CARBON FOOTPRINT: A DECARBONISING DISCLOSURE

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ABSTRACT

Carbon footprint is an important measure of combating climate change and hence can contribute towards the growth of green and sustainable economy. Keeping the importance of carbon footprint in mind, this research was planned with the aim of exploring the awareness level of carbon footprint among small, medium and large scale hosiery units of Ludhiana. The results revealed that very few units were aware of the concept of carbon footprint even though extent of awareness was more in the case of large scale units. Business associations and seminars were found to be the major source of spreading awareness of carbon footprint. Even though, few units firmly believed in the importance of measuring carbon footprint, but, none of them had measured the carbon footprint in spite of their awareness regarding the discharge of gases to be included in its calculation and emission sources. Very few of them were willing to measure their unit's carbon footprint in future. Lack of knowhow of calculation was found to be the most important inhibiting factor for not measuring carbon footprint. Information regarding the concept of carbon footprint and its importance was disseminated through a self designed leaflet among the surveyed hosiery units. It was aimed at making the people aware of the seriousness of carbon emissions caused by the organizations in their operations and, hence motivating them to do something regarding it. The effort was well appreciated by the units.

Key words: Carbon Footprint Awareness, Gases Included, Emission Sources, Inhibiting Factors, Awareness Leaflets.

INTRODUCTION

The great challenge we face is not technical or financial, but that of reforming the structure of our societies to value the environment and people, and stop sacrificing them both to greed and vested interests.

David Wanless (2002)

(as cited in "Questionnaire on Environmental ……. Summary,"2007,p.8)

Environmental impacts of an organization have come out to be the main indicators of its social performance evaluation. It has become the responsibility of the business enterprises to disclose the information as to how the resources provided by the nature are being misused and, what is the impact of activities of enterprises on the natural environment. Activities of the enterprises effect environment in the form of green house gaseous emissions, waste water, effluents, noise pollution, depletion of natural resources and so forth. So it becomes imperative for these enterprises to disclose the information about them and the expenditures made to carry out their environmental liabilities along with information regarding compliance with the environmental protection laws and standards.

Though industrialization is an essential pre-requisite for overall economic growth, yet its damaging effect on ecological environment needs to be taken care of. The various governments have made various rules and regulations to protect the environment but the implementation process is very large, sluggish and ineffective .In India, to make it possible, the government enacted the Environment Protection Act in 1986 to provide for the protection and improvement of environment. Eventhough, there has been increased community attention towards the identification of approaches to deal more effectively with environmental concerns,many corporate managements have developed environmental management systems and increasingly adopted environmental reporting within their annual reports but there still exists a communication gap about it(Malhotra, Singh & Bhalla,2007; Bhalla, Arora, Kaur, & Khanna,2007).

Carbon footprints carries an enormous importance in sustenance of our daily life on our mother earth, hence its awareness, measurement, reporting and reduction is very important, especially in the apparel sector. The full footprint of an organization encompasses a wide range of emission sources from direct use of fuels and its indirect impacts such as employee travel or emissions from other organizations up and down the supply chain. Calculation of footprint helps in the management and its reduction over time. It focuses on identification and prioritization of the areas of greatest savings potential and opportunities for reduction. If it can be communicated and reported accurately to a third party for marketing or for corporate social responsibility purposes. It is also important to fulfill requests from business or retail customers or from investors, and, ascertain what level of emissions they need to offset in order to become 'carbon neutral'(Meena, 2011, p.44).

Keeping the importance of carbon footprint as a tool of measuring sustainability and its impact on the environment, this study was planned with the following aims and objectives-

1. To find out the extent of awareness regarding carbon footprint in the hosiery industry of Ludhiana.
2. To analyze the association between the size of the unit and its awareness regarding the concept of carbon footprint.
3. To analyze the inhibiting factors regarding the measurement of carbon footprint.

Limitations

1. The study was limited to 80 hosiery units located in Ludhiana.
2. Since all the units covered in the study were located in Ludhiana, thus the findings of the study may not be applicable to the whole industry and the hosiery units in other parts of the country.
3. An attempt has been made to obtain complete information by interviewing the owners or dealing persons of these units, but some information might have been kept hidden by them as it was a survey work.

METHODOLOGY

The locale of the present study was confined to the hosiery cluster of Ludhiana (Punjab**)** as it contributes almost to 80% of the total woollen and acrylic output of the economy. Eighty hosiery units in Ludhiana were randomly selected for survey from the sampling frame obtained from Ludhiana Knitwear Club (Regd.) having membership of 800 units representing all categories. Sample area was divided in four regions namely Area I, II, III and IV as shown in Table 1. Twenty units each were randomly selected from these four areas.

TABLE 1
Distribution of Sample Area

Type of Area	Places included	Sample Size
Area-I	Rahoan Road, Village Bhatiya, Jalandar Byepass, Bhadur Ki Road and Tilak Nagar	20
Area-II	New Madhavpuri, Sunder Nagar, Bajwa Nagar, Seikhayval and Madhapuri	20
Area-III	Chandigarh, Focal Point, Industrial Area, Shivpuri & Sheerpur	20
Area-IV	Civil Lines, Hambran Road, City Area, Manna Singh Nagar and New Kundanpuri	20

Survey and field study research methods were considered suitable in order to meet the specific objectives of the study. Data regarding carbon footprint awareness was collected using questionnaire-cum-interview schedule. These units were classified on the basis of size as per the criteria of investment in plant and machinery. This criterion was considered appropriate as given by Micro, Small and Medium Enterprises Development Act (MSMEDA) 2006, for the manufacturing sector. Investment in plant and machinery in small scale units varied from rupees 25 lakhs to 5 crores, in medium scale units it varied from rupees 5 crores to 10 crores, while, in large scale units it was more than rupees 10 crores.

RESULTS AND DISCUSSIONS

The results of the study are presented into three sections. The first section deals with demographic profile, the second section deals with the extent of carbon footprint awareness and the third section deals with the dissemination of information.

a) Demographic Profile

This section dealt with basic information of the hosiery units in terms of type, year of establishment, form of organization, certification etc.

The distribution of the hosiery units on the basis their establishment year in Table 2(i) revealed that 65% of the units were established between 1986-1995, while only 5% were established before 1965. Most of the large scale units were found to have been established before 1985 while the majority of small and medium scale units were established after 1986 that is 69% and 76% (between 1986-1995) respectively. Establishment year and size of the unit was found to be significantly associated to each other as the calculated value of chi-square is much higher than its table value (12.59) at 6 degree of freedom.

The distribution of the hosiery units on the basis of the type as shown in Table 2 (ii) revealed that 61% of these units were garment manufacturing units, 25% were fabricating while 14% were composite units, producing fabric as well as garments. Analysis of Chi square test revealed that there was no significant relationship between the type and the size of the hosiery unit as p-value was found non-significant(x^2= 4.78; df = 4; p- value >.05).

TABLE 2

Distribution on The Basis of Establishment Year, Type of Unit, Form of Organization, and Customer Base

n=80(S=55, M=17, L=8)

Variable	Options	S		M		L		T		X^2	df	P value	T value
		f	%	f	%	f	%	f	%				
(i)Establishment year	Before-1965	1	2	0	0	2	24	4	5	18.98	6	.004*	12.59
	1966 -1985	10	18	2	12	4	50	16	20				
	1986-1995	38	69	13	76	1	13	52	65				
	2006 & above	6	11	2	12	1	13	9	10				
(ii)Type of unit	Composite	6	11	3	18	2	25	11	14	4.78	4	.314 ns	9.48
	Fabricating	17	31	3	18	0	0	20	2				

									5				
	Garment Manufacturing	32	58	11	64	6	75	49	61				
(iii)Form of organization	Partnership	18	33	1	6	0	0	19	24	26.14	6	.000**	12.59
	Proprietorship	26	47	8	47	1	13	35	44				
	Public Limited	1	2	0	0	2	25	3	4				
	Private Limited	10	18	8	47	5	63	23	28				
(iv)Customer base	Domestic Unit	50	91	13	76	4	50	67	84	14.13	4	.007**	9.48
	Export Unit	0	0	0	0	1	12	1	1				
	Domestic & Export Unit	5	9	4	24	3	38	12	15				

Note. S=small; M=medium; L=large scale unit; T=Total units; x^2 = chi square; df= degree of freedom; T-value=Table value; p-value= significance.

Distribution of the units on the basis of form of organization as seen in Table 2(iii) revealed that 44% were proprietorship type, 28% were private limited, while only 4% were public limited. The relationship between the form of organization and the size of the unit was found highly significant, after the chi- square analysis at 1% significance. It was found that most of the small scale units were either formed through partnership or proprietorship in comparison to large scale units which were mainly private limited. Medium scale units were private limited and formed through proprietorship both.

Distribution of the units on the basis of customer base category as shown in Table 2 (iv) revealed that 84% units were domestic, 15% were both domestic and export oriented units while only 1% was export oriented unit. This could be, because Ludhiana is mainly famous for producing hosiery products for domestic use. Chi square analysis revealed a significant relationship between the size of the unit and the customer base category as (x^2= 26.14; df = 6; p-value <.001) calculated value of the chi square is higher than table value. It could be due to the

reservation of non-export oriented hosiery sector for small scale units and more over large units were not allowed to operate in domestic market.This is in line with the findings of Uchikawa(2012) which revealed that Ludhiana mainly caters to the domestic market.

TABLE 3

Distribution on the Basis of Certification, Number of Employees, and Floor Area

n=80(S=55, M=17, L=8)

Variable	Options	S		M		L		T	
		f	%	f	%	f	%	f	%
(i)Certification	ISO14000	0	0	0	0	1	13	1	1
	ISO9000	0	0	2	12	7	87	9	11
	SA8000	2	4	4	24	0	0	6	8
	No certification	53	96	11	64	0	0	64	80
(ii) Number of full Time employees	Less than 100	45	82	0	0	0	0	45	56
	100-200	10	18	12	71	0	0	22	28
	200-300	0	0	5	29	1	12	6	8
	More than 300	0	0	0	0	7	88	7	8
(iii) Floor Area(sq.feet)	Less than 15,000	40	73	0	0	0	0	40	50
	15,000 - 30,000	15	27	14	82	0	0	29	36
	30,000 - 45,000	0	0	3	18	3	38	6	8
	More than 45000	0	0	0	0	5	62	5	6

Note. S=small; M=medium; L=large scale unit; T=Total units.

Analysis of Table 3(i) depicts that 80% of the hosiery units had no certifications either related to environment,or quality or Corporate Social Responsibility (CSR). Only eight percent had social accountability certification, 11% had ISO 9000 quality certification, while only 1% had ISO 14000 environmental certification. This could be because most of the units were domestic units and as the domestic buyers are not very particular about the quality, social, labour, ethical, environmental standards being followed in the manufacturing units, these units did not feel the need to adopt quality and environmental standards .In comparison to European importers, which were very stringent on compliance of SA8000 and ISO14000, putting pressure on industry to follow international labour and environmental laws. The export oriented units follow international labour and environmental laws due to the pressure by the international buyers, as also supported by Singh (2011). Also applying for certification is a hectic and time

consuming process and requires investment, commitment and lot of hard work to comply with these standards. This could be the reason that small scale units were not motivated enough to apply for these quality and environment related certifications. Uchikawa(2012) also supported the findings with the fact that international certification was not very popular among Ludhiana hosiery exporters. Ludhiana's units had just not realized the need of it and latent benefits associated with it. Also there was no scheme from state government and centre government to promote international certification among the hosiery products exporters.

Table 3(ii) shows the distribution of the units on the basis of number of employees revealing that majority of the large scale units had more than 300 employees while small scale units had 10-100 employees, medium scale units had employees ranging from 100-200. In Ludhiana hosiery industry, majority of the workers were engaged on daily wages as piece rate system.

Distribution of the units on the basis of floor area as depicted in Table 3(iii) highlighted that most of the large scale units had more than 45,000 square feet area in comparison to small scale units, which had less than 15,000 sq. feet area, and medium scale unit had floor area from 15,000-30,000 sq. feet.

b) Carbon Footprint Awareness

This section dealt with finding the awareness level of the hosiery units of Ludhiana regarding carbon footprint.

Hypothesis : Size of the unit makes a significant difference in the awareness regarding the concept of carbon footprint.

TABLE 4

Distribution on the Basis Of Awareness about Carbon Footprint

n=80(S=55, M=17, L=8)

Awareness about CFP	S		M		L		T		x^2	df	P value	T value
	f	%	f	%	f	%	f	%				
Yes	2	4	1	6	5	63	8	10				

No	53	96	16	94	3	38	72	90	27.295	2	.000**	5.99

Note. S=small; M=medium; L=large unit; T=Total units; x^2 = chi square; df= degree of freedom; T-value=Table value; p-value= significance.

It was found that 90% of the respondents were not aware about the carbon footprint. Sixty three percent of the large scale units were aware of carbon footprint in comparison to only 4% of small scale units. Significant p-value of chi-square led to the acceptance of alternate hypothesis that there is a significant difference between the small, medium and large hosiery units regarding the awareness of carbon footprint. Table 4 shows the awareness of the small, medium and large scale units regarding the concept of carbon footprint. Large scale units were more aware regarding the carbon footprint concept in comparison to medium and small scale units.

It was further revealed in Table 5 that majority of the large scale units were aware of the concept and were of the opinion that reducing carbon emission is important for slowing down the climate change as it has high value in causing disasters, floods and melting of glaciers. Most of them also believed that carbon footprint is caused by the processes associated with the production and distribution of the product. They also agreed that it was their moral and social responsibility to reduce these emissions by its measurement and reporting to its buyers.

TABLE 5

Distribution on the basis of Degree of Agreement on Statements about Carbon Footprint.

n=8(S=2, M=1, L=5)

Variable	**Options**	**Weighted Mean**		
		S	**M**	**L**
Degree of agreement	Carbon emissions produced by the unit has an impact on health of the environment.	4	5	8
	Apparel industry contributes very less to the carbon emissions.	2	5	12
	The main contributors to the unit's carbon footprints are use of fuel for travel and electricity.	5	2	11
	It is our moral or social responsibility to reduce	7	5	4

	carbon emissions			
	Reducing carbon emissions is important in slowing down the climate change	4	5	13
	Carbon footprint is caused by all the processes associated with production and distribution.	5	1	11
	Disasters, Floods, melting of glaciers are a result of Carbon emitted in the environment by the apparel production units.	2	2	72
	It is the responsibility of companies to disclose policy on carbon footprint to its buyers.	3	3	9

Note. S=small; M=medium; L=large scale unit. Weight age 5 was attached to option 'Strongly Agree', 4 to 'Agree', 3 to neither 'Neither Agree nor Disagree', 2 to 'Disagree' and 1 to 'Strongly Disagree'.

Weighted score mean difference obtained by small, medium and large scale units respectively clearly depicts that there was a difference in their extent of awareness. Large scale units were far more aware regarding the concept and importance of carbon footprint in comparison to small and medium scale units. Even though medium scale units had heard about the carbon footprint but very few were aware of its sources and importance of its measurement.

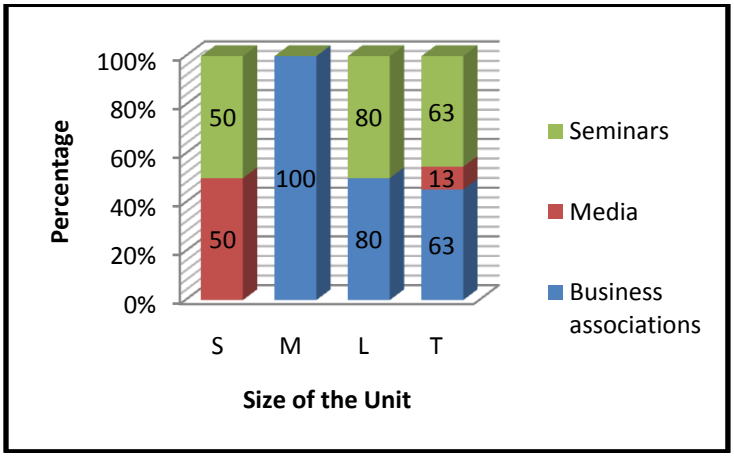

FIGURE 1

Bar diagram showing the distribution on the basis of source of awareness.

Eighty percent of the large scale units became aware of the carbon footprint through their meeting conducted by the business associations and seminars each in comparison to 100% medium scale units who became aware through business associations, and 50% of small scale units became aware through media and participation in the seminars. None of the respondents

became aware about carbon footprint through local NGOs, magazines or newspaper, and other companies, as shown in Figure 1.

TABLE 6

Distribution on the Basis of the GHG Included in the Calculation of Carbon Footprint.

n=8(S=2, M=1, L=5)

Green House Gases	S		M		L		T	
	f	%	f	%	f	%	f	%
Carbon dioxide	2	100	1	100	3	60	6	75
Methane	0	0	0	0	0	0	0	0
Nitrous oxide	0	0	0	0	0	0	0	0
Hydro fluorocarbons	0	0	0	0	0	0	0	0
Per fluorocarbons	0	0	0	0	0	0	0	0
Sulphur hexafluoride	0	0	0	0	0	0	0	0
Hydrofluoroethers	0	0	0	0	0	0	0	0
All the above	0	0	0	0	2	40	2	25

Note. S=Small; M=Medium ; L=Large Scale Unit; T=Total units.

As very few hosiery units of Ludhiana were aware of the measurement procedures of the carbon footprint. The units had a vague idea regarding the gases to be included in its calculation. Majority of the respondents that is 75% believed that only carbon dioxide was included in the calculation. Forty percent of the large scale units knew about all the gases namely Carbon dioxide, Methane, Nitrous oxide, Hydro fluorocarbons, Per fluorocarbons and Sulphur hexafluoride and Hydro fluoroethers used it in the calculation of the carbon footprint, in comparison to none of the medium and small scale units which were not very sure about the other gases except carbon dioxide as shown in Table 6.

TABLE 7

Distribution on the Basis of the Sources Causing GHG Emissions

n=8(S=2, M=1, L=5)

Options	S		M		L		T	
	f	%	f	%	f	%	f	%
Waste	0	0	0	0	0	0	0	0
Water	0	0	0	0	0	0	0	0
Fuel use in transport & machines	1	50	0	0	0	0	1	12
Electricity	0	0	0	0	0	0	0	0

All of the above	1	50	1	100	5	100	7	88

Note. S=small; M=medium; L=large scale unit; T=Total.

Analysis of Table 7 revealed that all the large and medium scale units were aware of the sources of GHG emissions namely waste, water, electricity, fuel used in transport and machines and so forth in comparison 50% of small scale units which had identified only fuel used in transport and machines as a source of emissions.

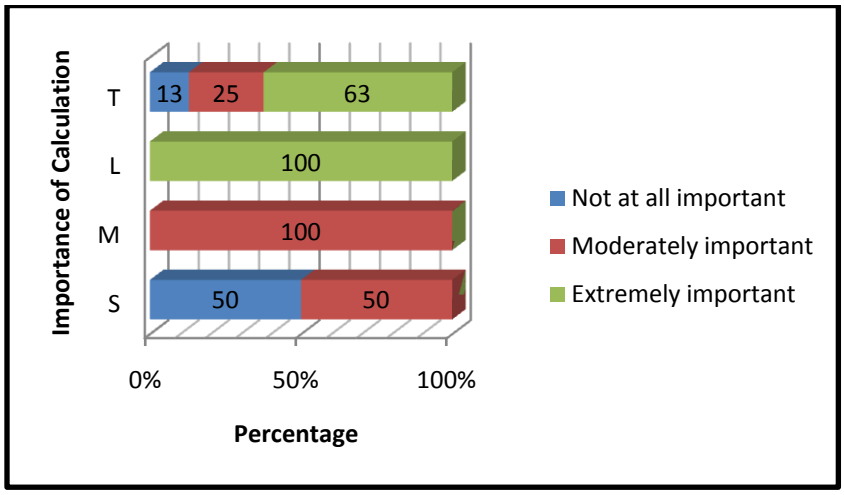

FIGURE 2
Bar Diagram Showing Importance of Carbon Footprint Calculation.

Figure 2 revealed that all the large scale units firmly believed that it was extremely important to calculate carbon footprint and believed that the measurement is the first step towards reduction of the carbon footprint which ultimately will lead to slowing down the climate change. Few small scale units believed that measuring carbon footprint will fulfill major Corporate Social Responsibility. Majority of medium and large scale units were more aware of the benefits of measuring carbon footprint as they believed that it will open up new markets, increase profitability, leads to efficient improvement, energy savings and lower expenditure, enhance brand image, improve employee and stakeholder satisfaction, competitive advantage and so forth.

The results revealed that none of the large, medium and small scale hosiery units had measured carbon footprint in their hosiery units even though some of them were aware of the concept.

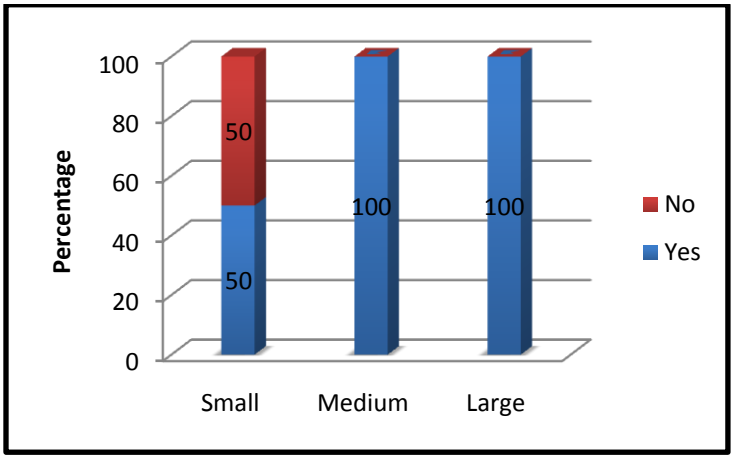

FIGURE 3

Column Diagram Showing Distribution on The Basis of Willingness to Measure and Dedication Specific Working Hours.

Figure 3 revealed that all the large and medium scale units were ready to measure carbon footprint in comparison to 50% of the small scale units which were willing and 50% not willing to measure each. All large and medium scale hosiery units were ready to dedicate specific hours of their staff and workers towards its calculation in comparison to 50% of small scale units.

TABLE 8

Distribution on the Basis of the Reasons for not Measuring Carbon Footprint

n=80(S=55, M=17, L=8)

Factors for measuring Carbon footprint	**Weighted mean**			
	S	**M**	**L**	**T**
No Pressure from govt.	83	33	21	135
No Pressure from buyer.	106	36	18	159
No Profit	117	37	21	174
No Pressure from customers	126	40	20	184
Lack of financial resources	117	40	22	177
Lack of interest of unit	119	31	22	170

Lack of knowhow of calculation	137	44	25	204
Time constraints	122	45	23	187

Note. S=small; M=medium; L=large scale unit; T=Total units. Note. Weightage 5 was attached to option 'Certainly'.4 to 'Probably'.3 to 'Not Sure'.2 to 'Probably Not ' and 1 to 'Certainly Not'.

Weighted mean difference in different types of units as depicted in Table 8 revealed that most important reason for not measuring carbon footprint was lack of knowhow of calculation in case of large, medium and small scale units as revealed by its weighted mean of 25, 44, and 137 respectively. Medium scale unit had also identified 'Time constraints' as a major inhibiting factor with a weighted mean score of 45,while 'No pressure from the government' was the least important factor as weighted mean of 83, 33 and 21 was achieved by small, medium and large respectively. Difference in the weighted mean score of the small, medium and large scale units in relation to the reasons for not measuring carbon footprint clearly depicts that most of the small scale units were not aware of the procedure to calculate the carbon footprint of the unit followed by time constraints, lack of interest of unit and no pressure from customers. While most of the large scale units did not measure carbon footprint, due to mainly lack of knowhow of calculation and time constraints. No pressure from the government and buyers were the least important reasons for not measuring carbon footprint.

c) Dissemination of Information

This section dealt with spreading awareness regarding carbon footprint. Information regarding the concept of carbon footprint, its importance and reduction was disseminated through distribution of a self designed leaflet as shown in Figures 4 and 5.The leaflet included all relevant information on carbon footprint and points to reduce it. The owners and the management appreciated the effort of the researchers and thus became keen to calculate their organizational footprint.

FIGURE 4

Leaflet on Carbon Footprint.

FIGURE 5

Distribution of Leaflet on Carbon Footprint.

Distribution of carbon footprint informatory leaflets and informal talks provided the respondents with an in-depth understanding of carbon footprinting and it further motivated the hosiery industry to measure their impact on the environment.

CONCLUSION

Low awareness level of the hosiery industry of Ludhiana regarding the concept of carbon footprint had stimulated the need for awareness workshops and discussions in this region. There is a dire requirement of strengthening the capacity and coordination of enforcing agencies by the government so that the Ludhiana industry is able to take a lead, devise a better carbon-reduced pathway for the future and transform themselves into a climate responsive organization and capitalize the opportunity by not only assessing its carbon emissions but also finding ways to reduce them.

REFERENCES

1. Bhalla, G.S.,Arora,S., Kaur,H., & Khanna,H.(2007), " Environment Reporting practices in India: a case study" G.S. Bhalla, & H. Khanna (Eds.), Environmental education, Regal publications, New Delhi, India, pp.202-216.
2. Questionnaire on Environmental Problems and the Survival of Humankind 15-Year Summary. (2007),available at: http://www.af-info.or.jp/en/questionnaire/doc/review15years.pdf (accessed 10th July,2014).
3. Malhotra,N., Kaur ,H., & Bhalla, G.S.(2007), "Climate change and energy policy: Indian scenario",G.S. Bhalla, & H. Khanna (Eds.), Environmental education , Regal publications , New Delhi, India , pp. 217-226.
4. Meena, C.R.(2011), "Carbon footprint in textiles", The Journal of Textile Association,Vol.72,No.1,pp.44-45.
5. Singh,A.(2011). *Chapter 1: Introduction,* available at: *shodhganga.inflibnet.ac.in/bitstream/10603/2895/.../07_**chapter**%201.pdf (accessed 24th July,2014)*
6. Uchikawa,S.(2012), "The Development of apparel Industrial cluster in India: A comparison between Ludhiana and Tiruppur" ,Fibre2fashion, available at: http://www.fibre2fashion.com/industry-article/42/4155/the-development-of-apparel1.asp (accessed 13th April,2014).