



STUDY OF DIGITAL CARBON FOOTPRINT CREATED BY E-MAILS AMONG COLLEGE STUDENTS.

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Abstract :

The Internet is an indispensable part of our lives. Many of us access the internet on a daily basis which clearly shows the huge potential of this global system of interconnected networks and how people around the world are easily addicted to it. E-business and E-commerce being the new normal, the exchanges of e-mails have accelerated since the 2020 pandemic. E-mails form a crucial part of every commercial, social, and academic system throughout the world. During this process every time internet leaves a carbon footprint. Carbon footprint is the total amount of greenhouse gases (including carbon dioxide and methane) that are generated by our actions. The major contributors to carbon footprints are food, consumption, transportation, and household energy. The newly added category is digital carbon footprint wherein the time spent scrolling, browsing and sending emails can leave Carbon trails behind. A digital survey response was recorded from college students from various backgrounds. College students form the main area of study because youths are the majority victims under this category which is mainly dominated by students and teenagers. The research focuses on an average digital carbon footprint generated by college students via E-mails stored, received, and sent by them in a day. The data collected revealed the lack of awareness related to digital carbon footprint and yield figures to reach a conclusion. The study highlights the adverse effects of storing E-mails on the environment and discusses the remedies to cut off the digital carbon footprint generated by E-mail.

Key words: carbon footprint, climate change

Introduction:

Carbon forms an essential part of our nutrient cycle. It occurs in various forms in nature such carbon monoxide and carbon dioxide., etc. Of which Carbon dioxide forms 0.04% of our atmosphere and is essential for growth and development of biotic factors. Every Biotic factor emits a certain amount of carbon back to the atmosphere to complete the nutrient cycle and thus leaving behind a carbon footprint . A carbon footprint is a measure that allows the calculation of the total climate change impact of something by a carbon dioxide equivalent (CO₂e) metric.

The carbon footprint generation is a natural process but due to human interventions and natural processes the amount of carbon footprint generated increases and thus impacts the overall health of the ecosystem and thereby affecting the environment. Several human and natural activities result in CO₂ emissions. In the atmosphere, many of these activities contribute toward emitting a specific amount of carbon. The US alone is contributing 79% of carbon emission due to human activities which is the leading reason. (Stolz, S., & Jungblut, S.,2019). The ultimate problem for the entire nation is carbon emission by human beings (Sari, E., & Sofwan, M. ,2021).

The increased use of cloud computing applications has significantly been associated with the carbon footprint. Over the past few years, cloud computing including digitization processes is related to an increased rise in carbon emissions. (Sharma and Dash, 2022). Cloud computing is a significant power guzzler, which refers to the technology associated with storing data in computers where they can be accessed remotely from any location (Jungblut ,2019, Agarwal *et. al* 2020). It is the technology backed up for people to access from any location with specific software (Kessel et al., 2008). Assessment of their emails by people anywhere is the best example of cloud computing technology. The internet backs up all over the emails, and then allowing people from different locations to access them. With new advancements comes new problems such as internet. The Internet is a blessing but also a curse in disguise. The Internet is a huge part of our life and a broad term. This research paper focuses on a small part of the internet called As E-mails. The E-mails that we receive , store and send from our devices contribute to a certain amount of Carbon Emissions.

E-mails are stored in server / Data centers in large amount and this servers require a huge amount of electricity to run and the ultimate source of energy to power such plants comes from burning of fossil fuels which in turn emits a high amount of carbon dioxide and thus leaving behind a huge amount of carbon footprint. Such a type of Carbon Footprint that is generated due to the use of Internet from any digital medium is termed as Digital Carbon Footprint.

This research is trying to calculate the digital carbon footprint generated by E-mails among the undergraduate students and to make them aware how to reduce the same.

Method:

1.Participants:

Undergraduate college students from various departments such as Botany, Economics, Computer science and Biotechnology department of R.J. College, Ghatkopar Mumbai, Maharashtra, India were selected for the survey.

The total number of participants and total number of responses collected was 70, the survey was conducted in the month of September 2022.

Out of which a total number of female and male participants were 45 and 25 respectively. The mean age of participants being 19 years.

2.Design of the study:

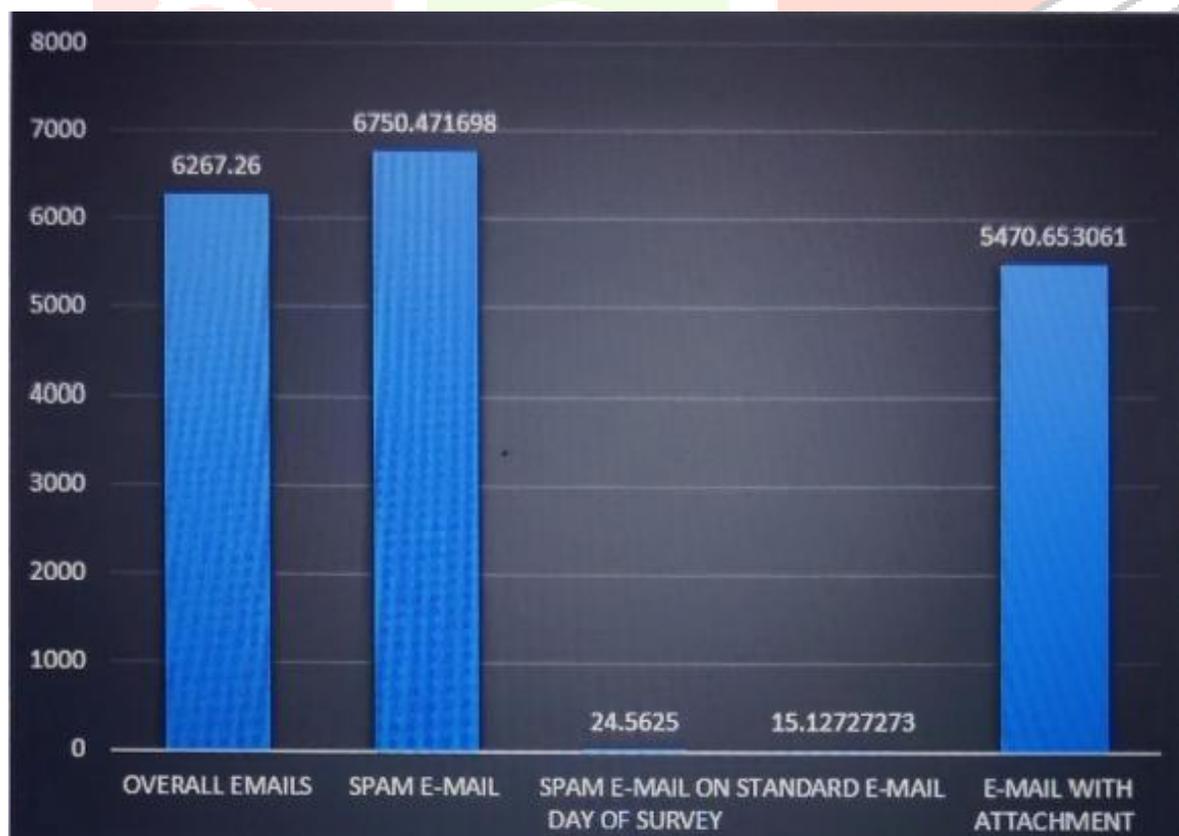
A self-administered online survey format was used as method to gain maximum response and reach out to diverse groups of students and was cost effective thus was one of the most convenient methods to use.

3. Procedure and Measures:

A digital survey using google forms was conducted. A link was sent to the respective participants WhatsApp number as provided in the google survey form and they were requested to participate in the survey . The link was attached with a message that gave the participants a basic idea behind the survey and in turn creating awareness and explaining how they would help reduce their personal digital carbon footprint and pave a way for a more sustainable future .

The survey had a questionnaire which comprised of the following:

- 1.Personal information which included the e-mail of the participants, their name and the year of under graduation degree.
- 2.The next part comprised of basic information on how many e-mails accounts the participants had, and the average number of e-mails they received on a daily basis.
3. The third part categorized the term e-mail into standard email , spam e-mails and e-mails with attachments and the participants where explained the difference and were asked to fill in the respective numbers.
- 4.Lastly the questionnaire was concluded with a question that help identified the level of awareness among the people and their eagerness to contribute to the cause.



Results:

The collected data was an approximate measure and calculated further the multiplying the average values we received in g CO₂ e unit. adapted from the method of Sarah Walkley (2020)

The total number of emails were multiplied with green house potential i.e. GWP value of CO₂ which is 1 in unit of carbon dioxide equivalent i.e. CO₂ e

Since all values have the same unit we added them and we can get an overall outcome of total amount of carbon footprint generated by e-mails.

Graphical representation of tabular data : Average Number of E-mail received by the participants everyday here, on the day of survey .

Average amount of carbon footprint generated by (according to the survey) :

Formula used: Average number of type of e-mail concerned x gwp (global warming potential) of CO₂ in terms of g CO₂ e x standard values of carbon footprint generated by the type of e-mail concerned

Standard values of carbon footprint generated by the type of e-mail concerned (According to a book 'how bad are bananas : the carbon footprint of everything' by Mike Berner Lee)

1.Spam E-mails = 0.3 g of CO₂

2.Standard E-mails = 0.4 g of CO₂

3. E-mails with attachments = 50 g of CO₂

1) Spam E-mails received everyday: $6750.471698 \times 1 \times 0.3 = 2025.1415094$ g CO₂ e

2) Spam E-mails received on day of survey: $24.5625 \times 1 \times 0.3 = 7.36875$ g CO₂ e

3) Standard E-mails received everyday: $15.12727273 \times 1 \times 0.4 = 6.050909092$ g CO₂ e

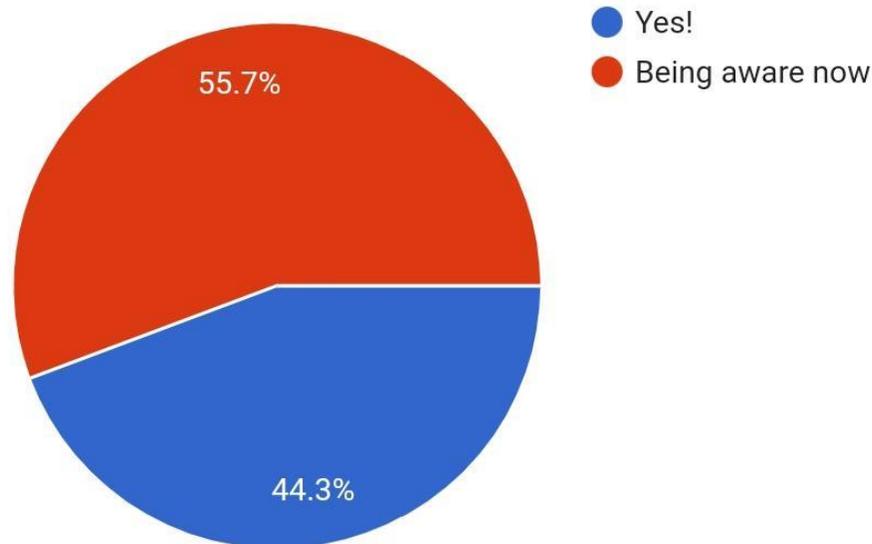
4) E-mails with Attachments received everyday: $5470.653061 \times 1 \times 50 = 273532.65305$ g CO₂ e

5) total of Spam, Standard and E-mails with Attachments received everyday:

$2025.1415094 + 6.050909092 + 273532.65305 = 2,75,563.845468492$ g CO₂ e

From the above data we can see the high amount of carbon dioxide emitted by a part of so called green internet. The data collected explains the amount of data released in a single day so if assuming numbers to be same (which is not the case as they vary from person to person) the total amount is high enough to set us on a high alert about the upcoming dangers which cannot be completely modified but few precautions may help us and our future generations to lead a peaceful life.

The pie chart shows the level of awareness among the participants regarding to the digital carbon footprint of E-mails.



Conclusion:

Internet is a backbone of our society and E-mails form a crucial part of our lives, being in modern world we cannot avoid the disadvantages that come along with the luxury of the internet but we can all help by playing a small role in reducing on our digital carbon footprint by opting for clean internet habits as few mentioned in discussion and help world be a better place for us and the upcoming generation.

By taking few precautions like unsubscribing Spam E-mails, reducing the number of unnecessary downloads, reduce the overall carbon footprint deleting all the unwanted E-mails and Storing of data in green cloud provider instead of normal one are the best ways to reduce your personal digital carbon foot print.

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