Effectiveness of Intervention Program on Knowledge among Residents Living in Apartments on Carbon Foot Print Management

Rita Kumari C.M[1] and Dr. Srilakshmi.R[2]

[1]*Research Scholar, Department of Resource Management, Smt VH D Central Institute of Home Science,*
(Autonomous) Sheshadri Road, Bangalore-560001
[2]*Assistant Professor, Department of Extension Education & Communication, Smt. V H D Central Institute of Home Science,*
(Autonomous) Sheshadri Road, Bangalore-560001
E-mail: [1]ritamachaiah@gmail.com, [2]miraauro999@yahoo.co.in

Abstract—*The term carbon foot print is the accumulation of Green House Gases which is expressed in carbon dioxide equivalents, emitted during the life cycle of any process or system as an indicator for assessing the impact of human activities on Global warming. The emission of greenhouse gases and their accumulation leads to climate change and effects the environment. The present study focuses on carbon foot print of individuals on domestic level and their knowledge which is compared during the pre test and post test after giving Intervention. The design of the study is Survey method. Purposive sampling method was used for sample selection. The total sample size comprising of 500 out of which 250 samples were chosen from residents who are living in conventional apartments and 250 samples were chosen from the residents living in eco friendly apartments. The questionnaire was developed to evaluate the knowledge of the respondents residing in two apartments. The questionnaire was used as a tool to measure 10 components. 1) Environment 2) Waste Management 3) Water foot Print 4) Food Foot Print 5) Energy Management 6) Reduce Reuse and Recycle 7) Indoor air Quality 8) Vaasthu aesthetics 9) Insulation 10) Carbon foot print. Pre test assessment on Knowledge towards carbon foot print management on the aspects was done. Further the intervention program was carried using lecture modules and PPT for a period of 3months. Post test was carried after the intervention program to obtain the knowledge assessment using the same questionnaire.*
The study found that 50.4% of the residents had inadequate knowledge level during pre test. During post test after the Intervention the knowledge levels was Adequate, increased with 60.8%. The results subjected to variation in the knowledge level among the respondents between pre and post test found to be statistically significant (χ^2 = 562.09*). Mean Pre test knowledge scores found to be 49.4% as compared to post test (80.0%) with enhancement as 30.6% on carbon foot print management revealing significance (t=122.18*). Further the enhancement of knowledge scores of residents on carbon foot print management among all the aspects order of study found to be significant at 5% level. By creating awareness among individuals, households, social circles and communities on carbon foot print management environment sensitization can be achieved. For reaching the goal of sustainable cities it is proved that individuals through the domestic front play a vital role in creating the level of awareness among communities and the population by demonstrating the consequences of Carbon foot print on environment and discussing possible solutions through intervention program.

Keywords: *Carbon foot print, Global warming, Climate change, Eco-friendly, Conventional.*

1. INTRODUCTION

A **carbon footprint** is historically defined as the total emissions caused by an individual, event, organization, or product, expressed as carbon dioxide equivalent[1] Carbon foot print management is of increasing interest to individuals, households, and communities. In order to effectively access and manage their climate impacts[5] Wiedmann *et al*[14] the carbon footprint is a measure of the total amount of carbon dioxide emissions directly and indirectly caused by an activity or accumulated over the life stages of a product. Meanwhile, the carbon footprint is a measure of carbon dioxide emissions.

The carbon footprint mainly applies to personal, products, organizations, cities and countries[13], etc . A personal carbon footprint is carbon dioxide emissions caused by each person's clothing, food, housing and traffic of daily life. A product carbon footprint measures the greenhouse gas (GHG) emissions over the entire life of a product (goods or services), from the extraction of raw materials and manufacturing right through to its use and the final re-use, recycling or disposal. An organizational carbon footprint measures the GHG emissions from all the activities across the organization, including energy used in buildings, industrial processes and company vehicles. A country carbon footprint focuses on carbon dioxide emissions in the entire country generated by the overall consumption of materials and energy, vegetation and other carbon sequestrations, as well as the indirect and direct emissions caused by import and export activities, to analyze the carbon dioxide emissions of the entire country[6]

Rising population and concentration of industrial activities in mega-cities are transforming them into source centers of air pollution. Urbanization and energy-intensive economic development are determining factors for emissions of GHGs. Activities such as urban transport, solid waste disposal, domestic fuel use, industrial activities and power generation for meeting the energy demand of the cities generate a considerable amount of GHGs along with other air pollutants. Even in the rural areas of the developing nations the use of traditional fuels, like wood, animal waste and crop residues, has local environmental impacts due to significant emissions of pollutants such as SO2, NO_X, etc. along with emissions of GHGs like CO2, CH4 and N2O. Carbon footprint is used as an indicator to measure and compare the impact due to such activities across geographies. Carbon footprint is the overall amount of CO2 and other GHG emissions expressed as CO2 equivalent associated with a product, along its supply-chain and sometimes including emissions from use and end-of-life recovery and disposal [10]. Household consumption is a main driver of economy and might be regarded as ultimately responsible for environmental impacts Occurring over the life cycle of products and services. Given that purchase decisions are made on household levels and are highly behavior –driven, the derivation of targeted environmental measures requires an understanding of household behavior patterns and the resulting environment impacts [3]. The first carbon footprint challenge from the domestic area of the society resulting from their activities, both directly and indirectly, such as the burning of fuel, electricity consumption, and waste management and transport, by showing the amount of greenhouse gas emissions in units of carbon dioxide equivalent (CO2e) [12].

Greenhouse gas emission, a significant amount of which also comes from the residential sector, is the cause of global warming, and is a threat to humanity at this time. As a result, the concept of managing the carbon dioxide emitted in the daily life by the residents living in the apartments to help reduce the amount of greenhouse gases which is measured in terms of carbon dioxide equivalent. This study focuses on the importance of managing the Carbon Footprint based on the activities of residents living in eco friendly and conventional Apartments in Bangalore city, data collection on knowledge of carbon foot print management before and after intervention by sources such as electricity and water supply consumption, quantity of wastewater and garbage, and amount of fuels used etc [12].

Climate change is a worldwide issue which is related to the greenhouse gas (GHG) emissions are the major reason for global and nation climate change. Climate change, deforestation, overgrazing, fisheries collapse, food insecurity and the rapid extinction of species are all part of a Single, over-arching problem: Humanity is simply demanding more from the Earth than it can provide (Global Footprint Network, 2015). In addition, climate change is not an issue in isolation, but rather, a symptom of a broader challenge: humanity's systematic overuse of the planet's finite resources. Our natural systems can only generate a finite amount of raw materials (fish, trees, crops, etc.) and absorb a finite amount of waste (such as carbon dioxide emissions) (Wackernangel, 2014). [12]

Climate change and global warming are internationally recognized as current issues, driving negative effects on humanity, and being mainly caused by GHG emissions generated both by human lifestyle and industrial activities[2]. A growing number of studies, research and collected data, reveal the existence of a direct relationship between climate change and carbon dioxide emissions[2] Carbon emission from urban households is an important contributor to overall carbon emissions and an integral part of carbon mitigation on the national, regional and municipal scales. A set of demographic, economic, behavioral, and spatial factors are key determinants of urban household carbon emissions in the region [15].

2. METHODOLOGY

The Study was undertaken in two apartments at Bangalore city. Two Conventional apartments and Two Eco friendly apartment were selected for the study. Total sample size comprising of 500 respondents viz., 250 respondents from Conventional apartments and 250 from Eco friendly apartments were selected. The sampling method adopted using purposive random sampling.

Constructed a structured questionnaire and validated by the experts and information obtained from the respondents under different components

i) Socio-demographic characters considered were Age, Gender, Educational qualification, Type of family, family members.

ii) Knowledge assessment comprising of 94 statements. Response obtained as 'Yes' and 'No' and further scoring given as 'One' and 'Zero' respectively.

Evaluated the knowledge of residents using questionnaire comprising of 10 components as 1) Environment 2) Waste Management 3) Water foot Print 4) Food Foot Print 5) Energy Management 6) Reduce Reuse and Recycle 7) Indoor air Quality 8) Vaasthu aesthetics 9) Insulation and 10) Carbon foot print management.

After obtaining pre test information from the respondents, intervention program was conducted for 3 months to selected samples using modules scheduled on weekly twice for two hour duration on the topics stated above. Further, Post test was administered and obtained information on knowledge from the respondents to measure the Impact and effectiveness of the intervention programme. The data was analyzed under both descriptive and inferential statistics.

3.   RESULTS AND DISCUSSIONS

The data obtained from the study samples subjected for tabulation and analysis carried out and results indicated in the following tables.

TABLE 1: Classification of Respondents by Age group

N=500

| Age group (years) | Respondents residing in | | | | | | χ^2 Test |
| | Conventional | | Eco friendly | | Combined | | |
	N	%	N	%	N	%	
21-30	93	37.2	0	0.0	93	18.6	
31-40	81	32.4	64	25.6	145	29.0	141.67*
41-50	34	13.6	93	37.2	127	25.4	
51+	42	16.8	93	37.2	135	27.0	
Total	250	100.0	250	100.0	500	100.0	

* Significant at 5% level, χ^2 (0.05,3df) = 7.815

From table -1 it is evident that the higher respondents (37.2%) from Conventional Apartments were in the age group of 21-30 years .Further (32.4%) belong to the age group of 31-40 years, 16.8% belonged to the age group 51+ and remaining 13.6%belong to the group of 41-50 years. Whereas in Eco friendly Apartments the higher respondents (37.2%) belongs the age group 41-50 years and 51+ years of age and the remaining (25.6%)belonged to 31-40 years of age. However it is very interesting to know that (29.0%) of the respondents of both the Conventional and Eco friendly Apartments were in the age group of 31-40 years.

TABLE – 2: Classification of Respondents by Gender

N=500

| Gender | Respondents | | | | | | χ^2 Test |
| | Conventional | | Eco friendly | | Combined | | |
	N	%	N	%	N	%	
Male	73	29.2	82	32.8	155	31.0	0.76 NS
Female	177	70.8	168	67.2	345	69.0	
Total	250	100.0	250	100.0	500	100.0	

NS : Non-Significant, χ^2 (0.05,1df) = 3.841

Table –2 indicates majority of the respondents from Conventional and Eco friendly Apartments were female(70.8%) and (67.2%) respectively as compared to that of male respondents (29.2%) from Conventional Apartments and (32.8%) from Eco friendly Apartments. However it also shows that (69.0%) of the respondents were female from both the Conventional and Eco friendly Apartments and 31.0% were male respondents from both the Conventional and Eco friendly Apartments.

TABLE 3: Classification of Respondents by Educational qualification

N=500

| Educational qualification | Respondents | | | | | | χ^2 Test |
| | Conventional | | Eco friendly | | Combined | | |
	N	%	N	%	N	%	
PUC	58	23.2	24	9.6	82	16.4	
Graduate	139	55.6	69	27.6	208	41.6	89.16*
Post graduate	53	21.2	157	62.8	210	42.0	
Total	250	100.0	250	100.0	500	100.0	

* Significant at 5% level, χ^2 (0.05,2df) = 5.991

With regard to the educational qualification of respondents the results from Table -3 indicate that most of the respondents residing in Conventional Apartments (55.6%) were graduates followed by (23.2%) were PUC and remaining (21.2%) respondents qualification was Post Graduation. Whereas when compared to the respondents from Eco friendly Apartments most of them were (62.8%) Post Graduates, followed by Graduates(27.6%) and remaining (9.6%) were PUC qualified. It is also interesting to know that (42.0%) of the respondents were Post graduates from both Conventional Apartments and Eco friendly Apartments, (41.6%) were Graduates and (16.4%) were PUC qualified from both the apartments.

TABLE – 4: Classification of Respondents by Type of family

N=500

| Type of family | Respondents | | | | | | χ^2 Test |
| | Conventional | | Eco friendly | | Combined | | |
	N	%	N	%	N	%	
Nuclear	120	48.0	178	71.2	298	59.6	
Joint	60	24.0	72	28.8	132	26.4	82.38*
Extended	70	28.0	0	0.0	70	14.0	
Total	250	100.0	250	100.0	500	100.0	

* Significant at 5% level, χ^2 (0.05,2df) = 5.991

From table-4, respondents family type ,it is evident that majority from Conventional Apartments (48%) of them belonged to nuclear family followed by 28% belonged to extended family and (24.0%) of the respondents belonged to joint family.

From Eco friendly Apartments also majority (71.2%) of the respondents belonged to Nuclear family followed by (28.8%) belonged to Joint family and none (0.0%) of them belonged to Extended family. Also from both conventional and Eco friendly Apartments combined, majority (59.6%) were from Nuclear family, followed by (26.4%) from Joint family and (14.0%) from Extended family.

TABLE – 5: Classification of Respondents by Number of family members

N=500

Number of family members	Respondents						χ2 Test
	Conventional		Eco friendly		Combined		
	N	%	N	%	N	%	
2-3	120	48.0	178	71.2	298	59.6	
4-5	62	24.8	58	23.2	120	24.0	46.98
5-6	68	27.2	14	5.6	82	16.4	*
Total	250	100.0	250	100.0	500	100.0	

* Significant at 5% level,   χ2 (0.05,2df) = 5.991

Table -5 indicates the number of family members of the respondents residing in Conventional Apartments showing that (48.0%) family consisted of 2-3 family members, (27.2%) family consisted of 5-6 family members and (24.8%) family consisted of 4-5 family members. Most of the respondents from Eco friendly Apartments showing that (71.2%) family consisted of 2-3 family members,(23.2%) family consisted of 4-5 members and only (5.6%)consisted of 5-6 family members and from both conventional and eco friendly Apartments majority (59.6%) consisted of 2-3 family members, followed by (24.2%) consisted of 4-5 family members and (16.4%) consisted of 5-6 family members.

TABLE – 6: Classification of Respondent Pre test Knowledge level on Carbon foot print management

N=500

Knowledge Level	Respondents					
	Conventional		Eco friendly		Combined	
	N	%	N	%	N	%
Inadequate	141	56.4	111	44.4	252	50.4
Moderate	109	43.6	139	55.6	248	49.6
Adequate	0	0.0	0	0.0	0	0.0
Total	250	100.0	250	100.0	500	100.0
χ2 test	χ2=7.20*					

 * Significant at 5% level,   χ2 (0.05,1df) = 3.841

From table -6 it is evident that among respondents of Conventional Apartments (56.4%) of the respondents had Inadequate knowledge on Carbon Foot print Management during pre test, and (43.6%) respondents knowledge was moderate , none (0.0%) of the respondents had adequate knowledge on carbon foot print management during ht pre test.

Among respondents of Eco friendly Apartments (55.6%) of the respondents had Moderate knowledge on Carbon Foot print Management during pre test and (44.4%) respondents knowledge was Inadequate, none (0.0%) of the respondents had adequate knowledge on carbon foot print management during pre test. Conventional and Eco friendly Apartments combined results revealed majority (50.4%) had Inadequate knowledge on Carbon Foot print Management during pre test followed by (49.6%) having Moderate knowledge and none of them (0.0%) having Adequate knowledge on carbon Foot Print Management during pre test. Further the data subjected to χ2 test found to be Significant at 5% level. The above results lies

on par with the study by Ibrahim M[7] which reveals that measurement of knowledge towards environmentalism indicate that the mean knowledge score,15, is not just low but very low, with 68.7% scoring below the mean. This percentage of respondents can be arbitrarily referred to as possessing unhealthy knowledge of environmentalism.

This is similar to findings of the study of: Arcury[4] using telephone survey data from 680 Kentucky residents, asserted that his respondents "did not score well on the measures of environmental knowledge". Also Mansaray et al[8] in their survey among some Nigerian secondary school teachers also asserted that their respondents "generally demonstrated a low level of environmental knowledge".

TABLE -7: Classification of Respondents of Post test Knowledge level on Carbon foot print management

Knowledge Level	Respondents					
	Conventional		Eco friendly		Combined	
	N	%	N	%	N	%
Inadequate	0	0.0	0	0.0	0	0.0
Moderate	102	40.8	94	37.6	196	39.2
Adequate	148	59.2	156	62.4	304	60.8
Total	250	100.0	250	100.0	500	100.0
χ2 test	0.54 NS					

 * NS   χ2 (0.05,4df) = 3.41

From table –7 it is evident from the respondents of Conventional apartments, the post test knowledge on Carbon Foot Print management found that (59.2%) had adequate knowledge, (40.8%) percent of the respondents posttest knowledge towards carbon foot print management was moderate. None (0.0%) of the respondent's posttest knowledge towards carbon foot print management was Adequate. Whereas the respondents of Eco friendly apartments, the post test knowledge on Carbon Foot Print management found that (62.4%) had adequate knowledge, (37.6%) of the respondents posttest knowledge towards carbon foot print management was moderate. None (0.0%) of the respondent's posttest knowledge towards carbon foot print management was Adequate. Also both respondents of Conventional and Eco friendly Apartments , majority (60.8%) had adequate knowledge on Carbon Foot Print Management followed by (39.2%) of the respondents had Moderate knowledge and none (0.0%) had Inadequate knowledge on Carbon Foot Print management during post test. Statistically the findings were non-significant NS - χ2 (0.05,4df) = 3.41

TABLE – 8: Over all Pre test and Post test Mean Knowledge on Carbon foot print management

N=500

Sample	Aspect	Knowledge Response				Paired 't' Test
		Mean	SD	Mean (%)	SD (%)	
Conventional (n=250)	Pre test	45.94	6.0	48.9	6.3	82.54*
	Post test	74.92	5.7	79.7	6.1	

	Enhancement	28.97	5.5	30.8	5.9	
Eco friendly (n=250)	Pre test	46.90	5.5	49.9	5.8	90.39*
	Post test	75.40	5.8	80.2	6.1	122.18*
Combined (n=500)	Enhancement	28.50	5.0	30.3	5.3	
Pre test	Pre test	46.42	5.7	49.4	6.1	122.18*
Post test	Post test	75.16	5.7	80.0	6.1	
Enhancement	Enhancement	28.73	5.3	30.6	5.6	

* Significant at 5% level,   t (0.05,499df) = 1.96, Max.Score = 94

Table -8 reveals the overall pretest and Post test Mean Knowledge on Carbon foot print management. The result indicates that the mean pre test knowledge found to be higher (49.9%) among respondents of eco friendly apartments when compared to respondents of Conventional apartments (48.9%). Post test knowledge of respondents of eco friendly apartments is higher(80.2%) compared to respondents of conventional apartments(79.7%). It is further evident from the findings that the enhancement of knowledge found to be higher (30.8%) in respondents of conventional apartments as against (30.3%) knowledge response of eco friendly apartments. The data subjected for statistical test reveals that the enhancement of knowledge found to be significant at 5% level t (0.05,499df) = 1.96.The result also indicates that the Combined mean pre test knowledge found to be 49.4% as compared to post test knowledge of 80.0%. It is further evident from the findings that the enhancement of knowledge found to be 30.6% on Carbon Foot Print Management. The data subjected for statistical test reveals that the enhancement of knowledge found to be significant (t= 122.18*).

TABLE – 9: Aspect wise Mean Pre test and Post test Knowledge on Carbon foot print management

N = 500

No.	Knowledge Aspects	Knowledge Response (%)						Paired 't' Test
		Pre test		Post test		Enhancement		
		Mean	SD	Mean	SD	Mean	SD	
I	Environment	46.8	8.4	76.4	8.8	29.6	11.2	59.10*
II	Waste management	51.7	12.4	78.5	11.5	26.7	14.6	40.89*
III	Water foot print	48.4	12.0	80.2	9.2	31.8	10.4	68.37*
IV	Food foot print	46.2	10.5	77.2	9.1	31.0	14.2	48.82*
V	Energy management	48.8	6.6	81.0	6.9	32.1	6.6	108.75*
VI	Reduce reuse & recycle	51.4	11.1	81.3	9.6	29.9	13.8	48.45*
VII	Indoor air quality	43.8	35.4	75.8	28.7	32.0	29.6	24.17*
VIII	Vaastu Aesthetics	59.3	25.0	86.5	15.3	27.2	23.3	26.10*
IX	Insulation	57.1	31.9	86.7	20.0	29.5	31.7	20.81*
X	Management	51.0	30.8	76.0	35.0	25.0	25.0	22.36*
	Combined	49.4	6.1	80.0	6.1	30.6	5.6	122.19*

* Significant at 5% level,
   t (0.05,499df) = 1.96

TABLE –9 Indicates the Aspect wise Mean Pretest and Posttest Knowledge on Carbon foot print management, the paired 't' test was applied on the aspect wise enhancement and the following results were revealed .The enhancement of knowledge found higher in energy management (32.1%),followed by Indoor air quality (32.0%),Water foot print (31.8%),Food foot print (31.0%),Reduce reuse recycle (29.9%), Environment (29.6%), Insulation (29.5%),However the enhancement of knowledge is found to be less in the aspects Vaasthu Aesthetics (27.2%) , waste management(27.7%), Carbon Foot Print Management (25.0%).

Further the enhancement of knowledge scores of residents on carbon foot print management among all the aspects order study found to be significant at 5% level .Similar results were found in the study on the knowledge of waste management of three different coastal communities [10] where in the result showed that, most people from the three communities in Ghana knew about waste and its implication. The result also agrees with the findings of McAllister [9] in his study in Gaborone, Botswana which said that citizens were aware of recycling and other sustainable waste-management techniques.

TABLE – 10: Classification of Pre test and Post test Knowledge level on Carbon foot print management

Knowledge Level	Category	Classification of Respondents				χ^2 Value
		Pre test		Post test		
		N	%	N	%	
Inadequate	≤ 50 % Score	252	50.4	0	0.0	562.09*
Moderate	51-75 % Score	248	49.6	196	39.2	
Adequate	> 75 % Score	0	0.0	304	60.8	
Total		500	100.0	500	100.0	

* Significant at 5% level,
   χ^2 (0.05,2df) = 5.991

TABLE – 10 indicates the Classification of Respondents Pre test and Post test Knowledge level on Carbon Foot Print Management. The findings reveal that (50.4%) of the respondents in the pre test found to be inadequate knowledge on Carbon foot print management as compared to (49.6%) of respondents noticed with moderate knowledge level. However, none of the respondents showed adequate knowledge level in the pretest. Further , it is evident from the data that (39.2%)of the respondents in the post test noticed with moderate knowledge level as compared to remaining 60.8% the respondents noticed with adequate knowledge level on Carbon foot print management and none (0.0%) were found with inadequate knowledge on Carbon Foot print knowledge during post test. The results subjected to variation in the knowledge level among the respondents between pre and post test found to be statistically significant (χ^2 = 562.09*).

4. CONCLUSION

Majority(29.0%) of the respondents were from the age groups 31-40 years, females (69.0%), post graduates (42.0%). Among the respondents female members were the highest (69.0%),. Majority(59.6%) from nuclear family, family size(59.6%) with 2-3 members. The study also found that majority (50.4%) of the residents had Inadequate knowledge level during pre test found to be adequate (60.8%) knowledge level in post test. The Combined mean pre test knowledge found to be (49.4%) as compared to post test knowledge of (80.0%). It is further evident from the findings that the enhancement of knowledge found to be (30.6%) on Carbon Foot Print Management. The data subjected for statistical test reveals that the enhancement of knowledge found to be significant (t= 122.18*).

Further , it is evident that Classification of Respondents Pre test and Post test Knowledge level on Carbon foot print management, majority (50.4%) of the respondents in the pre test noticed with Inadequate knowledge level as compared to post test majority(60.8%) respondents were found to be with adequate knowledge level on Carbon foot print management .

The results subjected to variation in the knowledge level among the respondents between pre and post test found to be statistically significant (χ^2 = 562.09*).

Thus it is proved that Knowledge on carbon Foot Print Management is increased from Inadequate during pre test to Adequate in the post test after the Intervention on Carbon Foot Print management.

In this study it is proved that through intervention program knowledge levels of the respondents of both eco friendly and conventional apartments in the post test has enhanced in reducing the carbon foot print .Therefore through carbon foot print management the sustainable goals can be achieved on Sustainable Cities and Communities, Responsible Consumption and Production, Climate Action, Life below Water, Life on Land and Good Health and Well-being. For

reaching the goal of sustainable cities it is proved that carbon foot print management play a vital role in creating the level of awareness among communities concerned and the population by demonstrating the consequences of Carbon foot print on environment and living organisms and discussing possible solutions through intervention programme. To make our earth a safe livable place every individual in the country and world should stick to healthy practices and sustainable resources and make our country and the world a healthy and livable space.

REFERENCES

[1] Andrew JE, *What is carbon footprint? An overview of definitions and methodologies. In: Vegetable Industry carbon footprint study* – discussion papers and workshop, Horticulture Australia Limited, Sydney e-book India 1-2 ISBN -978-9814585-(2008).,pp75-0

[2] Andreea Lorena Radu, Marian Albert Scrieciu and Dimitriu Maria Caracota, *Carbon Footprint Analysis: Towards a Projects Evaluation Model for Promoting Sustainable Development* , IECS ,Procedia Economics and Finance 6 , 2013 , pp 353 – 363.

[3] Andreas Froemelt, David J. Dürrenmatt, and Stefanie Hellweg, *Using Data Mining To Assess Environmental Impacts of Household Consumption Behaviors*, Environ. Sci. Technol., Article ASAP,35-26, (2018) DOI: 10.1021/acs.est.8b01452

[4] Arcury, T.A., *Environmental Attitude and Environmental Knowledge*. Human Organization, 49: 1990,pp 300-304.

[5] Christopher M. Jones and Daniel M. Kammen*Quantifying Carbon Footprint Reduction Opportunities for U.S. Households and Communities* , Energy and Resources Group, University of California, Berkeley, *Environ. Sci. Technol.*, *45* (9), ,2011, pp 4088–4095

[6] Finkbeiner M , *Carbon footprinting—opportunities and threats* , Int J Life Cycle Assess , 14, 2009, pp 91-94, https://doi.org/10.1007/s11367-009-0064-x.

[7] Ibrahim M. and Babayemi O.F,*Knowledge and Attitude of a Group of Nigerian Undergraduates Towards Enviromentalism,* Global Journal of Environmental Research, ISSN 1990-925X 4 (1): 2010 ,pp 47-53.

[8] Mansaray, A., J.O. Ajiboye and U.F. Audu, *Environmental knowledge and attitudes of some Nigerian Secondary School Teachers*, Environmental Education Res., 4: 1998,pp 329-339.

[9] McAllister, Jessica, *"Factors Influencing Solid-Waste Management in the Developing World*", All Graduate Plan B and other Reports. 2015, Paper 528. Available: http://digitalcommons.usu.edu/cgi/viewcontent.cgi?article=1537&context=gradreports Accessed: 18/11/2016

[10] Nasir Kofi Essuman, *Knowledge, Attitudes and Practices of Coastal Communities on Waste Management in Ghana,* Thesis for Novia University of Applied Sciences – degree, Sustainable Coastal Management, Raseborg/ Raasepori, ,(2017, pp 26-27.

[11] Sankesha P. Bhoyara, Suyash Dusad et al, *Understanding the impact of lifestyle on individual carbonfootprint,* Procedia - Social and Behavioral Sciences 133 ,2014.pp 47 – 60.

[12] Tatsanawalai Utaraskula (*Carbon Footprint of Environmental Science Students in Suan Sunandha Rajabhat University, Thailand* 7th World Conference on Educational Sciences , Novotel, doi: 10.1016/j.sbspro.2015.07.371

[13] Weidema BP, Thrane M, Christensen P , et al, *Carbon footprint* , *[J]* Ind Ecol vol. 12, 2008, pp 3 -6 .

[14] Wiedmann T Minx *A definition of Carbon Footprint* , *ISA Res Rep* , vol. 7, 2007, pp. 1- 7 .

[15] XibaoXu, Yan Tan, Shuang Chen, Guishan ang, and Weizhong Su *Urban Household Carbon Emission and Contributing Factors in the Yangtze River Delta, China,* PMCID: PMC4401559 , 2015,pp18.