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Review

Students' Attitude toward Carbon Footprints of a Leading Private University in India

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Students' Attitude toward Carbon Footprints of a Leading Private University in India

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Abstract

Asia-Pacific is currently in charge of almost half of the worldwide carbon outflows and thus causing harm to the environment. So, in order to reduce the carbon outflow, it is important to calculate or know the carbon dioxide emissions of Indian students perusing higher education in India and analyze the attitudes of students to reduce carbon footprint levels in the university campus. For this purpose, data were collected by conducting an online survey from 200 students pursuing higher education in a leading private university to assess individual carbon footprint per student by using the calculator developed. Findings revealed that higher awareness level of individual footprints positively impacted their behavior toward carbon footprint reduction as students are willing to avail shared services available in campus.

Keywords: Attitude-behavior estimation, carbon footprints, carbon emission calculator

1. INTRODUCTION

The Asia-Pacific locale is home to China and India—the world's two biggest emerging economies and most populous nations, which are also the two biggest producers of carbon dioxide. China and India are ranked number one and two in terms of population and collectively holding around 36% of the world's population. Over the previous decade, carbon dioxide emanations in this area have expanded at a normal yearly rate of 3.1%, relatively triple the worldwide normal. Subsequently, Asia-Pacific is currently responsible for almost half of worldwide carbon outflows. In 2016, worldwide outflows of carbon dioxide (CO_2) from nonrenewable energy sources and industry added up to 36.2 $\pm$ 2 gigatonnes (Gt), 62% more than that in 1990. The most populous nation, China, is also the biggest carbon dioxide (CO_2) producer and transmitter, as identified by the European Commission and the Environmental Protection Agency in the Netherlands, and then come the United States and India.

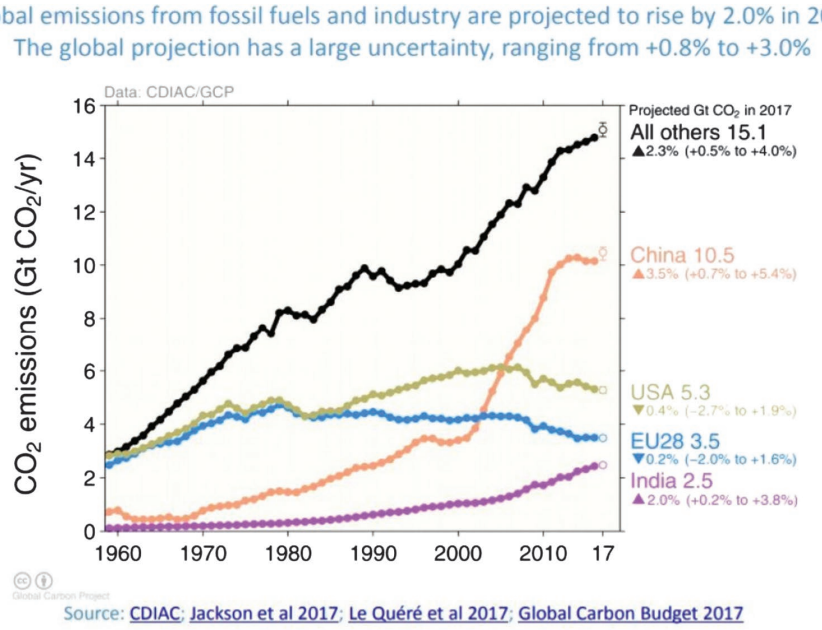
Although India has no compulsion, being a developing nation, to manage emissions, it may develop policies to cover and mitigate greenhouse gas (GHG) emissions and adaptation. The Climate Change Act of 2012 (India) focuses on reducing GHG emissions in India. India also aims to secure a carbon budget and trade plans. India's National Committee for Climate Change is constituted to advise the various government authorities on issues related to GHG emissions from different sectors, such as industry, transport, education, and energy. India aimed to reduce GHG emissions from its gross domestic product by up to 35% in the period from 2005 to 2030 under the Paris Climate Accord, against its old commitment to reduce by as much as 25%. Only a few scientific papers on GHG emissions from various sectors in India are available in the literature. Most of the papers/studies focus on the institutional or governmental contribution in carbon emission or the support and curbs done by them toward reducing the carbon footprint. Casey and Galor (2016) imply that 1% slower population growth could be accompanied by an increase in income per capita of nearly 7% while still lowering carbon emissions.

In India, the population is quite young: approximately 63% of them are in the mid-age group; furthermore, the literacy level has grown by leaps and bounds, and during the 2011 census, it was 74%. This young India is emerging, and considerable expectations are there from them with respect to environment changes and GHG emissions.

The study focuses on the students of a higher education institute, as this is a very important segment being currently ignored for GHG studies. India is a nation with the majority of its population under the age of 25 (Census of India, 2018). Furthermore, more than 35.7 million students are currently enrolled in some or the other higher education institute in the country, and it is expected that the knowledge of GHG emissions and carbon impact at this stage of education will help them in becoming climatic champions in the future. This is the motivation for this study. According to Klein-Banai, higher education institutions can take the lead in evaluating their emissions, developing climate change plans, and identifying possible reductions. All over the world, this type of initiative has been undertaken by several universities, such as University of Leeds, United Kingdom; University of Illinois, Chicago (UIC); University of Cape Town (UCT) South Africa; Norwegian Technological and Scientific University (NTNU); De Montfort University, United Kingdom; Yale University (Yale Uni.), United States. However, in the case of Indian higher education institutions, such an initiative still needs to be taken. This research is conducted to measure the carbon dioxide emissions of students studying in a university campus of India and their attitude toward the reduction of carbon emissions. Jabbour (2010) also describes that universities have a significant impact on the environment in terms of GHG emissions. Therefore, it is important to approach the level of awareness of higher education institutions, as they are a breeding ground for leaders. A real level of awareness can help them use this knowledge to create a sustainable environment. The objective of this research is to calculate the carbon dioxide emissions of Indian students participating in higher education in India and analyze the attitudes of students toward reducing carbon footprint levels on the university campus.

China's robust increase in emissions is expected to further increase by 3.5% in 2017. "Coal use, China's largest fuel source, could increase by 3% due to heavy growth in industrial production and reduced production of hydroelectric power because of the smaller amount of rainfall," says Glen Peters, director of research at CICERO in Oslo. India's emissions were forecast to increase by 2% in 2017, which is less than the average increase of 6% over the past decade. According to the Global Carbon Budget, this decrease is due to government interventions in the economy, and emissions from other countries, which account for about 40% of global CO_2 emissions, are expected to increase by about 2-3% in 2017 (Figure 1).

Figure 1. Global Emissions from Fuels and Industry.



The allocation and accounting of all emissions attributable to various human activities are complex and difficult (Bastianoni, Pulselli, Tiezzi, 2004; Department of the Environment, Food and Rural Environment, 2009). The present study uses the scope defined under standard ISO-14064. Although Scope 1 (direct emissions from sources of ownership controlled by the reporting organization) and Scope 2 (purchased electricity) are the simplest to allocate and calculate, Scope 3 emissions (the remaining indirect emissions and goods and services sold) are quantified in their entirety (Ranganathan et al., 2004; Huang et al., 2009). Despite convincing arguments for quantifying Scope 3 emissions, up to 80% of the carbon footprint can be attributed to undeclared indirect impacts (Ozawa-Meida et al., 2011). This problem is compounded by the complex nature of the activities of the organizations and the variables with which they operate (Williams et al., 2012a, 2012b).

It is well established that institutes of higher education are influential actors in shaping both local and national policies, by providing information to society through cutting-edge research and producing learned graduates (Etzkowitz, 1998). In addition, successful innovation incubators, many of which are sustainable start-ups, have also emerged [e.g., Blackout (University of Southampton, 2012), Student Interruption (Jones, 2012)].

2. BENCHMARK

Individual carbon footprint calculators are available on mobile application (8 on Google apps with, in total, 25,000 downloads).

- Carbon footprint calculators for companies are available online (10 are accessible on Google).
- The online software and platforms that engage communities and workers in the reduction of their carbon footprint (2 software).

In each category, the most complete and creative software has been selected to understand, analyze, and compare them and to find what are the good and bad points of each. The following have been noted:

For the carbon footprint calculator for companies, the website of "MyClimate.org" from Switzerland.

The good idea: Enable individuals to work in communities to reduce CO_2 emissions.

Carbon culture: Be able to pilot communities and individuals in the reduction of the whole carbon footprint. Use games and positive thinking. Use postal card to invite managers to new actions to decrease CO_2 emissions.

MyClimate: Very user friendly and clear calculator to evaluate company carbon footprint emissions.

After selecting the method that can make a successful calculator, these characteristics have been implemented into the framework for developing the students' carbon footprint calculator.

3. THE BARRIERS TO ENVIRONMENTAL ACTIONS

A. For what reason do students act naturally and what are the boundaries to proenvironmental conduct?
Various hypothetical systems are currently available to clarify the gap between awareness and ownership of environmental information and showing expert environmental conduct. To outline, variables have been identified to generate impact, negative or positive, on environmental conduct like external factors (e.g., institutional, monetary, social, and cultural) and internal components (e.g., inspiration, professional ecological learning, mindfulness, values, dispositions, feeling, locus of control, duties, and needs) (Kollmuss and Agyeman 2002).

B. Why natural information does not lead specifically to ace ecological conduct?
The Rajecki display
By "pro environmental conduct," researchers basically mean conduct that intentionally tries to limit the negative effect of one's activities on the normal and assembled world (e.g., limit asset and resource utilization, utilization of nondangerous substances, diminish waste generation). Characterized four causes that help a student adjust their conduct to his or her new environmental information.

Direct versus indirect student experience: Direct encounters affect individuals' conduct more than indirect encounters. For example, finding out about a natural issue in school rather than encountering it in person (e.g., seeing dead fish in the stream) will prompt weaker relationship among state of mind, attitude, and behavior of the student.
Normative impacts: Social standards, social conventions, and family traditions impact and shape students' state of mind—for example, the predominant culture proliferates a way of life that is unsustainable; proenvironmental conduct is more averse to happen, and the gap among disposition and activity would widen.
Temporal disparity: Inconsistency in results happen when data collected for attitudes and information accumulation for the action lie far separated (e.g., after Chernobyl, a lion's share of Swiss individuals were against atomic activity, yet a notice of 2 years after the fact that put a 10-year stop to building any new atomic reactors in Switzerland was endorsed by just an extremely limited edge). Temporal disparity alludes to the way that students' attitudes change over a period of time.
Attitude–behavior estimation: Often the deliberate states of mind are substantially more broader in scope (e.g., Do you think about the earth?) than the deliberate activities (e.g., Do you reuse?). This prompts errors in results.

C. For what reason does environment learning not lead specifically to proenvironmental conduct?
The Hines display
Sia et al. (1985-1986) completed a meta investigation of 128 proenvironmental conduct explore studies and found the accompanying factors related with capable proenvironmental conduct:

Knowledge of issues: The student must be acquainted with the environmental issue and its causes.
Knowledge of action strategies: The student should know how one could reduce impact on the environment.
Locus of control: This portrays students' view of whether they could achieve change through their own actions. Students with a stronger inner locus of control believe that their activities could realize change. In contrast, students with external locus of control feel that their activities are immaterial, and change must be realized by groundbreaking others.
Attitudes: Students with solid proenvironmental mentalities were observed to probably engage in genius proenvironmental conduct, yet the connection between attitude and activities turned out to be weak.
Verbal commitment: The communicated ability to make a move also gave some sign about the student's readiness to take part in proenvironmental conduct.
Individual sense of responsibility: Students with a more prominent feeling of personal responsibility will probably have an engaged attitude toward environmental conduct.

D. For what reason does environmental information does not lead straightforwardly to proenvironmental conduct?
Fietkau and Kessel (1981) utilize sociological as well as psychological elements to clarify proenvironmental conduct or its absence. Their model contains factors that impact either specifically or indirectly proenvironmental conduct. These factors are independent from each other and can be impacted and changed.

Possibilities to act ecologically. These are outer, infrastructural, and financial elements that empower or thwart a student from acting ecologically.
Behavioral incentives. These are more interior factors that can fortify and support ecological conduct (e.g. social desirability, personal satisfaction, savings).
Perceived feedback about ecological behavior (wahrgenommene Konsequenzen). A student should receive positive feedback to proceed with a specific ecological conduct. This feedback may be internal (e.g., fulfillment of "making the best decision") or external (e.g., social: not littering or reusing are socially attractive activities, monetary: getting cash for gathered containers).
Knowledge (Wissen). In Fietkau's model, knowledge does not directly impact conduct but rather goes about as a modifier of mental attitude and values.

4. RESEARCH METHODOLOGY

This study is exploratory in nature, as this study aims to assess individual carbon footprints per student by using the calculator developed for this purpose. This calculator can provide a fair idea on the carbon emission footprint emitted by students pursuing higher education within the university and their attitude toward reducing carbon emission by themselves. For collecting data from the students, detailed instruction related to the carbon emission calculator and the information about the scope were explained to them. Then, students were asked to calculate their individual scores. Then an online survey was conducted among the students, and data were collected on the scoping parameters and the students' attitude toward reducing individual carbon emission footprints. These quantitative data were analyzed, and the analysis provided insights to know where the individual emits CO_2 and can reduce consumption on priority. Data were collected from 200 students pursuing higher education in a leading private university.

Tools used: Carbon emission calculator of students with respect to their time spent at the university and other learning activities.

In this study, GHG protocol of ISO 14064 is utilized for estimation of the total CO_2 emissions with three scope definitions. Each scope is further subdivided into different categories as shown in Table 1.

5. ANALYSIS

Average carbon emission value calculated by carbon emission calculator came out to be KGCO2 116.53, which is less than the national carbon emission value. This is because almost 26.6% of the students are hostelers or live in the walking vicinity of the campus. Hence, they do not require vehicles for commuting to the campus.

Table 2 and Figure 2 show the results of a semantic differential question related to the attitude of students toward the carbon footprint in the university and other learning activities. The mean respondent's score is shown for each of the bipolar adjective pairs: "adequate-inadequate, disordered-ordered, open-secretive, complex-simple, old-fashioned-modern, ineffective-effective, and innovative-noninnovative" (Sangwan et al., 2018). Analysis of the data revealed that students exhibited a slightly optimistic view about their carbon footprint in the campus that is a bit normally distributed toward "innovative." The overall strongest attitude was identified in the bipolar pairing of "effective." Although a few negative connotations were identified, students favored "simple" over the more positive alternative. Moreover, 2.685 is the mean score of the bipolar attitude measured variable, which indicated that student of a private university has a positive attitude toward reducing carbon footprints.

Table 1. Scopes and Data Set Used in the Study.

Category	Use of data set
Scope 1	Direct emission by the students in university premises
Scope 2	Indirect emission by imported electricity consumed by the students in the university
Scope 3	Other indirect emissions from commuting; transportation of material, people, or waste; food emission; dry waste; water consumption; etc.

Figure 2. Results of Students' Attitude Toward Reducing their Carbon Footprint while in the University Campus Placed along a Continuum.

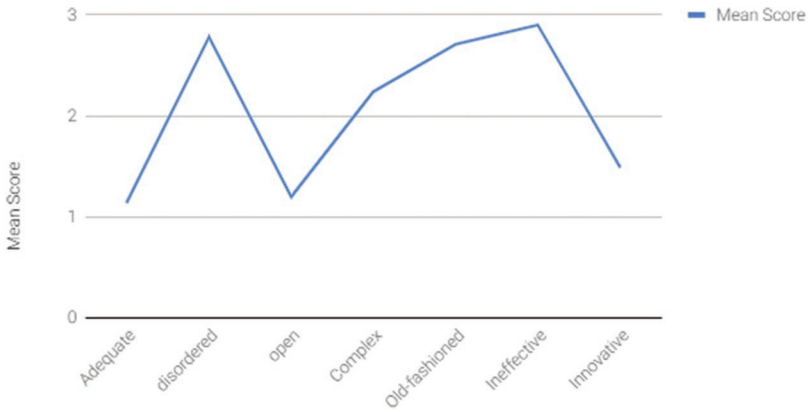


Table 2. Results of Students' Attitude toward Reducing Their Carbon Footprint while in the University Campus.

Bipolar attitude measuring variables	Mean score
Adequate	1.14
Disordered	2.78
Open	1.2
Complex	2.24
Old fashioned	2.71
Ineffective	2.9
Innovative	1.49

6. CONCLUSION

We all generate CO_2, directly and indirectly, and by that contribute to the emission of CO_2 to the atmosphere. We all have our own carbon footprint as individuals and as a society. On average, an individual Indian produces KGCO2 119 value, but a leading private university student produces KGCO2 116.53 value. Moreover, they have a positive attitude toward reducing their carbon emission footprints, as they want to contribute significantly to nature. It is observed that students emit higher carbon emission value due to high energy consumption by air conditioners in the campus. Although students use shared services such as metro, cabs, automobile, and buses for commuting to campus, still there are a considerable number of students who travel by their own vehicles, thereby increasing individual carbon footprints. Hence, higher education institutes should create an awareness among students about the measures for reducing carbon footprint, as students have a positive attitude toward it. Furthermore, it was observed that higher awareness level of individual footprints positively impacted their behavior toward carbon footprint reduction.

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