

## A STUDY OF ENGAGEMENT IN LOW CARBON BEHAVIOUR AND OBSTACLES TO ADOPTION AMONG STUDENTS IN KASHMIR VALLEY, JAMMU & KASHMIR, INDIA

Rouoof Habib Ganie<sup>1</sup>, \*P. G. Wadhvani<sup>2</sup>, A. Qayoom<sup>3</sup>, M. Abass Bhat<sup>4</sup>

<sup>1</sup>Research Scholar, Department of Environmental Science, Lovely Professional University, Punjab and Assistant Professor J&K Higher Education Department, India.

[roufhabib25@gmail.com](mailto:roufhabib25@gmail.com)

<sup>2</sup>Associate Professor, Department of Chemical Engineering, School of Chemical Engineering and Physical sciences, Lovely Professional University, Punjab, India. :

[pratima.24280@lpu.co.in](mailto:pratima.24280@lpu.co.in)

<sup>3</sup> Associate Professor, Department of Environmental Science, Govt. Degree College Hajin Bandipora, J&K Higher Education Department, India. [qayoommirrediffmail.com](mailto:qayoommirrediffmail.com)

<sup>4</sup>Research Scholar, Department of Environmental Science, Lovely Professional University, Punjab and Assistant Professor J&K Higher Education Department, India.

[abbassali14@gmail.com](mailto:abbassali14@gmail.com)

\*Corresponding author: [pratima.24280@lpu.co.in](mailto:pratima.24280@lpu.co.in)

### Abstract

The Himalayas is one of the sensitive ecosystems with respect to climate change. Kashmir valley situated in the Himalayas is highly vulnerable to the impacts of Climate change. Therefore, understanding the behaviors which can reduce the carbon footprint and proper engagement in such behaviours would be the best strategy to regulate the climate change. Developing adaptation methods by engaging in environmentally friendly behaviours is the best deal for to survive and make the system sustainable. Local to regional levels of grassroots participation should be involved in the development and implementation of these adaptation programmes. Locals must be aware of low carbon behaviours and the obstacles in their adoption in order to participate in the process of development and implementation of the programmes in an informed manner. Hence, we explored the engagement in low carbon behaviour and barriers in adoption of low carbon behaviours among students. We observed the differences in the responses of the students with respect to their gender, residence, subject stream, semester, parental education, father's occupation and family income. Convenient sampling was used and data was collected through online google form questionnaire from undergraduate students of twenty Govt. Degree Colleges spread over ten districts of Kashmir Valley and received 1129 responses. It was found that students were intending to be engaged in low carbon behaviours, but hurdles in engagement like lack of availability and the opportunities and lack of knowledge and skills on how to practice low-carbon lifestyle were also found to be high. It was also found that there exists significant difference in "engagement of Low Carbon Behaviours (LCBs)" among students with respect to gender and subject stream and no significant difference was observed among students with respect to barriers in adoption of Low Carbon Behaviours.

**Key Words:** Low Carbon Behaviour, Kashmir Valley.

### 1. Introduction

Climate change is a change in the average climate over a long period of time (decades or longer), which may be brought on by long-term natural or anthropogenic changes to the atmosphere or to land usage (Hussain 1987). Although there are many reasons of climate change, there does not appear to be a true consensus among academics on the topic as to which of these or

other variables may be dominant (Budyko 1974, Hansen et al. 2010, Liarakou et al. 2011, Jamal & Ahmad2020). Ocean currents, solar changes, and El Nino are examples of long- and short-term natural phenomena. By moving heat across the many components of the climate system, El Nino, a type of natural climatic variability, finally results in a general positive anomaly in the average world temperature. Humans have been modifying the earth's energy balance by releasing greenhouse gases into the atmosphere, changing land use, irrigating agriculture, draining wetlands, and draining wetlands, among other things (ICSU 1985). The use of fossil fuels, the production of cement, the flaring of natural gas, bushfires, and agricultural practices are other sources of anthropogenic emissions that contribute to the greenhouse effects (Hickman et al. 2021). The extent of human influence over the current climate has now surpassed the limits of natural variability and has confirmed that human activities are the main driver of climate change ((ICSU 1985, Pachauri & Spreng 2011).

The effects of climate change and fluctuation are wide-ranging, but they can be divided into concerns for agriculture, the economy, the environment, society, and health. Moreover, Ikeme (2005) confirmed that a shift in climate belts, projected to bring about by climate change, will increase aridity in the tropics and have significant effects on both energy supply and production. Likewise, Busallachiet al. (2005) argued that there are numerous scientific problems with regard to how humans affect the climate, particularly the relationships between anthropogenically produced changes and natural climatic variations. In addition, the IPCC (2000) claimed that climate change, particularly when it is poorly understood, has significant effects on the world's population, including floods, droughts, food shortages, the rise of new diseases, and global warming. Furthermore, Ayandele & Jegede (2016) had acknowledged that climate change would have an impact on every aspect of human socioeconomic activity, including the environment in which people live and the natural resources that support people in this environment.

Industrialized countries have a higher level of awareness of climatic fluctuations as compared to developing countries (ICSU 1985, Ikeme2005). It is also negligible in some developing regions such as Asia, Middle East, and Africa (McIntosh & Thom 1973, Kiliñç et al. 2011, Mandleni & Anim 2011, Mustafa et al. 2019). The nations in these regions have not given environmental issues any importance (Ikeme 2005, Mandleni & Anim 2011). However, USAID (2007) revealed that those living in developing countries may be more affected by the effects of climate change than people in developed countries. A change in the local weather and climate would have a direct influence on productivity levels and reduce the means of subsistence for the poor who frequently rely on climate-sensitive economic activities like agriculture and forestry. Furthermore, global climate change brings both opportunities and threats. Therefore, by being aware of, preparing for, and adapting to a changing environment, people and society can seize opportunities and lower their risk (Sarkar & Padaria2010, Freije et al. 2017). Therefore, having sufficient knowledge of climate change effects and increasing awareness of them by incorporating their study into the curricula at all educational levels and at both the global and local scales will provide sufficient knowledge of the effects of climate change on the environment, especially in the aspect of human activities like the burning of fossil fuels and deforestation that raise the level of greenhouse gases in the atmosphere. Overall, this illustrates the importance of including climate change studies into the curricula at all levels of schooling across the nation (Agboola & Emmanuel 2016).

Changing precipitation patterns, rising temperatures, deadly floods, repeated droughts, and glacier melting are just a few examples of how regional climatic differences have impacted ecosystem changes (Houghton 2004).Records show that the last five decades have been the warmest in the last six centuries (IPCC 2007, Dijkstra & Goedhart 2012),While the scientific evidence from IPCC (2001) indicated that the average temperature increased by 0.6°C over the past century. By the end of the century, an increase of around 2-3°C is anticipated

(Houghton 2004). Climate changes are predicted to be greater and less predictable in the twenty-first century as a result of greenhouse gas emissions than they were in the twentieth century (Leiserowitz 2006).

Considering the data from the literature, it's crucial to comprehend the dynamics of climate change, paying close attention to extremes in temperature and rainfall, floods and droughts, and their negative consequences on individuals' lives and the wellbeing of entire communities (Crona et al. 2013). Furthermore, it is highlighted that people's knowledge and perceptions differ between and within locations (McIntosh & Thom 1973, IPCC 2000, Mandleni & Anim 2011).

The College is a premier learning institution. College students should be aware of the concerns of climate change and sustainable development. Although scientific, comprehension of concepts and phenomena related to climate change is beneficial for all people. It is sufficient to say that undergraduates are responsible for passing on this information when they graduate and begin working in their fields (Jamal & Ahmad 2020). Understanding your impact on the climate and how the climate affects you and society is a requirement for climate science literacy, according to the US Global Change Research Council's framework (USGCRP 2009). A person who is climate literate: comprehends the fundamental concepts underlying the Earth's climate system; is able to evaluate information about climate that is supported by science; effectively communicates about climate and climate change; and is capable of making responsible decisions regarding actions that may have an impact on the climate (Cordero et al. 2020, Palomar & Ingcol 2020). Students can contribute to the efforts to lower greenhouse gas emissions.

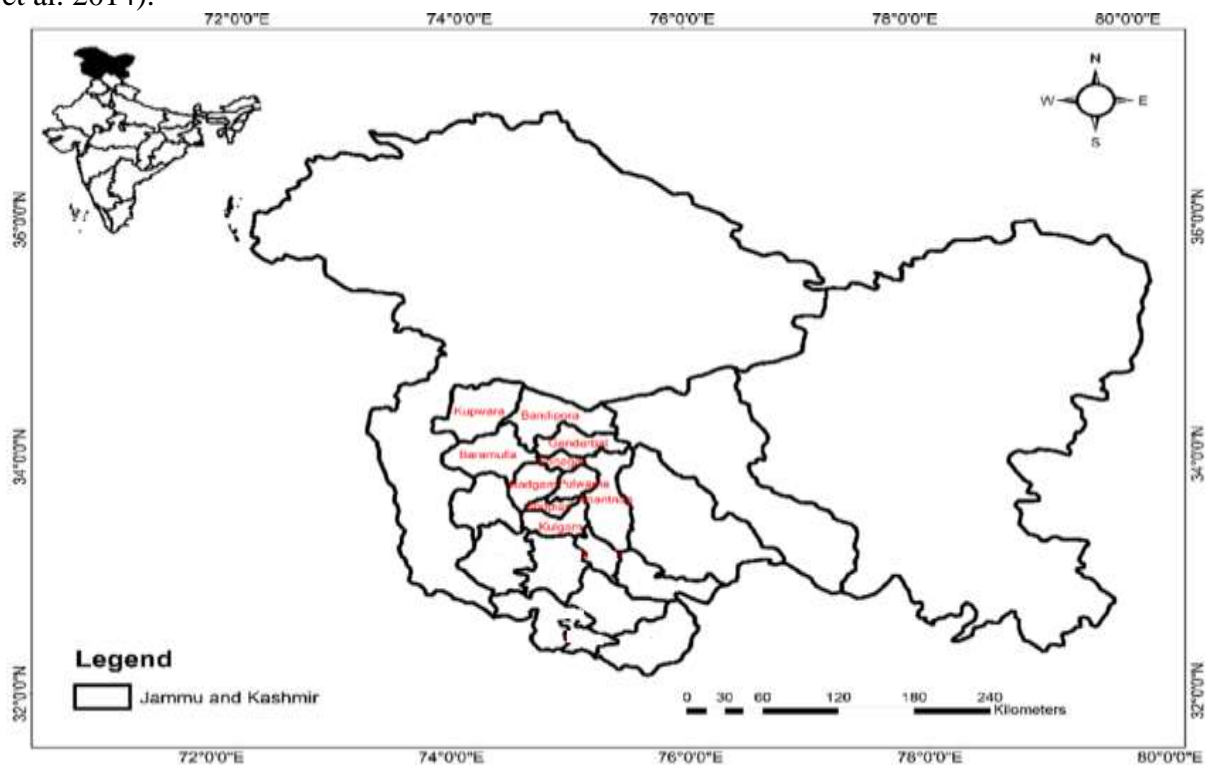
The most effective strategy to increase public knowledge of significant environmental issues and to encourage adaptive behaviour in response to climate change and global warming is to provide environmental education to students at all levels (Ikeme 2005, Pugliese & Ray 2009, Ogunsola et al. 2018). Numerous researches has been conducted on how students perceive and are affected by the greenhouse effect, global warming, and climate change (IPCC 2001, Chaudhary 2002, Leiserowitz 2006, PRC 2006, Environment Bureau 2010, Deressa et al. 2011, Álvarez-Nieto et al. 2022) across the world. The Himalayas reported an average temperature rise of 1.5 °C from 1982 to 2006 (Ogunsola et al. 2018) in contrast to the global average temperature increase of 0.6 °C from 1975 to 2005 (Dijkstra & Goedhart 2012). Even neighbouring regions reported 1.7 °C from 1981 to 2010 (Crona et al. 2013). Despite significant weather variations in J&K, no investigations on local perceptions and their engagement in low carbon behaviour have been conducted except the one conducted in District Rajouri of Jammu Division in Jammu and Kashmir (Zeeshan et al. 2021). So, using data from colleges in Kashmir Valley, Jammu and Kashmir, we tried to determine how much students are aware about climate change. Consciously or unconsciously, students construct experiences from their parents, peers, their own first-hand experiences, the curricula, and the professors when forming their perceptions (Taber & Taylor 2009). As a result, it may be said that pupils represent the "culture" of the neighbourhood, which, according to Crona et al. (2013), is similar to how everyone in the neighbourhood views environmental issues. Colleges, the conventional means of education and premier institutions of learning, help in absorbing and sharing common perceptions. In fact, experiences are shared and perspectives are standardised through education. In this study we aimed to ascertain the following:

- (i) Participation in low-carbon behaviour, and the adoption hurdles among students.
- (ii) Whether gender, subject stream impacts students' participation in low carbon behaviours.
- (iii) Whether parental literacy and family income of students have impact on their participation in low carbon behaviours.
- (iv) Whether rural and urban students differ in their engagement in low carbon behaviour.

## 2. Methods

### 2.1 Study Area

We have selected the Kashmir Valley as our study area to investigate student's perceptions of climate change. The Kashmir Valley is located between (32°.22" and 34°.43") north latitude and (73°.52" and 75°.42") east longitude (Hussain 1987). The Jhelum River's drainage basin coincides with the geographical boundaries of Kashmir's stunning valley (Dar et al. 2014).



**Figure 1: Map of Jammu & Kashmir showing 10 districts of Kashmir Valley**

### 2.2 Questionnaire Survey

This study is primarily based on questionnaire surveys carried out among Govt Degree College students of Kashmir Valley, Jammu and Kashmir. The union territory of Jammu and Kashmir is divided into two divisions i.e. Jammu division and Kashmir division. There are 142 Govt. Degree Colleges, 02 Govt. College of Engineering and Technology and 04 private grant in aid colleges in Union territory of Jammu and Kashmir. Among the 142 Govt. Degree Colleges 70 are in Kashmir Valley and 72 are in Jammu division. The colleges form the larger part of the higher education sector in the region and are considered as the hub of knowledge and talent. Despite having strategic importance, these institutions have received little attention from the researchers. To narrow down the sampling unit, students from only twenty colleges with two colleges from each district were selected for the present study. The districts include Anantnag, Pulwama, Kulgam, Shopian, Srinagar, Budgam, Ganderbal, Bandipora, Baramulla and Kupwara.

The questionnaire was adapted from Tse Ka Ho Alan (2013) who surveyed climate change perception among students in the Hong Kong. In order to gain a more comprehensive knowledge of how students engage in LCBs and the hurdles to their adoption, our questionnaire had two components, each of which was derived from a different researcher.

Section A discusses adopting low-carbon behaviour (LCBs). With reference to a few of the LCBs, Shimo-Barry (2008) created a 10-item scale. The LCBs studied in this study included waste separation/recycling, energy saving, sustainable consumption, sustainable eating, eco-friendly transportation, and involvement in environmental (low-carbon) activities. The rating was determined using a Likert scale with a maximum score of 5, where 1 means "very often engage" and 5 indicates "almost never engage."

Section-B examines how the students feel about the challenges to implementing LCBs. The measure consists of five items that assess societal and personal barriers (such as a lack of interest or difficulty changing one's lifestyle) (i.e., lack of facilities and product choices). Using a 5-point Likert scale, "1" denotes the strongest agreement that the item in question constituted a barrier, and "5" denotes the strongest disagreement, all items were scored.

The convenience sampling method was used to choose the sampling units (Government Degree Colleges) from the total number of colleges located in both rural and urban areas and to choose the students across all the districts of the geographical location opted for the study. This handy sampling technique was chosen because it depends on data gathered from population members who are readily available to participate in a study. Besides, it is a predominant sampling method among researchers as it is extremely prompt, uncomplicated, economical and also, members are readily approachable to be part of the sample. The survey was conducted in the 20 Colleges spread over 10 districts of Kashmir Valley from November 2022 to January 2023. Of the total 1129 students submitted their responses with almost equal proportion from every district.

### **2.3 Demographic attributes of respondents:**

The demographic information about the respondents is listed in Table 1. Out of 1129 respondents males were 537 and females were 592, students from semester 1<sup>st</sup> were 197, 192 from semester 2<sup>nd</sup>, 177 from semester 3<sup>rd</sup>, 191 from semester 4<sup>th</sup>, 198 from semester 5<sup>th</sup> and 174 from semester 6<sup>th</sup>, students with Bachelor of Arts Stream were 583, 306 from Bachelor of science stream and 240 from other streams like B.com, BBA, BCA etc, students from rural residence were 663 and from urban areas were 466, students with illiterate father were 417 and with literate father were 712, students with illiterate mothers were 590 and with literate mothers were 539, students with father's occupation as govt service were 245, with private service were 246 and with self-employed father were 638. Students with family income less than 25000 were 674, between 25000-50000 were 251 and above 50000 were 204.

### **3. Results and Discussion**

The data was collected from the students of colleges of Kashmir valley belonging to different semesters with different socio-demographic attributes. The data collected was analyzed using SPSS and is discussed as below. The variable has been studied under the following sub variables.

Section A: Engagement in low carbon Behaviour (LCB).

Section B: Hurdles in adoption of low carbon Behaviour (HLCB).

The Cronbach's  $\alpha$  value for the sub variables under Section A and B is 0.848 and 0.679 (Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization). The composite reliability (CR) for LCB and HLCB are 0.802 and 0.681 (rounded off to 0.7) respectively While as average variance extracted (AVE) values of LCB and HLCB are 0.332 and 0.302.

**Table 1: Composite reliability and Average variance extracted of LCB and HLCB**

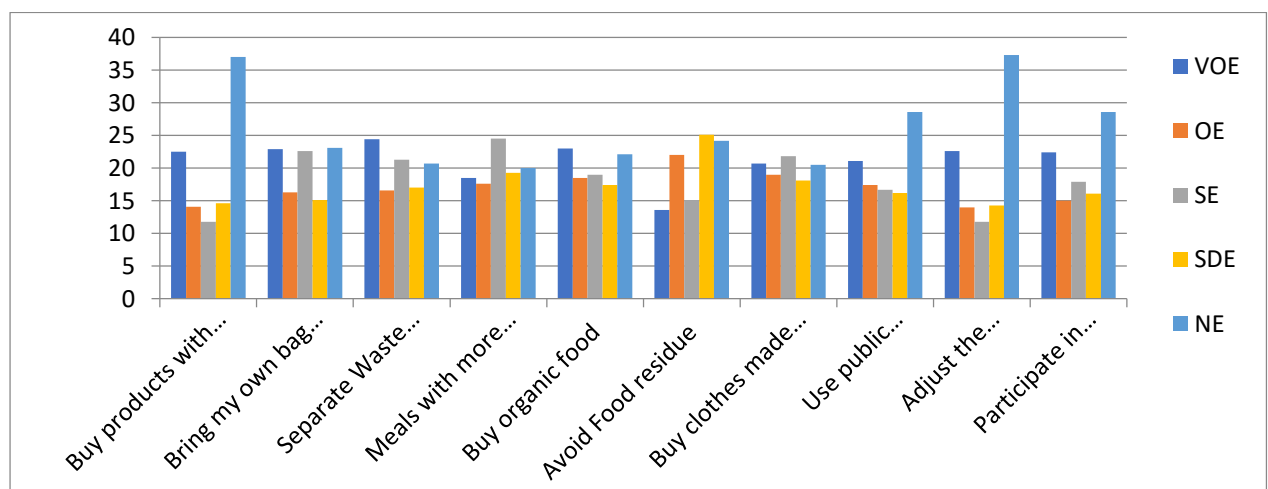
Variable	CR	AVE
LCB	0.802	0.332
HLCB	0.681	0.302

The AVE values are below 0.5, however according to Malhotra & Dash (2018),“AVE is a more conservative measure than CR and hence, on the basis of CR alone, the researcher may conclude that the convergent validity of the construct is adequate, even though more than 50 per cent of the variance is due to error.” Therefore, it can be concluded that convergent validity has been established for all the constructs.

**Table 2: Students’ engagement in low carbon (Green Living) Behaviour(LCB)**

S.No.	Statement	Mean	SD	VOE	OE	SE	SDE	NE
1	Buy products with less Packaging	3.30	1.61	22.5	14.1	11.8	14.6	37
2	Bring my own bag when shopping	2.99	1.47	22.9	16.3	22.6	15.1	23.1
3	Separate Waste for recycling	2.93	1.46	24.4	16.6	21.3	17	20.7
4	Meals with more vegetables and less meat	3.05	1.38	18.5	17.6	24.5	19.3	20
5	Buy organic food	2.97	1.47	23	18.5	19	17.4	22.1
6	Avoid Food residue	3.24	1.39	13.6	22	15.1	25.1	24.2
7	Buy clothes made of natural or organic material	2.98	1.42	20.7	19	21.8	18.1	20.5
8	Use public transport, bike or walk to school	3.14	1.52	21.1	17.4	16.7	16.2	28.6
9	Adjust the thermostat of air conditioner to 25.5°C in summer.	3.29	1.61	22.6	14	11.8	14.3	37.3
10	Participate in green (low carbon) activities in schools and community.	3.14	1.53	22.4	15	17.9	16.1	28.6

VOE..Very often Engage, OE...Often Engage, SE...Sometimes Engage, SDE...Seldom Engage, NE...Almost Never Engage



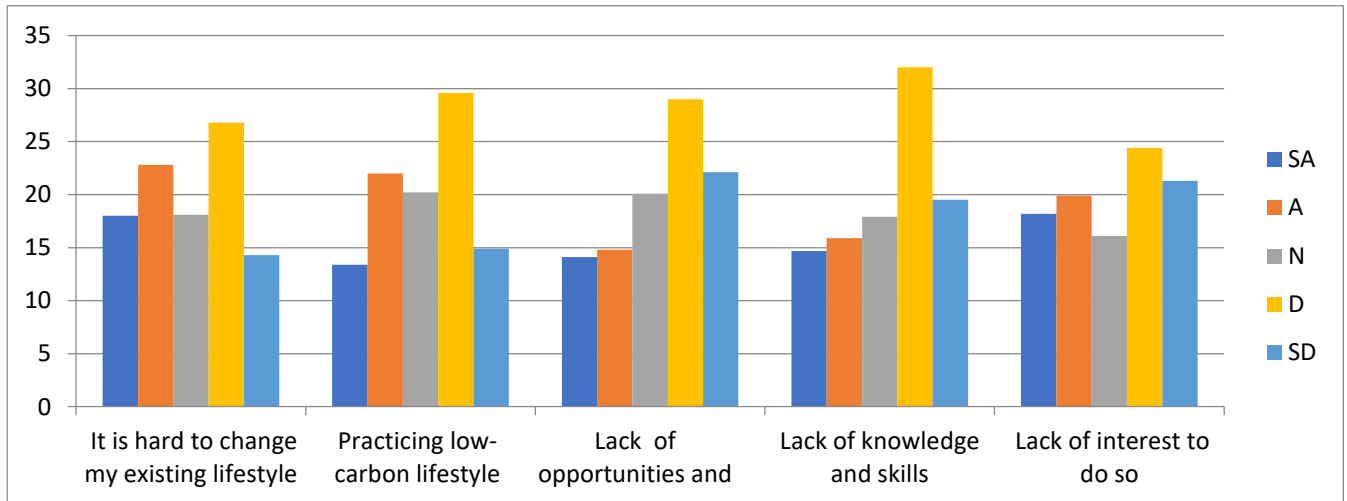
**Figure 2: Students’ engagement in low carbon (Green Living) Behaviors (LCB)**

As shown in Table 2 and Figure 2, the overall mean for “engagement in LCB” was 3.10, which indicates that students practiced LCBs a little bit more frequently than occasionally. It is revealed that students engage in low carbon behaviors partially like buying products with less packaging (36.6%), shopping with own bag(39.9%), Use Public transport(36.5%), prefer vegetables over meat(36.1%), buy organic food (41.5%),avoid food residues (25.6), wear clothes of natural material(39.7%), participate in green activities (37.4%). However more than 49% students do not engage in avoiding food residues and more than 50% do not buy products with less packaging. Overall, it can be inferred that people are not ready to change their behaviours towards low carbon and thus curbing the climate change will be difficult.

**Table 3: Students’ views on hurdles/barriers in adopting low carbon Behaviors**

S.No.	Statement	Mean	SD	SA	A	N	D	SD
1	It is hard to change my existing lifestyle because I already get used to it.	2.97	1.34	18	22.8	18.1	26.8	14.3
2	Practicing low-carbon lifestyle needs additional commitment (e.g. time &money)	3.11	1.28	13.4	22	20.2	29.6	14.9
3	Lack of opportunities and availability in society (e.g. facilities/choices)	3.30	1.34	14.1	14.8	20.1	29	22.1
4	Lack of knowledge and skills on how to practice low-carbon lifestyle	3.26	1.33	14.7	15.9	17.9	32	19.5
5	Lack of interest to do so	3.11	1.42	18.2	19.9	16.1	24.4	21.3

SA...Strongly Agree, A...Agree, N...Neutral, D...Disagree, SD...Strongly Disagree



**Figure 3: Students’ views on hurdles/barriers in adopting low carbon Behaviour**

As illustrated in Table 3 and Figure 3, the views of students regarding the barrier to low adoption of low carbon behaviors were found to be moderate as depicted by the overall mean of 3.15. However, the study identified two major barriers that hindered students from the adoption of LCBs: (1) Lack of opportunities and availability in society(Mean= 3.30) and (2) Lack of knowledge and skills on how to practice low-carbon lifestyles (Mean=3.26).Evidently, society still lacks auxiliary infrastructure and product options that would encourage low-carbon living, such as organic farming, household waste separation facilities, and the availability of eco-friendly goods at fair costs. It was therefore not surprising that students had this opinion. It is astounding; however, how little knowledge and expertise students have regarding adopting low-carbon lifestyles.

**Table 4: Student's engagement in low carbon behaviour with respect to their Socio-demographic attributes**

S.No.	Gender	NO.	Mean	SD	t-value	p-value
01	Male	537	3.04	0.97	2.11	0.03
02	Female	592	3.16	0.96		
S.No.	Residence	NO.	Mean	SD	t-value	p-value
01	Rural	663	3.12	0.96	0.71	0.48
02	Urban	466	3.07	0.98		
S.No.	Stream	NO.	Mean	SD	F-value	p-value
01	B.A	583	3.06	0.93	3.53	0.03
02	B.SC	306	3.23	1.02		
03	Others	240	3.04	0.98		
S.No.	Father's Education	NO.	Mean	SD	t-value	p-value
01	Illiterate	417	3.05	0.93	1.34	0.18
02	Literate	712	3.13	0.99		
S.No.	Mother's Education	NO.	Mean	SD	t-value	p-value
01	Illiterate	590	3.05	0.96	1.81	0.07
02	Literate	539	3.16	0.97		
S.No.	Semester	NO.	Mean	SD	F-value	p-value
01	1 <sup>st</sup>	192	3.24	0.94	1.04	0.39
02	2 <sup>nd</sup>	197	3.10	0.90		
03	3 <sup>rd</sup>	177	3.05	0.98		
04	4 <sup>th</sup>	191	3.07	1.01		
05	5 <sup>th</sup>	198	3.06	1.00		
06	6 <sup>th</sup>	174	3.09	0.96		
S.No.	Father's Occupation	NO.	Mean	SD	F-value	p-value
01	Govt Service	245	3.14	1.01	0.31	0.74
02	Private Service	246	3.12	0.95		
03	Self Employed	638	3.08	0.96		
S.No.	Family Income	NO.	Mean	SD	F-value	p-value
01	Below 25000	674	3.10	0.94	0.66	0.52
02	25000-50000	251	3.15	1.06		
03	Above 500000	204	3.05	0.93		



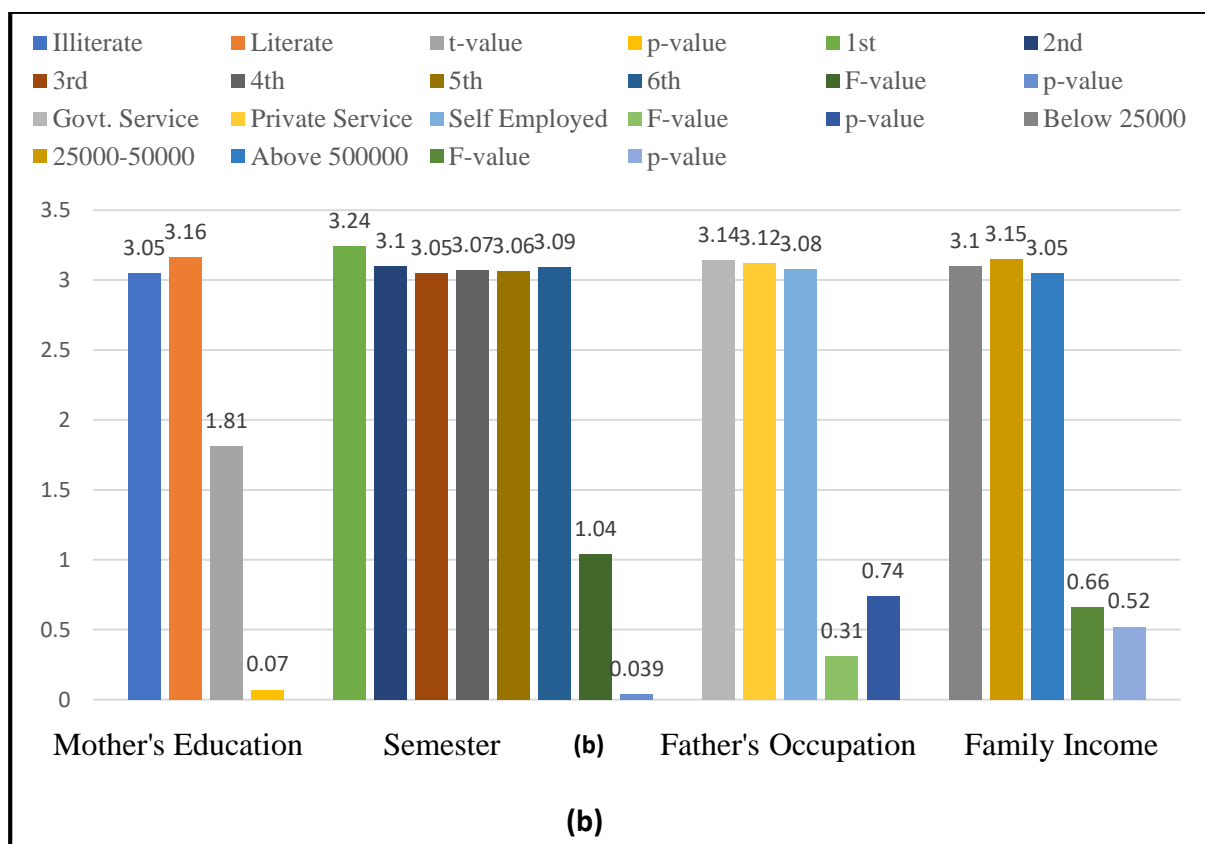
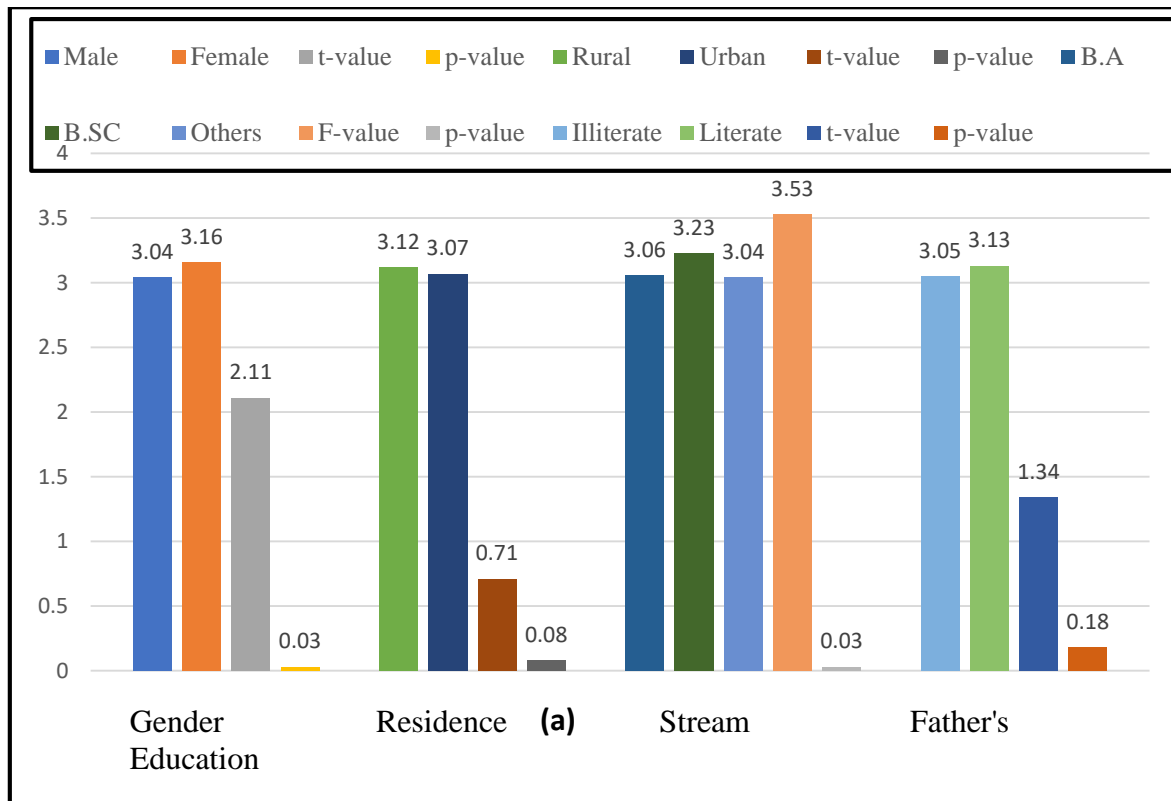


Figure 4 (a) and (b):: Student's engagement in low carbon behaviour with respect to their Socio-demographic attributes

**Table 5: Student’s views on hurdles/barriers in adopting low carbon behaviours with respect to their Socio-demographic attributes**

S.No.	Gender	NO.	Mean	SD	t-value	p-value
01	Male	537	3.12	0.86	0.85	0.39
02	Female	592	3.17	0.92		
S.No.	Residence	NO.	Mean	SD	t-value	p-value
01	Rural	663	3.17	0.88	0.92	0.35
02	Urban	466	3.12	0.90		
S.No.	Stream	NO.	Mean	SD	F-value	p-value
01	B.A	583	3.16	0.91	0.45	0.64
02	B.SC	306	3.11	0.89		
03	Others	240	3.17	0.84		
S.No.	Father’s Education	NO.	Mean	SD	t-value	p-value
01	Illiterate	417	3.20	0.87	1.52	0.13
02	Literate	712	3.12	0.90		
S.No.	Mother’s Education	NO.	Mean	SD	t-value	p-value
01	Illiterate	590	3.18	0.89	1.44	0.15
02	Literate	539	3.11	0.89		
S.No.	Semester	NO.	Mean	SD	F-value	p-value
01	1 <sup>st</sup>	192	3.14	0.79	0.51	0.77
02	2 <sup>nd</sup>	197	3.19	0.86		
03	3 <sup>rd</sup>	177	3.22	0.89		
04	4 <sup>th</sup>	191	3.13	0.97		
05	5 <sup>th</sup>	198	3.09	0.85		
06	6 <sup>th</sup>	174	3.13	0.97		
S.No.	Father’s Occupation	NO.	Mean	SD	F-value	p-value
01	Govt. Service	245	3.25	0.89	2.13	0.12
02	Private Service	246	3.10	0.90		
03	Self Employed	638	3.13	0.88		
S.No.	Family Income	NO.	Mean	SD	F-value	p-value
01	Below 25000	674	3.14	0.88	0.26	0.77
02	25000-50000	251	3.18	0.91		
03	Above 500000	204	3.13	0.90		

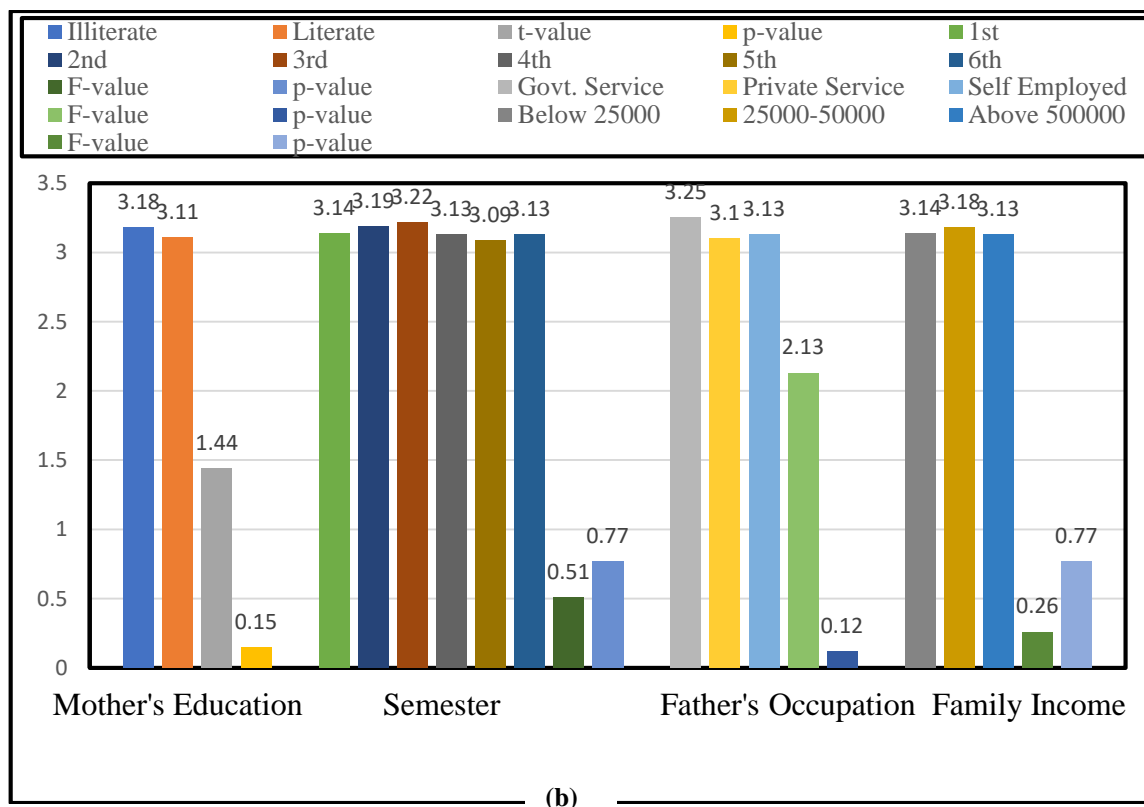
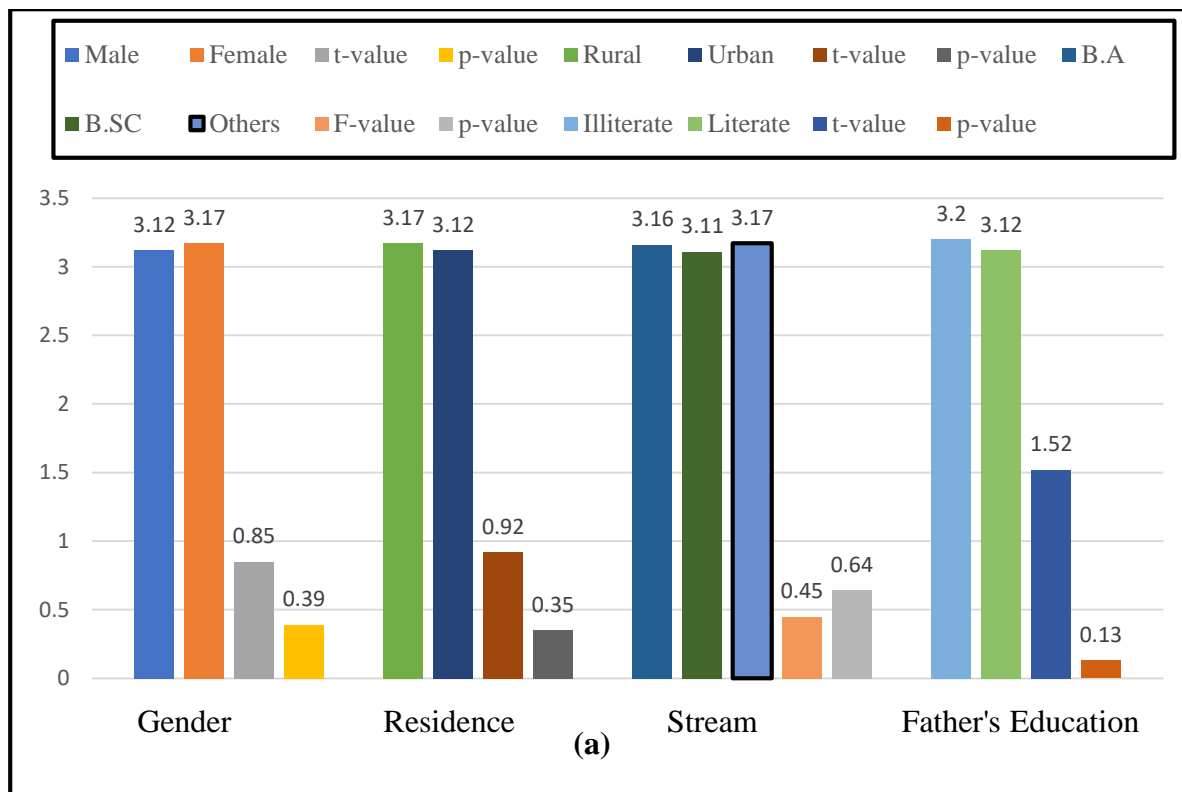


Figure 5 (a) and (b): Student's views on hurdles/barriers in adopting low carbon behaviours with respect to their Socio-demographic attribut

Table 4 and Figure 4 (a) and (b) revealed that there exists significant difference, in engagement of Low Carbon Behaviours (LCBs), among the undergraduate students of various colleges of Kashmir valley with respect to their gender as depicted by t-value (2.11) and p-value(0.03) and thus significant at 0.05 level with female students found to be more engaged in LCBs than male students as depicted by their mean values(3.04 for males and 3.16 for females).The difference was also found to be significant at 0.05 level with respect to their subject stream as depicted by their F-value (3.53) and p-value (0.03) with students from science stream more engaged in LCBs than arts stream students, which in turn are more engaged in LCBs than other streams like commerce, computer application, management students. However no significant difference in engagement in LCBs was found with respect to residence, fathers' education, mothers' education, semester in which studying, fathers' occupation and family income.

Table 5 and Figure 5 (a) and (b) revealed that there exists no significant difference, in the views on barriers in adoption of LCBs, among the undergraduate students of various colleges of Kashmir valley with respect to their gender, residence, subject stream, fathers' education, mothers' education semester in which studying, fathers' occupation and family income as p-value was not found to be less than 0.05 with respect to any socio-demographic attribute.

#### **4. Conclusions**

The engagement of undergraduate students of Kashmir Valley in low carbon behaviour (LCB) and barriers in adoption of low carbon behaviours was studied. It was concluded that students practiced LCBs a little bit more frequently than occasionally, views regarding the barriers in low adoption of low carbon behaviours were found to be moderate. It was found that students were hardly engaging in the LCBs like buying products with less packaging or trying to make efficient use of electricity through adjustment in air conditioners. It was also concluded that in case of “engagement of Low Carbon Behaviours (LCBs), students were found to have significant difference with respect to gender and subject stream and no significant difference was observed among students with respect to barriers in adoption of LCBs. In case of obstacles in the adoption of LCBs, lack of availability and the opportunities was found to be the highest obstacle in adoption of LCBs followed by lack of knowledge and skills on how to practice low-carbon lifestyle

#### **Declaration of Conflict of Interest**

The authors declare that they have no known conflict of interest that could have appeared to influence the work reported in this paper.

## References

1. Agboola, O. S. and Emmanuel, M. 2016. Awareness of Climate Change and Sustainable Development among Undergraduates from Two Selected Universities in Oyo State, Nigeria. *World J. Edu.*, 6(3): 70-81.
2. Álvarez-Nieto, C., Richardson, J., Navarro-Perán, M. Á., Tutticci, N., Huss, N., Elf, M. and López-Medina, I. M. 2022. Nursing students' attitudes towards climate change and sustainability: A cross-sectional multisite study. *Nurse Edu. Today*, 108: 105185.
3. Ayandele, A. and Jegede, M. O. 2016. Climate Change Education and Knowledge among Nigerian University Graduates. *Weather Clim.and Soc.*, 8(4): 465-473.
4. Budyko, M. I. 1974. *Climate and Life in D.H. Miller.* (Eng. Edi. Edit.). International Geophysics series, 18:290–316. Academic Press. NY.
5. Busallachi, A., Legler, D., Cattle, H., Palmer, T. and Gould, J. 2005. Climate Change and Variability—What can We Predict? *WMO Bull.*, 54(2): 51–57.
6. Chaudhary, P. 2002. Religious terrorism-the latest threat (Juxtaposition of Jammu's Heritage-Living and vibrant versus dead and decaying). 311-314.
7. Cordero, E. C., Centeno, D. and Todd, A. M. 2020. The role of climate change education on individual lifetime carbon emissions. *PloS one*, 15(2): e0206266.
8. Crona, B., Wutich, A., Brewis, A. and Gartin, M. 2013. Perceptions of climate change: Linking local and global perceptions through a cultural knowledge approach. *Climatic Change*, 119(2): 519-531.
9. Dar, R. A., Rashid, I., Romshoo, S. A. and Marazi, A. 2014. Sustainability of winter tourism in a changing climate over Kashmir Himalaya. *Envir. Monit. and assess.*, 186(4): 2549-2562.
10. Deressa, T. T., Hassan, R. M. and Ringler, C. 2011. Perception of and adaptation to climate change by farmers in the Nile basin of Ethiopia. *The J. of Agri. Sc.*, 149(1): 23-31.
11. Dijkstra, E. M. and Goedhart, M. J. 2012. Development and validation of the ACSI: Measuring students' science attitudes, pro-environmental behaviour, climate change attitudes and knowledge. *Environ. Edu. Res.*, 18(6): 733-749.
12. Environment Bureau. 2010. Hong Kong's Climate Change Strategy and Action Agenda: Consultation Document. Hong Kong: Environment Bureau, HKSAR Government.
13. Freije, A. M., Hussain, T. And Salman, E. A. 2017. Global warming awareness among the University of Bahrain science students. *J. Assoc. Arab Univ. Basic Appl. Sci.*, 22: 9–16.
14. Hansen, J., Ruedy, R., Sato, M. and Lo, K. 2010. Global surface temperature change. *Rev. of Geophys.*, 48(4).
15. Hickman, C., Marks, E., Pihkala, P., Clayton, S., Lewandowski, R. E., Mayall, E. E. and van Susteren, L. 2021. Climate anxiety in children and young people and their beliefs about government responses to climate change: a global survey. *The Lancet Planet. Hlth.*, 5(12): e863-e873.
16. Houghton, J. T. 2004. *Global Warming-The Complete Briefing.* Cambridge University Press. 216-241.
17. Hussain, M. 1987. *Geography of Jammu and Kashmir State*, Rajesh Publication, New Delhi. pp11-18.
18. ICSU. 1985. *Global Change. Proceedings of International Council of Scientific Union (ICSU).* T.F. Malone and R.G. Roederer. Eds. Cambridge University Press.
19. Ikeme, J. 2005. Assessing the Future of Nigeria's Economy: Ignored Threats from the Global Climate Change Debacle. *Africa Economic Analysis.* ([www.Africa Economic Analysis.org](http://www.AfricaEconomicAnalysis.org)).individual lifetime carbon emissions. *PloS one*, 15(2): e0206266.
20. IPCC. 2000. *Special report on emissions scenarios*, Cambridge University Press, Cambridge, UK.

21. IPCC. 2001. The Third Assessment Report on Climate change: Impacts, Adaptation and Vulnerability. Cambridge University Press.
22. IPCC. 2007. The Fourth Assessment Report on Scientific Aspects of Climate Change: for Researchers, Students and Policy makers. Cambridge University Press.
23. Jamal, S. and Ahmad, W. S. 2020. Assessing land use land cover dynamics of wetland ecosystems using Landsat satellite data. *SN Applied Sc.*, 2(11): 1–24.
24. Kiliñ, A., Boyes, E. and Stanisstreet, M. 2011. Turkish school students and global warming: beliefs and willingness to act. *Eurasia J. Math. Sci. Technol. Educ.*, 7(2): 121–134.
25. Leiserowitz, A. 2006. Climate change risk perception and policy preferences: The role of affect, imagery, and values. *Climatic Change*, 77(12): 45–72.
26. Liarakou, G., Athanasiadis, I. and Gavrilakis, C. 2011. What Greek secondary school students believe about climate change. *Internat.J. of Envir. and Sc. Edu.*, 6(1): 79-98.
27. Malhotra, N.K., and Dash, S. (2018). *Marketing Research: An Applied Orientation* (7th ed.). Pearson India Education Services.
28. Mandleni, B. and Anim, F. D. K. 2011. Climate change awareness and decision on adaptation measures by livestock farmers in South Africa. *J. of Agricul.Sc.*, 3(3): 258.
29. McIntosh, D. H. and Thom, A. S. 1973. *Essentials of Meteorology*. Wykeham Publishing Ltd. London.
30. Mustafa, G., Latif, I. A., Bashir, M. K., Shamsudin, M. N. and Daud, W. M. N. W. 2019. Determinants of farmers' awareness of climate change. *Appl. Environ. Edu. & Comm.*, 18(3): 219-233.
31. Nath, B. 2009. Instilling environmental awareness in undergraduate university students. *Environ. Edu. and Awareness.*, 1: 244-253.
32. Ogunsola, O. E., Araromi, O. I. and Adeshina, O. A. 2018. Studies on students' awareness on climate change education in Nigeria: A case study of the University of Ibadan. *J. of Emerg. Trends in Edu. Res. and Policy Stud.*, 9(6): 251-257.
33. Pachauri, S. and Spreng, D. 2011. Measuring and monitoring energy poverty. *Energy policy*, 39(12): 7497–7504. doi:10.1016/j.enpol.2011.07.008
34. Palomar, B. C. and Ingcol, R. S. 2020. Students' Conceptual Understanding and Images on Climate Change. *Students' Conceptual Understanding and Images on Climate Change*, 46(1): 20-20.
35. Pew Research Center (PRC) 2006. No global warming alarm in the U.S., China. Washington, D.C.: The Pew Research Centre for the People & the Press.
36. Pugliese, A. and Ray, J. 2009. A heated debate: Global attitudes toward climate change. *Harvard Internat. Rev.*, 31(3): 64.
37. Sarkar, S. and Padaria, R. N. 2010. Farmers' awareness and risk perception about climate change in coastal ecosystem of West Bengal. *Ind. Res. J. of Exten. Edu.*, 10(2): 32–38.
38. Shimo-Barry, A. 2008. *The environment equation—100 factors that can add to or subtract from your total carbon footprint*. London: New Holland.
39. Shrestha, U. B., Gautam, S. and Bawa, K. S. 2012. Wide spread climate change in the Himalayas and associated changes in local ecosystems. *PLoS One* 7(5):1–10.
40. Taber, F. And Taylor, N. 2009. Climate of concern—a search for effective strategies for teaching children about global warming. *Int. J. Environ. Sci. Educ.* 4 (2): 97–116.
41. Tse, K. H. (2013). Students' perceptions on climate change and engagement in low-carbon behaviours: implications for climate change education in Hong Kong. *HKU Theses Online (HKUTO)*.
42. United Nations Framework Convention on Climate Change (UNFCCC)(2013). Global Warming Potentials. Retrieved from [http://unfccc.int/ghg\\_data/items/3825](http://unfccc.int/ghg_data/items/3825).

43. United States Global Change Research Programme (USGCRP) (2009). Climate Literacy: The Essential Principle of Climate Science: A Guide for Individuals and Communities: A Climate-Oriented Approach for Learners of all Ages. Second Version Retrieved on 5<sup>th</sup>May, 2015 from: [www.globalchange.gov](http://www.globalchange.gov).
44. USAID. 2007. Adapting to Climate Variability and Change – A Guidance Manual for Development Planning (United State Agency for International Development (USAID) in Duane Muller (Ed.).
45. Wong, K. K. 2012. Global climate change and low-carbon living: Perceptions of secondary school students in Hong Kong. Hong Kong: Sino-Forest Applied Research Centre for Pearl River Delta Environment, Hong Kong Baptist University.
46. Zeeshan, M., Sha, L., Tomlinson, K. W. and Azeez, P. A. 2021. Factors shaping students' perception of climate change in the western Himalayas, Jammu & Kashmir, India. *Curr. Res. in Environ. Sustain.*, 3: 100035.