majority of the public. There is a need to make changes at local, national, regional and global levels together with an economic and social transformation at the levels of individuals and communities to save further depletion of environment.

Index Terms **- Awareness, environment, pollution, renewable**

I. INTRODUCTION

"I don't understand why when we destroy something created by man, we call it vandalism, but when we destroy something by nature we call it progress" (Ed Begley Jr.).

We have been conquering nature for more than 200 years and now we are almost killing it.

The pyramid of life is on very tremulous ground. Saving and protecting the environment is not a subject anymore. It is survival veracity. It is vital for individuals, organizations and governments to come forward and join hands to save whatever is left of our beautiful planet so that the future is not annihilated. No war machine, however strong, can repel the dangers to our ecological security.

An extract from noted journalist's work says: "Our enemy is no longer Pakistan or China: it is now landslides. We live in fear of landslides. Our weapon is now trees, to save civilization".

There is more energy conversation going on these days than energy conservation. Time has come to walk the talk.

The environment cannot be protected until and unless people are enlightened and appraised about the fact that the resources are their own and it is their duty to protect them.

Need

Development should focus just not on fulfilling social, political and economic goals but on the overall growth of all aspects of human life besides other living organisms. Ecology and development can blend if man realizes that he's a part of nature's mechanism and his survival depends upon prudent use of resources without endangering natural biotic systems. Due to increase in global warming, there has been rise in the level of ocean, receding glaciers, change in climate and resultant change in seasons, thinning of ozone layer and many other threats to environment and biodiversity. A question arises that whether whatever man has gained in the name of development is justifiable? Should factories be shut down because they produce waste and emit smoke? Should use of automobiles and aircrafts be ceased because they emit exhaust fumes and cause noise pollution? Or development work should be discontinued because they have a disastrous side? The answer is perhaps 'no'. Instead the attention should shift to

focusing on genuine needs and not on artificial wants, on natural life style instead of contemporary machine-like way of living. The progress should be based on ecological balance. Keeping this present mad race for economic development and the resultant fast economic degradation in mind the study was initiated.

As a planet we are using up our environmental capital far faster than we can replenish it. Energy is one such area that takes out a lot from nature. Environmentalists have long been warning to look for non-conventional sources of energy to reduce the dependence on non-conventional sources as well as providing breathing space to nature to repair itself. The government of any country or state should ideally be the foremost practitioner of safe environmental practices that serves as an example to others to follow.

Initiatives taken by our government are not sufficient. Punjab government has though taken some steps in tapping renewable energy and its sources but a lot needs to be done. Hardly any study covering the awareness of renewable energy has been conducted.

OBJECTIVE

• The aim of the study is to analyse the level of awareness among people of Punjab state regarding renewable energy;

• In this study emphasis has been placed on respondent's awareness and opinion on ecosystem, global warming, climate change and factors that attribute to environmental degradation;

• Willingness to pay more for 24hrs of power supply augmented by supply from renewable source and preference of people towards personal or district level generation of power from renewable source has also been studied.

RESEARCH METHODOLOGY

Sampling Plan: The following are included in the sampling plan for the purpose of present study:

a) Universe of sample: The sample has been taken from the universe of Amritsar city.

b) Sampling unit: The sampling unit consists of different individual respondents of different gender and age from the city of Amritsar.

c) Sample size: The sample size of the study is three hundred and eighty seven respondents.

d) Sampling procedure and Method:

A convenience sampling technique was used for the survey. The study is based on primary data collection by administering an interview schedule.

e) Collecting the Information

The data collection is the most expensive and the most prone to error. The interview schedules of 369 were received back and response of 357 respondents was found fit for the purpose of study.

REVIEW OF LITERATURE

November (2017) – Michael Harris in his article in World Energy Outlook 2017, mentioned four major drivers identified by International Energy Agency (IEA) in its annual study. These drivers have been found to affect the international market related to renewable energy. These were firstly the research, development and fall in costs of technology related to renewable energy. According to the executive director of IEA, Dr. Faith Birol solar energy was fast becoming the cheapest source for generating electricity in global power markets, especially China and India. Second driver was the growth in the use of electricity as energy. Due to increase in support by the government to electric vehicles and reduction in costs of battery, electrification of energy gained momentum. The third driver has been the shift to China as the new global leader. The reason for this being a driver was the fact that U.S., under the leadership of President Donald Trump, had become the only country not adhering to Paris Climate Agreement. Though the per captia energy consumption rate of China was expected to surpass by 2040 that of European Union but China was ready for an energy revolution and was preparing to take several measures to meet increase in demand for energy. This gave rise to the fourth driver, i.e., the resilience in the U.S. of oil and shale gas.

The major source of renewable energy has been solar and wind in China but hydropower also played a magnificent role lately. In 2000, the installed capacity was 79GW whereas by 201 it jumped to 332 GW.

As per IEA, by 2040, solar energy will rule 40% of energy generation in India and China whereas wind power will lead in Europe accounting for nearly 80% of power generation. Direct investment schemes and aggressive feed-in-tariff will play a major role in the increase in use of wind energy.

November (2015) – According to the reports of Survey by India Ratings, the estimated target of the government to add 60,000 MW of capacity of wind power by 2022 seems tough seeing the present rate of program.

The states of Andhra Pradesh, Madhya Pradesh, Gujarat and Karnataka had around two-thirds of the additions in capacity till 2017. These states had margin of error in limit or plant load factors. This increased the chance of only interested and deep-rooted producers of power who worked independently. The cumulative addition of capacity has decreased in the above states from 19 percent between 2009-2012 to 9 percent between 2012-2015. This percent is not likely to improve because of evacuation problems and certain state policies.

November (2014) - According to the reports, 107 megawatt (MW) of power from wind was added in Tamil Nadu over a period of six months. This project was not a new one but just completion of old orders. New projects were not coming up as the state government of Tamil Nadu was proposing wind tariff of Rs. 3.58, which is the lowest in the country. Neighboring state, Madhya Pradesh was proposing Rs. 5.92. No doubt investors were more attracted to other states like Andhra Pradesh, Karnataka and Maharashtra.

Amritsar Tribune (2014) reported that solar energy is still largely untapped in Amritsar even after subsidized equipment offered by Union Government. This is proved by the fact that though a large number of resident colonies have come up and are even coming up but hardly any house is using solar energy. Raman Gupta, an industrialist, has stated that though thousands of houses are being constructed every year but not even a percent of these houses are using solar energy. According to him the reason behind this was an indifferent approach of the government in popularizing solar energy. The state has released a draft policy on net metering for solar energy in August 2013. Even the Union Government is extending its support by giving 33 per cent subsidy on installing of apparatus under this scheme. Harpinder Singh, a construction material dealer, said that though people were spending lakhs of rupees on construction of houses but they were not investing any money for saving on energy resources. He was of the opinion that this was due to lack of awareness among people.

Tools of Analysis

A number of factors contribute to environmental degradation or are in one way or the other responsible for decelerating sustainable growth.

An endeavor has been made to uncover the latent structure (dimensions) of a set of variables responsible for degrading the environment. A Factor Analytic technique has been used to reduce attribute space from a larger number of variables to a smaller number of factors. Further descriptive statistics have been applied to analyse the data.

Exploratory factor analysis is a statistical technique that is used to reduce data to a smaller set of summary variables and to explore the underlining theoretical structure of the phenomena. It is used to identify the structure of the relationship between the variable and the respondent.

Following measures have been used to check whether the data is appropriate to apply factor analysis.

Kaiser-Meyer- Olkin Measure of Sampling Adequacy: The sampling adequacy is measured by KMO. The value varies between 1 and 0. The values which are closer to 1 are considered better while values less than .6 are considered inadequate.

Bartlett's test of sphercity: This test helps to examine the co-relation among the variables in the population.

Communalities: The amount of variance shared by one variable with all the other variables is communality.

Eigenvalue: The total variance that each factor explains is represented by Eigen value.

Factor Loadings: The correlation between the factors and variables is factor loadings.

Development of Research Instrument

The literature review Jha, P.K. (1998), Shoberi(2007), Bhalla,G.S.(2007) provided the basis for the generation of the questionnaire. The questionnaire is divided into 3 parts. Part A contained the demographic profile of the respondents. Part B contained general questions related to renewable energy. Part C contained 44 statements related to climate change and environment degradation. The respondents had been asked to rate the statements using five-point Likert scale ranging from “strongly disagree” as 1 and “strongly agree” as 5. Initially the scale consisted of 44 items. Exploratory factor analysis was run to improve the questionnaire. Factor loading more than .45 were retained and 41 items were retained for further analysis..

DATA ANALYSIS AND INTERPRETATION

This section contains the details about the descriptive statistics as well as the results of respondents rating of statements regarding climate change and environment degradation. To make the data more presentable and understandable, tables and graphs have been used. Details of factor analysis have also been given.

Section A of the questionnaire dealt with demographic profile of respondents. Table 1 is showing the results (in percentages).

Table 1

Description	Percentages
Gender	
Male	59.4
Female	40.6
Total	100
Age	
Less than 30 years	47.9
30 years and above	52.1
Total	100
Marital Status	
Married	53.2
Unmarried	46.8
Total	100
Educational Qualification	
Under graduate	48.2
Over graduate	51.8
Total	100

Section B contained questions in general about renewable energy.

The first and second questions dealt with the general idea about the eco-system and awareness regarding climate change, global warming, renewable and green energy. These questions were deliberately set to help participants by introducing the concept and need of using renewable energy technology towards better environment.

About 87% respondents had heard about ‘global warming’ and 83% about climate change.

34% of respondents had heard of the term “Renewable Energy”

There is overall lack of education and awareness among people when it comes to knowing what renewable/clean/green energy.

Figure 1

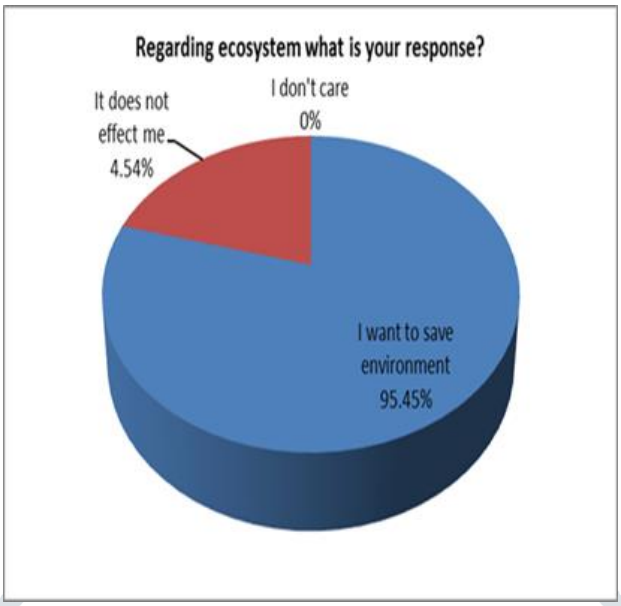
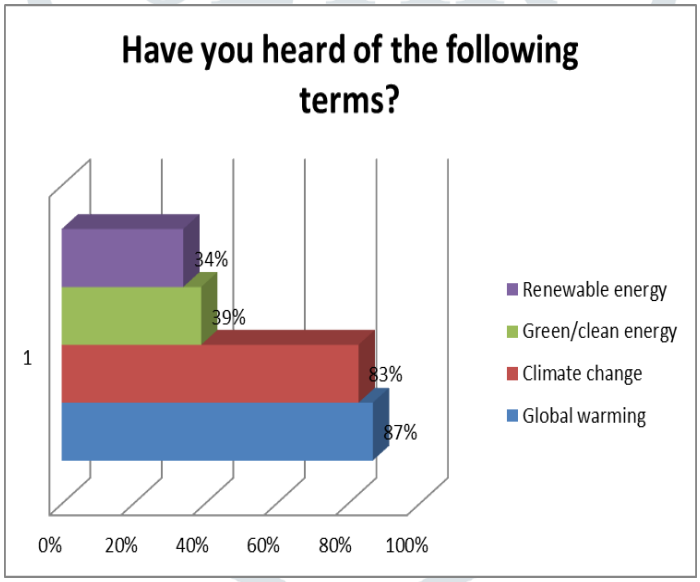


Figure 2



The third question checks the respondents' awareness about the different kinds of power from renewable sources. The question itself provided those with five different options, namely solar power, hydro power, wind power, biomass and waste to energy. This question was more of an informative type, which educated people about the existing sources of power from renewable sources.

67% of respondents were aware of solar power and 52% had heard of power from winds.

56% of the respondents were aware of hydro energy while 45% were aware of biomass.

Awareness of waste to energy was quite low.

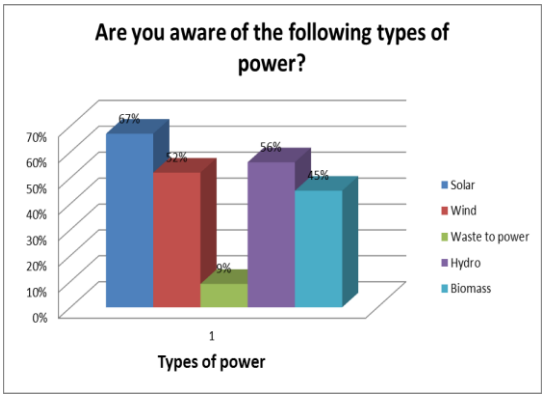


Figure 3

Out of these respondents 6 had solar heaters and 4 had solar lights installed. 2 had solar panel and 2 had biomass installed. 92.93% had no type of renewable energy installed.

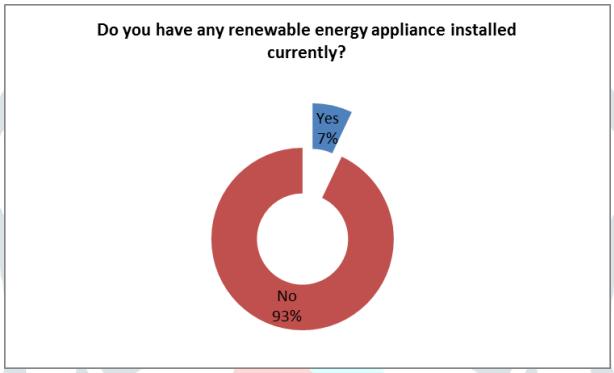


Figure 4

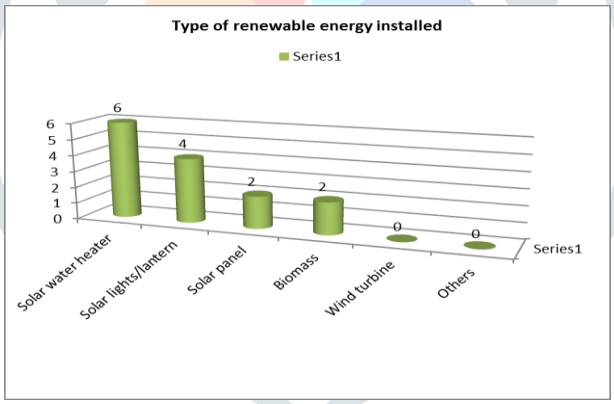


Figure 5

About 36% of the respondents said that they may think about installing renewable energy in future and 25% said they definitely will install renewable energy in future whereas 39% said they had no future plans of installing any type of renewable energy.

But the irony of the findings is that not all are willing to pay a slightly higher amount to get electricity from a renewable source. 55% of respondents are willing to pay more while 29% said ‘maybe’. 16% even refused to pay extra for energy from renewable source.

Most of these respondents had installed their backup generators

There is a chance to convert maybe’s to yes but it is possible only by educating and communicating to them the benefits of renewable energy. Moreover the government should try to bring down the cost of generating electricity from renewable source, by investing in research and development.

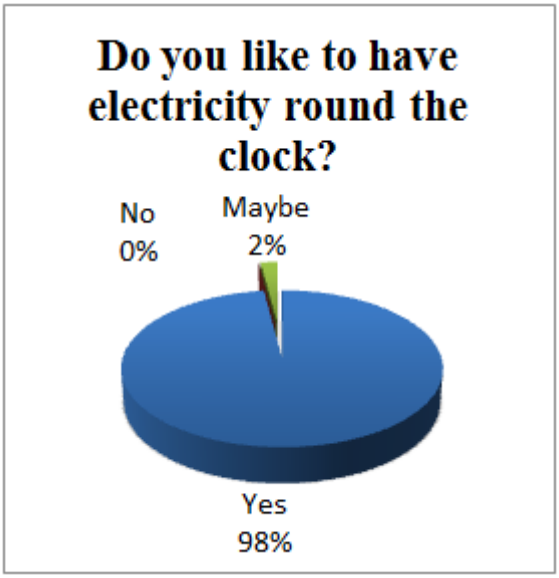


Figure 6

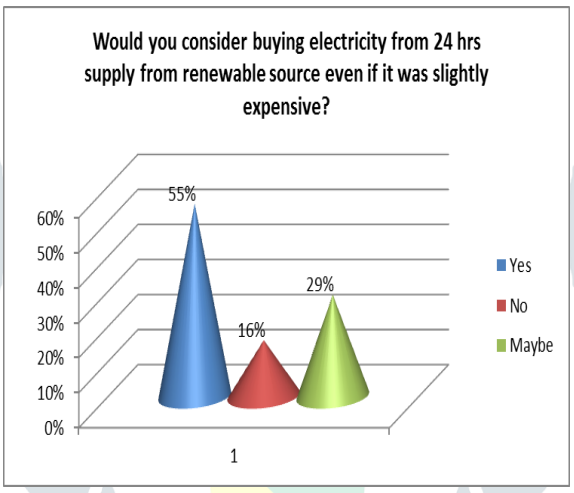


Figure 7

96.46% of all the respondents show their preference for generation and distribution of renewable energy at district level.

It is basically because people do not prefer to have solar panels on their roof tops as it disturbs the view. Also people are hesitant as these panels are not a common sight in the society and neighborhood. Government should build at least one passive house in every region to develop confidence among people and also advertise it.

Section C consisted of question on climate change. This question contained 44 statements aimed to identify the attitude of people towards various factors that attribute to climate change and environment pollution/degradation. The respondents were asked to rate the statements on a five point scale ranging from Strongly Agree (SA), Agree (A), Neither Agree/Neither Disagree (NA/ND), Disagree (A) to Strongly Disagree (SD).

Principal Component Factor analysis was conducted on these 44 statements and 8 factors are extracted which explained 74.656 % variance. The number of factors to be retained was based on the Latent Root Criterion i.e. Eigen values greater than 1.

The factors having loadings +0.50 or higher (ignoring signs) are considered very significant while factor having loadings + 0.40 or higher (ignoring signs) are considered important and factors with loadings + 0.30 or higher (ignoring signs) are considered significant (Hair et al., 2003, p.111).

The results were obtained through Orthogonal Rotation with Varimax and all factor loadings 0.45 or higher (ignoring the signs) were retained. Varimax Rotated Factor analytical results for all respondents are presented in Table 2.

Total Variance Explained

Table 2

Component	Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative%
1	6.710	18.640	18.640
2	4.503	12.508	31.148
3	3.884	10.788	41.936
4	2.724	7.567	49.503
5	2.414	6.705	56.208
6	2.400	6.668	62.876
7	2.282	6.338	69.214
8	1.959	5.441	74.656

Extraction Method: Principal Component Analysis

Bartlett's test of sphericity rejects the null hypothesis that the variables in the population are uncorrelated. Table 3 shows the approximate chi square statistics as 1.236E4 (very large value) with 630 Degree of freedom, which is significant at 0.05 level. KMO statistics value comes out to be .860 which is bigger than .6. Thus factor analysis can be considered as an appropriate technique for analyzing the various factors causing climate change and environment degradation.

Reliability Coefficients	
N of Cases = 357	N of Items = 36
KMO and Bartlett's Test	
Kaiser-Meyer-Olkin Measure of Sampling Adequacy	.860
Bartlett's Test of Sphericity Approx. Chi-Square	1.236E4
Df	630

Table 3

Table 4 shows the eight factors extracted with Eigen value of 1 or more than 1. The eight factors that are extracted account for 74.656% of total variance together. These 8 factors are extracted after reducing 36 statements (44 original statements).

TABLE OF FACTORS

Table 4

Factors	Statements	Factor Loadings	Mean Score	S.D.
Factor 1	**Lack of awareness**			
1	No proper program chalked out to increase usage of alternate sources of energy	.926	1.42	.849
2	Inadequate awareness about saving environment	.898	1.48	.895
3	Scant awareness regarding need for sustainable development	.884	1.45	.761
4	Poor role played by communication media in spreading awareness to save and conserve environment	.779	1.48	.853

5	Inadequate education/literacy among masses	.777	1.40	.742
6	Absence of initiatives to promote renewable energy	.775	1.42	.849
7	Saving energy and reducing waste of energy not encouraged	.715	1.44	.848
8	Thoughtless attitude of society towards balanced growth	.708	1.44	.734
9	Less usage of green/renewable energy	.537	1.67	.796
	Cronbach's Alpha=.938 **Percentage of variance=18.64**			
Factor 2	**Haphazard urbanization**			
1	Haphazard Housing Construction	.816	3.91	.815
2	Unplanned urbanization	.806	3.90	.794
3	Booming industrialization	.778	3.97	.799
4	Change in concentration of population from rural to urban	.766	3.94	.767
5	Unethical practices of business houses	.760	3.95	.775
6	Immoral attitude of developed countries	.734	3.94	.773
	Cronbach's Alpha=.927 **Percentage of variance=12.50**			
Factor 3	**Lapse in implementation of law**			
1	Insufficient implementation of government policies for checking spread of pollution	.826	1.97	.650
2	No proper implementation of law	.802	1.98	.700
3	Absence of a proper functional public transport system is good	.734		
4	Deficit of Pollution Taxes	.709	2.01	.712
5	Absence of incentives for abstaining pollution	.682	1.98	.615
6	Consensus between corrupt politicians, selfish/ambitious businessmen and unethical bureaucracy for excessive exploitation of nature	.603	2.01	.624
	Cronbach's Alpha=.883 **Percentage of variance=10.78**			
Factor 4	**Increase in population**			
1	Growing population	.911	2.84	.619
2	Lack of initiative among masses for community cleanliness drive	.879	2.84	.653
3	Family welfare programs not followed by all citizens	.851	2.86	.775
	Cronbach's Alpha=.932			

	Percentage of variance=7.56			
Factor 5	**Improper farming techniques**			
1	Giving priority to agriculture without caring for forests	.836	2.06	.715
2	Lack of promotion of mixed cropping and crop rotation for fertility of soil	.822	2.02	.674
3	Lack of promotion of bio-fertilizer as a better means to increase fertility of soil	.657	1.30	.669
	Cronbach's Alpha=.829 **Percentage of variance=6.70**			
Factor 6	**Vehicular pollution**			
1	Lack of strict check on vehicles causing air pollution	.887	4.36	1.19
2	Lack of usage of catalytic converter in vehicles to prevent pollution due to smoke	.861	4.42	1.07
3	Increase in number of vehicles does not affect environment	.860	3.33	.950
	Cronbach's Alpha=.901 **Percentage of variance=6.66**			
Factor 7	**Deforestation**			
1	Near extinction of rare species	.793	1.81	1.11
2	Deforestation at large scale	.756	1.89	1.10
3	Lack of reforestation activity	.677	1.78	1.07
	Cronbach's Alpha=.891 **Percentage of variance=6.33**			
Factor 8	**Nuclear weapons**			
1	Increase in development of nuclear weapons	.777	4.60	.886
2	Lack of strict action against nations using chemical weapons	.758	4.59	.800
3	Insufficient care taken while disposing of nuclear weapons	.689	4.56	.840
	Cronbach's Alpha=.730 **Percentage of variance=5.44**			

74.56% has been the percentage of total variance. Cronbach's alpha (a) was used to check the reliability of each factor. The value of (a) for each factor came out to be .938, .927, .883, .932, .829, .901, .891, .730 respectively. All the values are far above the thumb rule of 0.6.

In the rotated factor matrix factor 1 has high coefficient for 9 statements (Inadequate awareness about saving environment, less usage of green/renewable energy, thoughtless attitude of society towards balanced growth …). This factor has been labeled as Lack of awareness and it accounts for 18.64% of variance. Respondents responded positively for statements related to Lack of awareness.

Factor 2 has high factor loadings for statements (Unplanned urbanization, Haphazard Housing Construction, Unethical practices of business houses, Change in concentration of population from rural to urban …). This factor may be labeled as haphazard urbanization with 12.50% of variance and attitude of respondents was negative towards haphazard urbanization.

Factor 3 has high coefficient for 6 statements (No proper implementation of law, Deficit of Pollution Taxes, Absence of a proper functional public transport system is good ...). This factor is labelled as lapse in implementation of law and it accounts for 10.78% variance. Respondents agreed with statements related to lapse in implementation of law.

Factor 4 named as increase in population accounted for 7.56% of variance whereas item loadings ranged from .911 to .851. Respondents were neutral with these statements.

Factor 5 has high factor loadings for statements (Giving priority to agriculture without caring for forests, lack of promotion of bio-fertilizer as a better means to increase fertility of soil, lack of promotion of mixed cropping and crop rotation for fertility of soil). This factor may be labeled as improper farming techniques and accounted for 6.70 % variance. Positive respond was found for all statements.

Vehicular pollution being factor 6 have recorded with 6.66% variance. And item loadings ranged from .887 to .860. Students responded disagree for statements related to vehicular pollution.

Factor 7 has high coefficient for statement (Deforestation at large scale, Lack of reforestation activity, near extinction of rare species …).Therefore this factor may be labeled as deforestation with 6.33% of variance. Respondents respond positively for statements related to deforestation.

Factor 8 has high coefficient for statements (Increase in development of nuclear weapons, lack of strict action against nations using chemical weapons, insufficient care taken while disposing of nuclear weapon). This factor may be labeled as Nuclear weapons and accounted for 5.44 % variance. Negative respond was found for all statements.

Lack of awareness has come out to be a major reason behind environmental degradation and climate change. Lapse in implementation of law, haphazard urbanization, deforestation, increase in population, increase in use of vehicles and nuclear weapons are the other main reasons behind environmental degradation. There is a requirement to bring changes at local, regional, national and global levels along with social and economic transformation at individual as well as community level to prevent environment pollution and save further depletion of environment.

People in general do not have similar outlook towards renewable energy products as government has. For the development, acceptance and increased usage of renewable energy products, there is need to shed light on people's in-depth knowledge about the importance of using existing renewable energy technology. The general public should be made aware and allowed to learn more and more about the advantage of using renewable energy.

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