CLIMATE CHANGE KNOWLEDGE, ENGAGEMENT IN LOW CARBON BEHAVIOUR AND BARRIERS TO ADOPTION AMONG STUDENTS IN THE WESTERN HIMALAYAS, JAMMU & KASHMIR, INDIA

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Abstract: Jammu and Kashmir being part of Himalayas is thought to be particularly vulnerable to climate change, developing adaptation methods for the region to deal with its effects is essential. Local to regional levels of grassroots participation should be involved in the development and implementation of these adaptation programmes. Locals must be aware of climate change and its effects in order to participate in the process of development and implementation of the programmes in an informed manner. Hence, we explored the level of awareness among undergraduate students regarding climate change, engagement in low carbon behaviour, barriers in adoption of low carbon behaviours and views on effects of climate change. 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 are not much aware about the causes, impacts and solutions of climate change. However the students were intending to be engaged in low carbon behaviours, but hurdles in engagement were also found to be high. It was also found that there exists significant difference, in understanding of climate change, among students with respect to their gender and mothers' education. 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 and in case of views on impacts of climate change on several aspects in Jammu and Kashmir, significant difference was observed with respect to gender, father's education and family income.

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Key Words: Climate Change, 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, Kilinç 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) The degree of student understanding of climate change, their participation in low-carbon behaviour, and the adoption hurdles.

ii) Whether gender, subject stream impacts students' perceptions about climate change.

iii) Whether parental literacy and family income of students have impact on their perception about climate change.

iv) Whether rural and urban students differ in their perception about climate change and 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).

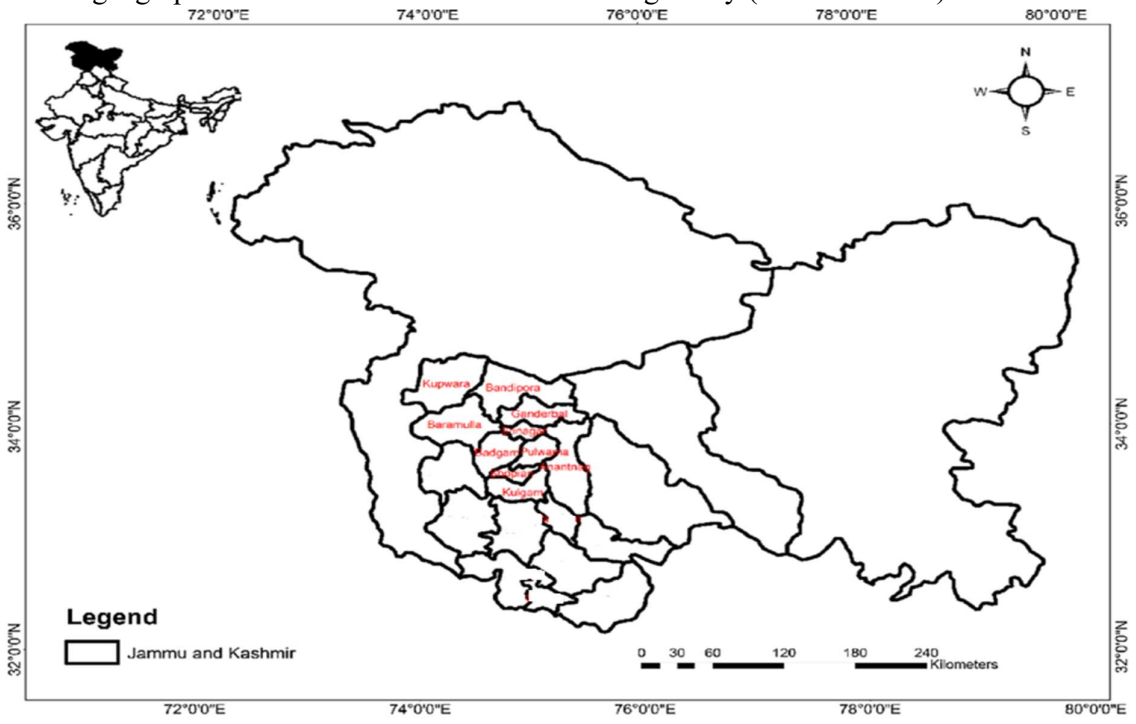

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Figure 1: Map of Jammu & Kashmir showing 10 districts of Kashmir Valley

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 perceive climate change, our questionnaire had four components, each of which was derived from a different researcher.

Section A investigates the students' understanding of climate change in terms of its causes, effects, and solutions. Ten questions that make up the scale were taken from Liarakou et al. (2011), Dijkstra & Goedhart (2012) and Wong (2012). The scale was scored using a 3-point Likert system, where 1 denotes "True," 2 denotes "False," and 3 denotes "Don't Know."

Section B 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-C 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.

Section-D looks into how pupils viewed the severity of the impacts of climate change in the Jammu and Kashmir. The Environment Bureau picked the survey items as the most sensitive components that will be most negatively impacted by climate change (Environment Bureau 2010). The seven-item measure covered both the natural environment and the human environment. A 5-point Likert scale was employed, with "1" denoting the extremely unserious and "5" the reverse.

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 1st were 197, 192 from semester 2nd , 177 from semester 3rd, 191 from semester 4th , 198 from semester 5th and 174 from semester 6th, 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 were712, 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: Understanding about Climate Change (UCC).

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

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

Section D: Impacts of climate change on several aspects in Jammu and Kashmir(ICC).

The Cronbach's α value for the sub variables under Section A, B ,C and D is 0.815, 0.848, 0.679 and 0.775 respectively(Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization).

The composite reliability (CR) for LCB, UCC, ICC and HLCB are 0.802, 0.768, 0.777 and 0.681(rounded of to 0.7) respectively While as average variance extracted (AVE) values of LCB, UCC, ICC and HLCB are 0.332, 0.294, 0.335 and 0.302 respectively.

Table 2: Convergent and Discriminant Validity

Variable	CR	AVE	LCB	UCC	ICC	HLCB
LCB	0.802	0.332	**0.576**			
UCC	0.768	0.294	-0.136***	**0.542**		

ICC	0.777	0.335	0.295***	-0.232***	**0.579**	
HLCB	0.681	0.302	0.324***	-0.126**	0.541***	**0.550**

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. By comparing the squared root of AVEs of the constructs with the corresponding construct correlations, it is observed that all the diagonal values (the squared root of AVE) are greater than off-diagonal values (inter-construct correlations), thus indicating the presence of good discriminant validity between construct.

Table 3: Student's understanding of climate change

S.No	Statement	Mean	SD	True	False	Don't know
1	Carbon dioxide has a stronger global warming potential than all other greenhouse gases. **Cause**	1.42	0.60	64.1	29.8	6.0
2	Climate change will lead to relocation of human settlements, plants, animals and disease. **Impact**	1.43	0.66	67	23.4	9.7
3	Reduce consumption and production cannot help mitigate climate change problem. **Solution**	1.42	0.64	66.2	25.2	8.6
4	The ozone depletion will enhance the greenhouse effect and global warming. **Cause**	1.42	0.65	67.2	23.3	9.5
5	Climate change will lead to global sea level rise and species extinction. **Impact**	1.41	0.67	69.1	20.1	10.8
6	The US government has ratified "Kyoto Protocol" already. **Solution**	1.49	0.66	60.1	30.6	9.4
7	Methane is a greenhouse gas. **Cause**	1.40	0.65	68.6	22.3	9.1
8	Sustainable development is a solution to climate change Problem. **Solution**	1.51	0.70	60.8	27.5	11.7
9	Burning fossil fuels and deforestation will increase the concentration of carbon dioxide in the atmosphere. **Cause**	1.37	0.65	72.2	18	9.8

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10	Renewable energy sources are example of sustainable development. It can alleviate the climate change problem. **Solution**	1.56	0.73	58.3	27.2	14.5

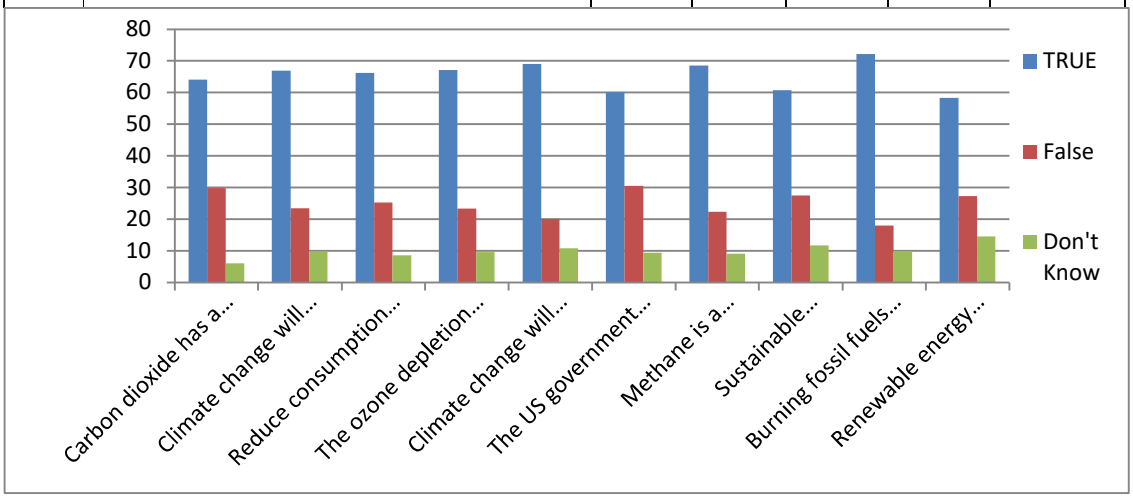


Figure 2: Student's understanding of climate change

From Table 3 and Fig 2, it can be inferred that students are not much aware about the causes, impacts and solutions of climate change as depicted by the mean value of 1.44 with 37% of the student having knowledge about the climate change and 35.51% gave wrong answer to the question about climate change. However, only 30.6% students were aware that US, the largest producer of greenhouse gases, has not ratified Kyoto protocol. More than 70% students were having knowledge about the burning of fossil fuels and deforestation as responsible causes of climate change. Only 23.3% students were knowing that ozone depletion will not lead to global warming as they are different environmental issues. It was also found that only 29.8% students were knowing that carbon dioxide is not having strong global warming potential (GWP) than other greenhouse gases as gases like methane, CFCs, nitrous oxide is having stronger GWP than carbon dioxide (UNFCCC 2013).

Table 4: 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^{0}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

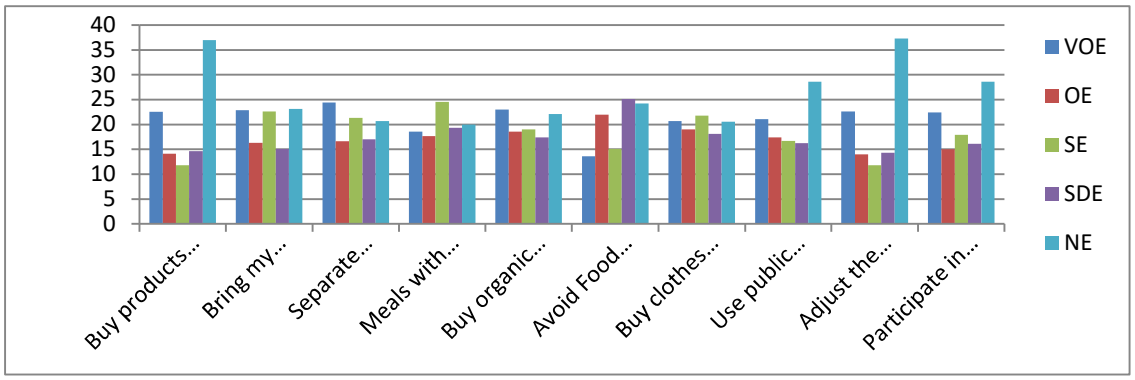


Figure 3: Students' engagement in low carbon (Green Living) Behaviors (LCB)

As shown in Table 4 and Figure 3, 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 5: 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

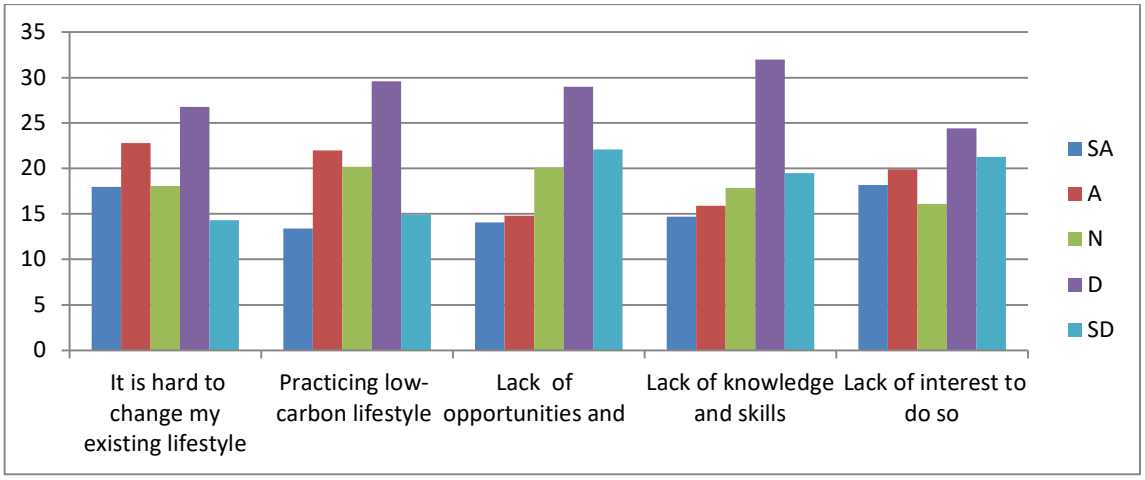


Figure 4: Students' views on hurdles/barriers in adopting low carbon Behaviour

As illustrated in Table 5 and Figure 4, 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 6: Students' view on impacts of climate change in Jammu & Kashmir

S.No.	Statement	Mean	SD	VUS	US	M	S	VS
1	Ecological environment and wildlife.	3.29	1.42	16.6	12.9	23.3	19.6	27.6
2	Industrial and commercial activities	3.39	1.25	8.3	19.2	19.8	30.4	22.2
3	Built environment and infrastructure.	3.22	1.32	13.6	16.3	25.7	23.5	20.9
4	Energy use and supply	3.32	1.32	12.3	16.3	21.9	26.3	23.2
5	Food supply	3.38	1.35	12.8	14	23.1	23	27.1
6	Melting of glaciers	3.45	1.48	16.1	13	16.1	19.3	35.4
7	Human Health	3.60	1.43	13.4	10.5	18.1	19	39.1

SD..Standard deviation VUS..Very Unserious, US..Unserious, M...Moderate, S…Serious,

VS…Very Serious

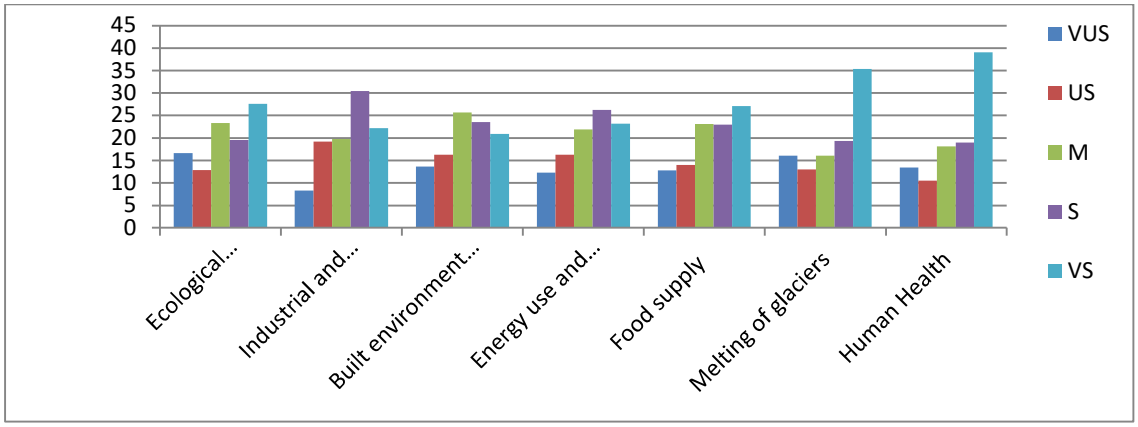


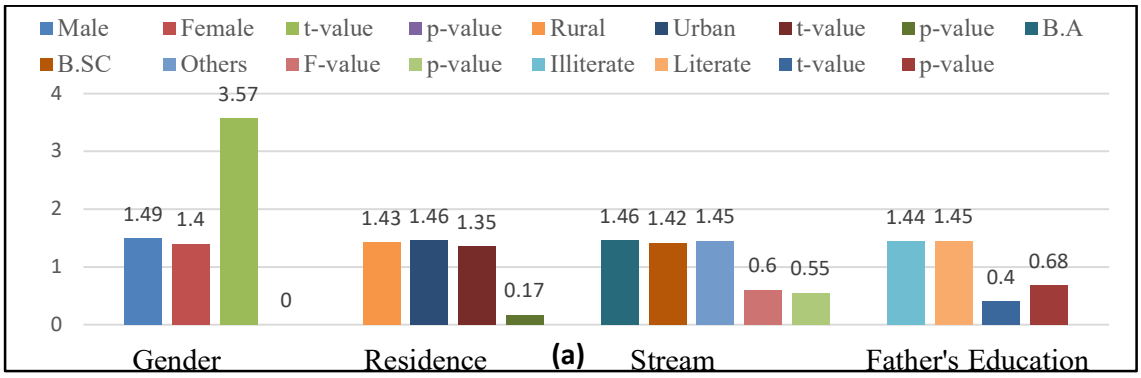
Figure 5: Students' view on impacts of climate change in Jammu & Kashmir

As observed from Table 6 and Figure 5, students believe that climate change has caused acute impacts in Jammu and Kashmir (Over all Mean= 3.38). Students were found to be of the opinion that climate change in Kashmir is having very serious impacts on human health (Mean=3.60) and melting of glaciers (Mean=3.45) and moderate effects on built environment and infrastructure (Mean=3.22). Students also viewed the impact on ecological environment (Mean=3.29) and food supply (Mean =3.38) as serious one.

Table 7: Student's understanding of climate change with respect to their Socio-demographic attributes

S.No.	Gender	NO.	Mean	SD	t-value	p-value
01	Male	537	1.49	0.43	3.57	0.00
02	Female	592	1.40	0.38		
S.No.	**Residence**	**NO.**	**Mean**	**SD**	**t-value**	**p-value**
01	Rural	663	1.43	0.40	1.35	0.17
02	Urban	466	1.46	0.42		
S.No.	**Stream**	**NO.**	**Mean**	**SD**	**F-value**	**p-value**
01	B.A	583	1.46	0.40	0.60	0.55
02	B.SC	306	1.42	0.42		
03	Others	240	1.45	0.41		
S.No.	**Father's Education**	**NO.**	**Mean**	**SD**	**t-value**	**p-value**
01	Illiterate	417	1.44	0.39	0.40	0.68
02	Literate	712	1.45	0.42		
S.No.	**Mother's Education**	**NO.**	**Mean**	**SD**	**t-value**	**p-value**
01	Illiterate	590	1.42	0.38	2.50	0.01
02	Literate	539	1.48	0.43		

S.No.	Semester	NO.	Mean	SD	F-value	p-value
01	1st	192	1.45	0.41	1.32	0.25
02	2nd	197	1.45	0.40		
03	3rd	177	1.39	0.38		
04	4th	191	1.46	0.41		
05	5th	198	1.49	0.44		
06	6th	174	1.43	0.39		
S.No.	**Father's Occupation**	**NO.**	**Mean**	**SD**	**F-value**	**p-value**
01	Govt. Service	245	1.40	0.39	2.52	0.08
02	Private Service	246	1.43	0.39		
03	Self Employed	638	1.48	0.42		
S.No.	**Family Income**	**NO.**	**Mean**	**SD**	**F-value**	**p-value**
01	Below 25000	674	1.46	0.41	1.57	0.21
02	25000-50000	251	1.41	0.37		
03	Above 500000	204	1.46	0.43		



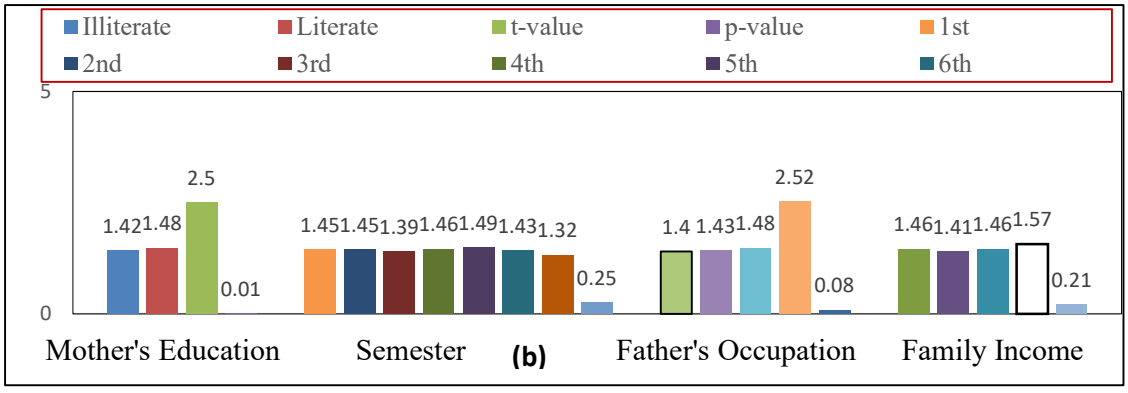


Figure 6 (a) and (b): Student's understanding of climate change with respect to their Socio-demographic attributes

Table 8: 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	1st	192	3.24	0.94	1.04	0.39
02	2nd	197	3.10	0.90		
03	3rd	177	3.05	0.98		
04	4th	191	3.07	1.01		
05	5th	198	3.06	1.00		
06	6th	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		

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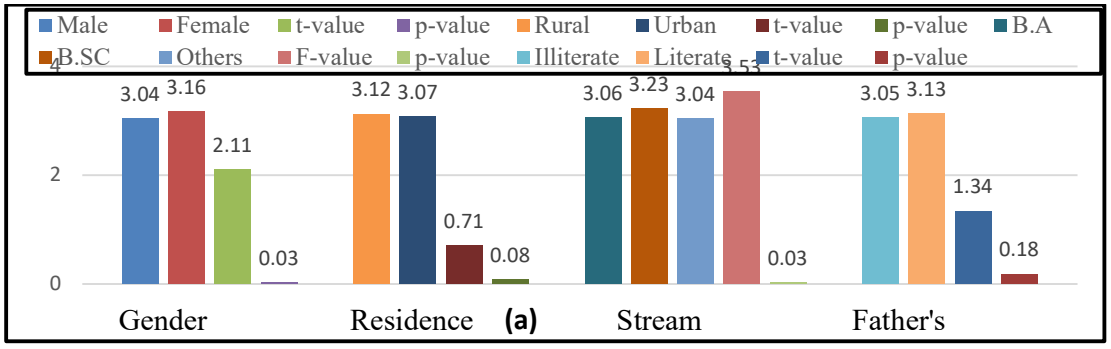


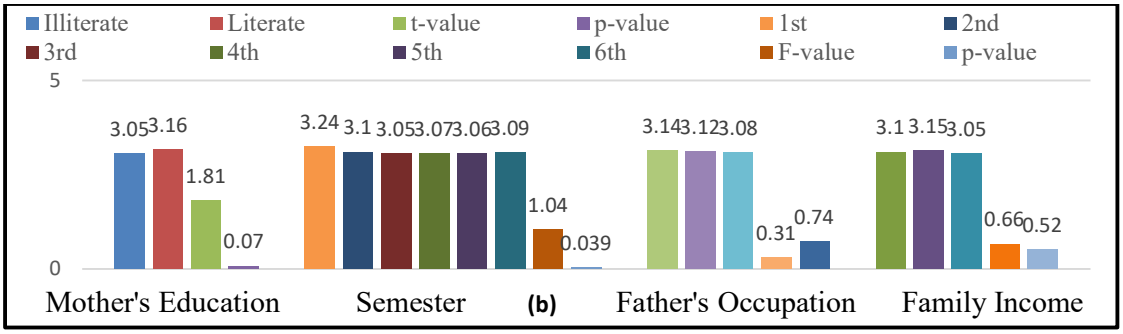
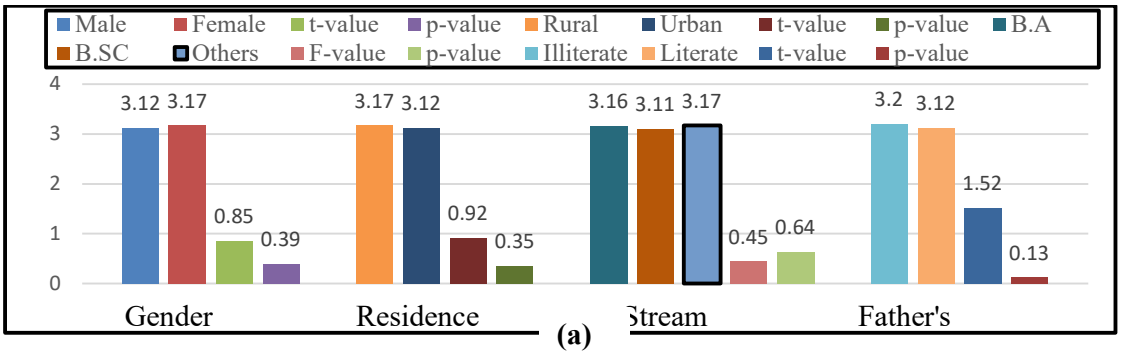


Figure 7 (a) and (b):: Student's engagement in low carbon behaviour with respect to their Socio-demographic attributes

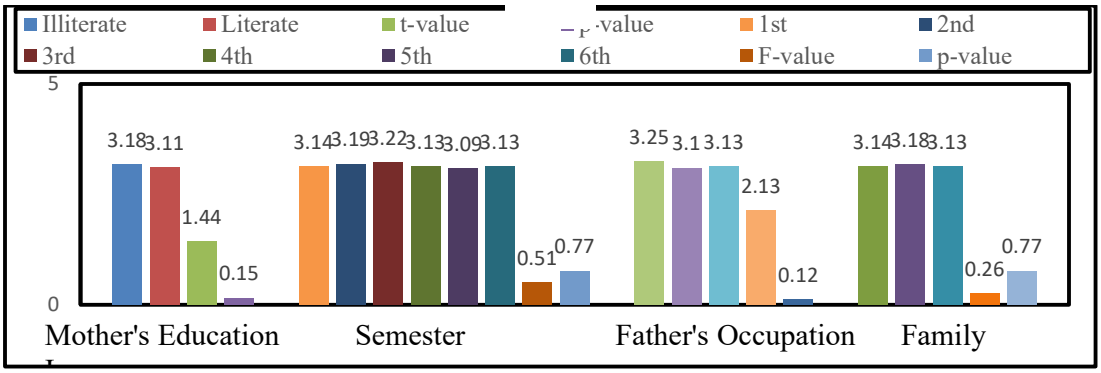
Table 9: Student's views on hurdles/barriers in adopting low carbon behaviours with respect to their Socio-demographic attributes

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	1st	192	3.14	0.79	0.51	0.77
02	2nd	197	3.19	0.86		

03	3rd	177	3.22	0.89		
04	4th	191	3.13	0.97		
05	5th	198	3.09	0.85		
06	6th	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		



(a)



(b)

Figure 8 (a) and (b): Student's view urdles/barriers in adopting low carbon behaviours with respect to their Socio-demographic attribut

Table 10: Students' view on effects of climate change in Jammu &Kashmirwith respect to their Socio-demographic attributes

S.No.	Gender	NO.	Mean	SD	t-value	p-value
01	Male	537	3.32	0.89	1.99	0.04

02	Female	592	3.43	0.89		
S.No.	**Residence**	**NO.**	**Mean**	**SD**	**t-value**	**p-value**
01	Rural	663	3.37	0.87	0.16	0.87
02	Urban	466	3.38	0.92		
S.No.	**Stream**	**NO.**	**Mean**	**SD**	**F-value**	**p-value**
01	B.A	583	3.34	0.89	1.21	0.29
02	B.SC	306	3.38	0.97		
03	Others	240	3.45	0.82		
S.No.	**Father's Education**	**NO.**	**Mean**	**SD**	**t-value**	**p-value**
01	Illiterate	417	3.28	0.88	2.88	0.01
02	Literate	712	3.44	0.89		
S.No.	**Mother's Education**	**NO.**	**Mean**	**SD**	**t-value**	**p-value**
01	Illiterate	590	3.37	0.89	0.37	0.71
02	Literate	539	3.39	0.89		
S.No.	**Semester**	**NO.**	**Mean**	**SD**	**F-value**	**p-value**
01	1st	192	3.48	0.86	1.59	0.16
02	2nd	197	3.28	0.84		
03	3rd	177	3.29	0.87		
04	4th	191	3.38	0.94		
05	5th	198	3.39	0.90		
06	6th	174	3.44	0.92		
S.No.	**Father's Occupation**	**NO.**	**Mean**	**SD**	**F-value**	**p-value**
01	Govt. Service	245	3.46	0.92	1.32	0.27
02	Private Service	246	3.35	0.86		
03	Self Employed	638	3.35	0.89		
S.No.	**Family Income**	**NO.**	**Mean**	**SD**	**F-value**	**p-value**
01	Below 25000	674	3.33	0.87	3.50	0.03
02	25000-50000	251	3.50	0.92		
03	Above 500000	204	3.39	0.91		

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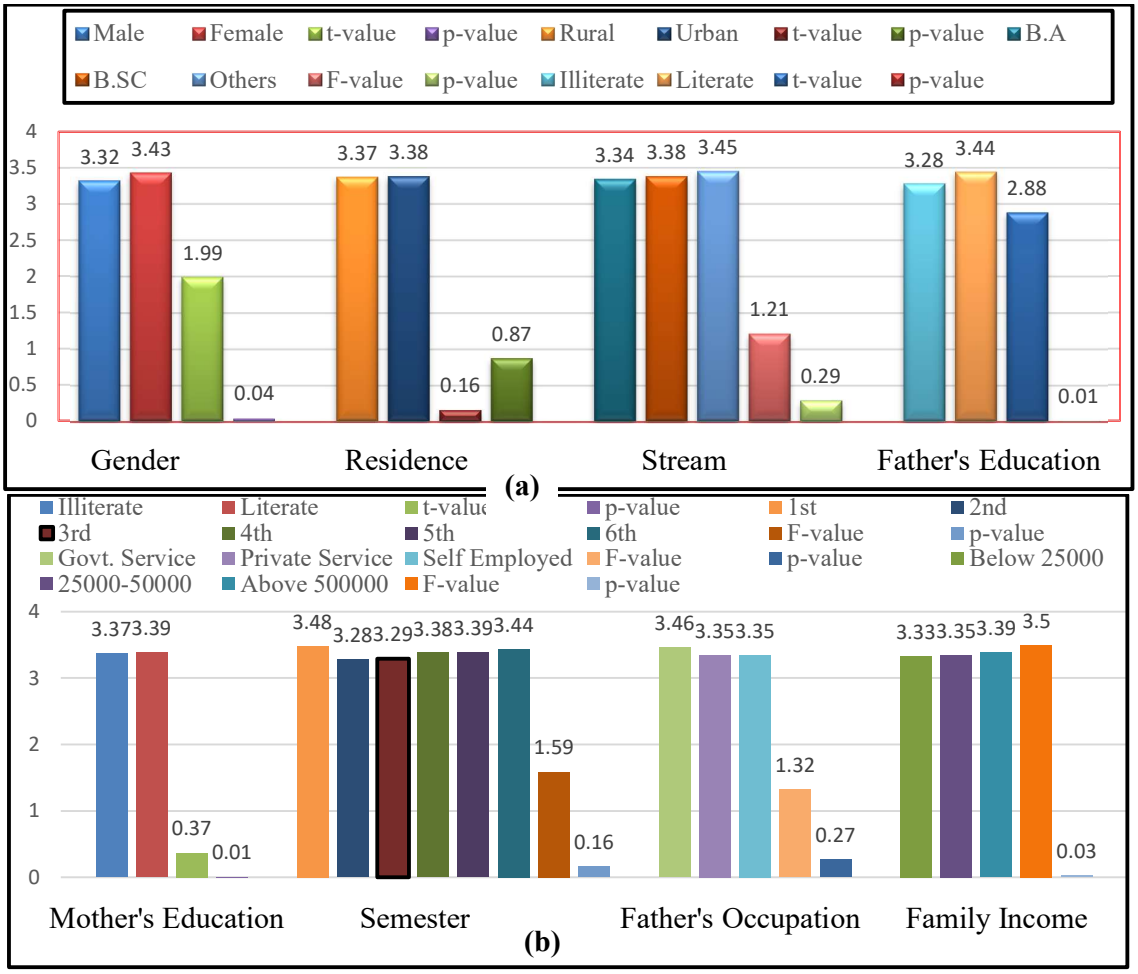

Figure 9 (a) and (b): Students' view on effects of climate change in Jammu & Kashmir with respect to their Socio-demographic attributes

Table 7 and Figure 6 (a) and (b) revealed that there exists significant difference, in understanding of climate change, among the undergraduate students of various colleges of Kashmir valley with respect to their gender as depicted by t-value (3.57) and p-value(0.00) and thus significant at 0.05 level with male students having better understanding of climate change than female students as depicted by their mean values(1.49 for males and 1.40 for females).The difference was also found to be significant at 0.05 level with respect to their mothers' education as depicted by their t-value (2.50) and p-value (0.01) with students having literate mothers more aware than students with illiterate mothers. However no significant difference in understanding climate change was found with respect to residence, subject stream, fathers' education, semester in which studying, fathers' occupation and family income.

Table 8 and Figure 7 (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 9 and Figure 8 (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.

Table 10 and Figure 9 (a) and (b) revealed that there exists significant difference, in views on effects of climate change on various aspects in Jammu and Kashmir, among the undergraduate students of various colleges of Kashmir valley with respect to their gender as depicted by t-value (1.99) and p-value(0.04) and thus significant at 0.05 level with female students having better views on effects of climate change than male students as depicted by their mean values(3.32 for males and 3.43 for females).The difference was also found to be significant at 0.05 level with respect to their fathers' education as depicted by their t-value (2.88) and p-value (0.01) with students having literate fathers more aware about the effects of climate change than students with illiterate fathers. It was also found that family income was having significant effect on the views of students regarding climate change as depicted by their F-value (3.50) and p-value (0.03) with students from middle class income families more aware about the effects of climate change than students from upper and lower class family income as depicted by their mean values. However no significant difference in understanding climate change was found with respect to residence, subject stream, mothers' education, semester in which studying and fathers' occupation.

4. Conclusions

The perception of undergraduate students of Kashmir Valley towards climate change was studied by studying their knowledge about climate change, engagement in low carbon behaviour (LCB), barriers in adoption of low carbon behaviours and views on effects of climate change. It was concluded that students are not much aware of the causes, impacts and solutions of climate change, 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 and effects of climate change were found to be acute. It was also concluded that there exists significant difference, in understanding of climate change, among students with respect to their gender and mothers' education. 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 and in case of views on impacts of climate change on several aspects in Jammu and Kashmir, significant difference was observed with respect to gender, father's education and family income.

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.

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