A study on environmental impacts of Internet Emissions: a case study of Yangon, Myanmar

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Introduction and Methodology: The Industrial Revolution was a significant stride forward in our society's modernization. The fast-industrializing globe, on the other hand, has an impact on our environment and has several negative consequences for our biodiversity and ecology. Similarly, developments in information and communication technology have resulted in pollution, which is lowering our quality of life and weakening our democracy. The impact of ICT on digital pollution is far broader and deeper than anyone realize. Industrial pollution, which is a by-product of a value-producing process rather than the product itself, is more complicated than digital pollution. On the internet, however, value and harm are frequently synonymous.[10] Globally, there are over 4 billion internet users, according to the Global Digital 2021 Report. Even though the internet has profoundly changed the way humans live their lives since its first commercial use in the 1980s, most people are unaware of its consequences or costs, particularly in terms of the environment. The average Australian internet user generated the equivalent of 81kg (179lbs) of carbon dioxide (CO_2e) into the atmosphere ten years ago. According to Malmodin, Jens & Lundén, Dag. (2018), the Information and Communication (ICT) sector's carbon footprint in 2015 is 730 Metric tons of carbon dioxide equivalent (Mt CO_2-eq) which equals 1.4% of carbon footprint globally. Because of the Covid-19 regulations, mankind will be even more reliant on digital technology in 2020, as virtual entertainment, video calls, and social networking sites become more popular. Global internet traffic grew by over 40% between February and April 2020, owing to worldwide lockdowns fueled by online gaming, video conferences, streaming, and social media. By 2022, web traffic will have doubled at this rate. Since 2011, Myanmar has undergone fast economic changes, transforming it into a typical developing country. The unification of the currency rate, trade and investment liberalization, a new law permitting farms to be used as collateral, and some advances in budgetary transparency are all important economic reforms. According to foreign reports, Myanmar's economy has declined in 2021 because of political concerns. However, between 2020 and 2021, the number of internet users in Myanmar increased by 2.5 million (+12%). As a result, the research study will provide an overview of how the internet operates, as well as its good and negative effects on humans and the environment in the nation. The study's main objectives are to examine Myanmar citizens' behaviors toward the internet and how they use it, to learn more about how the internet works in Myanmar and ASEAN Countries, to review the internet emissions affects to the environment, to determine the positive and negative effects on people and the environment, and to recommend better ways to avoid environmental issues. This research was carried out using the research framework demonstrated in Figure 1. Dozens of literature reviews were conducted as secondary data to understand how the internet functions in global and Southeast Asian countries. Furthermore, primary, and secondary data were used to assess the existing condition and practices of citizens' understandings on the internet. As secondary source, literature and research papers from international organizations and researchers have been reviewed.

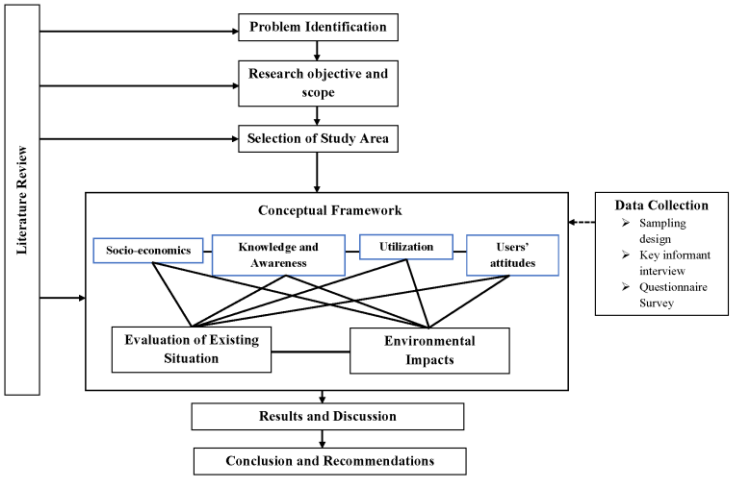

Figure 1. Research Framework

How does the internet works: The internet is a massive network of wired and/or wirelessly networked networks that allow people to share information and communicate with one another from around the world using information and communication devices such as phones, laptops, and social media.[14] But since technology is so enormous and ever-changing, there haven't been any definitive documentation to credit an exact person with creating the internet.[3] It is only known to be the result of decades of labor by various scientists and innovators. For example, in the early twentieth century, Nikola Tesla, a well-known scientist and inventor, experimented with and suggested the World Wireless System. Thereafter, the internet has been experimented and developed furthermore by visionary thinkers such as Paul Otlet, Vannevar Bush and Tim Berners-Lee. Consequently, the use of the internet has expanded significantly in the 20th century onto the 21st century to the point of it becoming the lifeblood of our society. Secondly, as the technology behind the internet can be ever so perplexing, it is quite difficult to explain the way the internet works within one context. Since this research paper focuses mainly on the impact's aspect of the internet, the technical aspect of it will only be presented generally and basically.

The internet, as previously stated, is a massive, interconnected network of people sharing information and/or connecting with one another. Emailing, accessing social networking, and using streaming services like Netflix and YouTube for educational or entertainment purposes are all examples of sending or receiving information to or from another device. The information can also be interpreted as data flowing through the internet. The data is stored as binary codes (1,0,1,0) in our electronic devices such as phones and computers. These data are then transferred through the internet as tiny packets onto another device when those devices are connected to the internet. One packet of those data contains 8 binary codes which is approximately 1 Byte (1 B) of storage. Thus, to send 1 Kilobyte (1KB) worth of data, there will be roughly around 8,000 packets of data traveling through the internet. In addition, for those packets of data to travel through the internet, an Internet Protocol (IP) Address is needed. The Internet Protocol (IP) Address is invented to give an electronic device connected to the internet an identifying number for other devices to locate to send the information, meaning that the Internet Protocol (IP) Address of a device acts as if a house address so that the other devices could identify it to send the packets of data within the internet.

According to Google's own statistics, the average user of its services creates less than 8g (0.28oz) CO_2e per day — someone who makes 25 searches per day, watches 60 minutes of YouTube, has a Gmail account, and uses some of its other services. The IT industry's greenhouse gas emissions are predicted to reach 14% of global emissions by 2040 but at the same time the UN's International Telecommunications Union has set the industry the target of reducing its emissions by 45% over the next decade. The following question relates how electronic gadgets connect to the internet in order to deliver data. To put it another way, these gadgets may connect to the internet in two ways: wired and wireless. To connect to the internet via wire, electronic devices require a medium or wire, such as an ethernet cable, to transfer data to and from the device. For the wireless method, the devices use radio waves to connect the devices such as using Bluetooth to transfer the data instead of a physical cable. However, this method only works when pairing between a couple of devices. For the billions and trillions of electronic devices around the world to connect to each other to transfer massive amounts of data within seconds, communication networks such as routers, modems, cellular towers, antennas, and data centers come into play. Networks operate as roadways and checkpoints for the internet, building massive, interconnected networks.

Personal choices also have the same impact on technology-related emissions. Prolonged use of a smartphone and repairing can reduce the carbon footprint, considering the carbon emissions during the process of making a phone. There are carbon footprints in every human activity. Things can get better if people can change the way they act and their lifestyles. Hence, the hidden social and environmental consequent impacts of the internet will be discussed to a greater extent at this stage. The internet, like many other great technologies throughout history, has both beneficial and harmful consequences for individuals and the environment. The most observable and apparent reason why most people tend not to notice the impacts of the internet is because of the difficult and little understanding of the internet from the public. As a result, the effects are generally hidden or can't be observed by the normal citizen.

Social Impacts of the Internet: Before it was formally marketed in the late twentieth century, the internet was exclusively utilized for military and government purposes. Since the early twenty-first century, the internet has been incorporated into the basic foundations of our societies all around the world. It has become an essential component of our global economy, health, education, politics, culture, agriculture, recreation, transportation, and environmental protection. Practically everyone today must rely on the internet for almost all of their everyday chores, especially during COVID-19. The flow and the accessibility of information have become faster and easier as the era has been, thereby, dubbed as the Age of Information or Digitalization. Information has rather become a commodity for all people than a privilege due to the internet which has also radically transformed the way of education from memorization to critical thinking and creativity. As a result, people around the world have become more informed than ever in human history. The global literacy rate has jumped from a mere 42% in 1960 to 86% in 2015. Not only that, but the entertainment sector has also become more unconventional than ever before. The internet has affected how people enjoy films, music, and video games. Instead of renting cassette tapes, CDs or DVDs, people are now using streaming services such as Netflix, HBO Max, and Disney Plus to enjoy entertainment from the comfort of their home. In 2020, the British Broadcasting Channel News has reported that the number of Netflix subscribers had doubled to 16 million during lockdowns of the pandemic. Comparatively, the way people consume their products have also changed distinctively in the form of online deliveries. For those reasons, new kinds of industries

have emerged, significantly terraforming the convention methods of doing business just because of the internet.

With all of these great benefits also come with unpleasant drawbacks. Though more people are being more informed, the matter of being correctly informed is also essential. The effects of misinformation and fabricated, fraudulent news accompanied by information overload on the masses could become severely dire if it is not treated sooner. Notably during the pandemic, fake news such as conspiracy theories from treating the virus with bleach to thinking the virus vaccines as biological weapons from the governments could have serious potential hindrance to prevent and mitigate COVID 19 for years to come. Additionally, the internet, specifically social media, can have serious effects on mental health without any knowledge or awareness. FOMO (Fear of Missing Out), anxiety, depression, internet addiction, insecurity which have led to self-harming and suicide are some of the most common mental impacts of carelessly using the internet. According DataProtal publications in 2021, students are almost twice as likely to attempt suicide if they have been cyberbullied. That is why internet education is certainly needed, particularly for young people, to develop good internet habits, avoiding these terrible acts.

Table 1. The Benefits and Drawbacks of Using the Internet for Social Impacts

Pros	Cons
Easier Information Accessibility	Information Overload
Higher Global Literacy Rate	Higher Global Fake News
Remote Working or Work from Home During COVID-19 era	Loneliness and Depression Due to the Lack of Human Interactions
Social Media Brings People Closer	Fear of Missing Out (FOMO) and Internet Addiction
More Efficient Form of Entertainment	Less Privacy

Environmental Impacts of the Internet and its emissions: Theoretically, internet usage has an impact on Carbon Dioxide (CO_2) emissions in three ways: increasing production efficiency and energy usage efficiency and reducing the cost of energy usage. Some scholars believe that internet usage can stimulate economic growth and improve energy utilization.[15] Being able to communicate with each other so quickly lets people do a lot of things that are good for the climate. For instance, before the internet, messaging have to be done through traditional post mailing system which takes weeks or even months locally or internationally which uses more energy and thus, emits more CO_2 into the atmosphere but at the present day, the use of the digital messaging systems such as Messenger, WhatsApp and Line, sending millions of messages within split seconds, have made messaging between billions of people more convenient, instantaneous, and less energy demanding than ever before. In fact, the internet helps avoid producing a lot of physical things, namely CDs, DVDs, Newspapers, Mails and Textbooks, slowing the use of more natural resources. In other words, digitizing millions of books into a single electronic device can significantly reduce the use of trees for manufacturing papers as well as unnecessary wastes. Similarly, producers and warehouses may better collaborate with retailers to eliminate unnecessary

transportation, minimizing waste. Furthermore, computerized maps such as Google Maps and Apple Maps can assist in better calculating the time we spend on roadways, reducing vehicular CO_2 emissions. Nonetheless, the CO_2 and other toxic compounds generated during its installation, as well as the use of fossil fuels for energy generation and e-waste, will represent a severe danger to long-term economic growth.

The main concern of the negative environmental impacts of the internet is the CO_2 emission with the tremendous use of energy. In the coming years, the internet is already expected to consume 7% of the global electricity with the anticipated threefold increase in global internet traffic, increasing energy demands furthermore. [5] Mozilla Firefox, an internet company, says that the Information and Communications Technology industry is responsible for 3.5% of global emissions. In order to discuss the negative environmental impacts of the internet, it can generally be divided into 3 parts, Devices, Data Centers and Communication Networks. The first part, Devices, includes the physical production, installation, and usage parts of an electronic device. When manufacturing and/ or installing an electronic device, various natural resources must be exploited from metals like gold, silver and copper to non-metals like silicon and lithium as well as rare earth materials. As it is a well-known fact that mining causes a huge negative impact on the environment by releasing massive amounts of greenhouse gasses into the atmosphere and polluting the lands, air and water of the surrounding areas. Besides that, when using an electronic device, it also has to be charged which uses electricity, mostly generated from fossil fuels to this day. According to Forbes, an average iPhone, depending on its battery capacity, uses approximately 2 kWh per year. Though it might not be much for one device, the usage can become far more when billions of other devices are added up. Even after the usage of that device, the carbon footprint of e-waste can negatively impact the environment. For the second part, Data Centers are storage facilities where billions of data are stored, processed, and transferred every single second. They are the physicality of the internet. Internet giants such as Google and Facebook (Meta) store, process and transfer billions and billions of data for their services, thus requiring lots of data centers around the world. According to Google, there are a total of 16 working interconnected data centers around the world. These data centers need substantial amounts of energy to operate fluently and to cool the latent heat of the data centers. As reported by ClimateCare, data centers accounted for 29% of the electricity consumption of the IT sector in 2017. This percentage is estimated by some scholars to only grow in the future. Cryptocurrency is a perfect instance to illustrate this.

Cryptocurrency is a new kind of payment network as opposed to the traditional cash payment. Just as printing new money, new cryptos are made in cyberspace which uses large data centers to do so, thus requiring a lot of electricity for processing power. Researchers at the University of Cambridge says that the annual electricity consumption of Bitcoin, a cryptocurrency company, is equivalent to the annual electricity consumption of the entire Argentina Republic. In addition, the carbon footprint of 1 bitcoin transaction is comparable to the carbon footprint of 2 million visa transactions as stated by digiconomist.com further exacerbating the global climate change problem. The Communication Networks section concludes this section. The biggest negative impact of Communication Networks, like data centers, is higher electricity consumption, which climbed from 219 TWh in 2007 to 354 TWh in 2012.[19] Furthermore, it is predicted that consumption will rise by 10%.

Table 2. Internet Carbon Footprint by different type of applications (Source- Energuide.be & Sarah Griffiths, 2020)

No.	Internet usage	Carbon footprint internet emissions
1.	Spam email	0.3 g
2.	Regular email	4 g
3.	Email with photo	50 g
4.	1 MB email	20 g
5.	Web address search	0.8 g
6.	Google services usage	8g

On the other hand, the biggest impact from data centers and networks is greenhouse gas emissions (GHG), which leads to a focus on energy efficiency and carbon footprint reduction. Compared to 1995, the number of users increased tenfold in 2015 and data traffic has increased by a factor of one million. In both 2015 and 2010, the ICT sector's electricity usage was around 800-Terawatt hour (TWh). The Entertainment and Media (E & M) sector which includes TV networks, printed media, and other electronics is the contiguous sector to the ICT sector. The decline in sales of TVs and other consumer electronics due to the increasing use of smartphones and tablets is one of the main reasons for the growth of the ICT sector. The E & M sector has already started to reduce carbon footprint. The global carbon footprint of the E & M sector was about 1.2% or 640 Mt CO_2-eq in 2015, which is a decrease from about 940 Mt in 2010. The average carbon footprint of an ICT subscription was 81 kg CO_2-eq and this should be compared to the global average carbon footprint of about 7000 kg CO_2-eq per person. Since 2010, the carbon footprint of each ICT subscriber has declined by over 20%. The devices called Internet of things (IOT) are already integrated into users' devices, but they have not had any significant impact on the overall results released in 2015. Overall, the study found that the ICT carbon footprint does not scale with data volume, but rather with the number of subscriptions. The number of subscriptions is likely to rise in the future as the number of Internet of Things (IOT) devices grows. However, initiatives to improve energy efficiency, including the use of renewable energy and more energy-efficient devices, will help to reduce energy consumption and carbon emissions.

Based on the International Energy Agency analysis reports, data centers that maintain data usage from internet usages online activities, such as video streaming and email use account for about 1% of overall electricity consumption in 2019. IEA says that demand for data center services has increased by 60% but energy demand for power is expected to remain unchanged until 2022. The reduction of carbon emissions and large industries still poses challenges because the required technologies are not yet commercially viable. It is easy to reduce the carbon emission of data centers if these centers are powered with clean electricity and reach by driving energy efficiency through innovation, investment, and policy. Data centers often generate a large amount of heat and dissipate it so that it would not melt down to everything. The Google data center in Finland utilizes recycled seawater to save the energy needed to cool its servers, while other companies have set up

factories near the Arctic Circle to gain natural cooling from cold air. Google, Facebook, Microsoft, and Amazon, among others, have made significant investments in submarine cables (subsea) new cable.[21] Technology giants such as Google, Microsoft, Facebook, Amazon, and Apple have also pledged to reach net-zero emission by using only renewable energy within the next two decades. Later on, advanced technologies such as artificial intelligence (AI), cryptocurrencies, and 5G networks could consume large amounts of power, which could slow down efforts to address global warming.

ASEAN Countries: There are 11 submarine cables connecting Thailand to Singapore, 32 cables connecting Singapore to Malaysia, and 23 cables connecting Malaysia to Thailand, according to review articles on Southeast Asian Regions.[20] If subsea cables are the veins of modern connection, data centers are the beating heart. Many businesses rely on data centers because they can support the applications, cloud connections, and digital infrastructures that they need to run their operations. By providing easy access to subsea cables, data center providers can improve the performance of applications and equipment. A data center is a physical location where businesses keep their mission-critical programs and data. A data center is built around a network of processing and storage resources that allows shared applications and data to be delivered.[1] Singapore's data centers use water-based cooling technologies to keep their infrastructure cool. In Singapore, air-based cooling is less common than in other ASEAN countries. In Malaysia, however, both air-based and water-based cooling systems are used for cooling. Several small data centers in Thailand use air-based cooling methods as well.[A6]

Thailand has 48.59 million internet users in January 2021. Between 2020 and 2021, the number of internet users climbed by 3.4 million. In January 2021, there were 5.29 million internet users in Singapore. Between 2020 and 2021, the number of internet users increased by 146 thousand. PUBG gaming, Line, Messenger for conversation, and Shopee TH shopping are some of the most popular or well-known programs. PUBG gaming, Shopee for shopping, Messenger, and Telegram for communication, and Tik Tok for video players and editors are all well-known in Singapore. But in Malaysia, it's slightly different. Google tools, WhatsApp, Messenger, Telegram, Facebook, and YouTube are widely used.[16] Moreover, there were 27.43 million internet users in Malaysia in January 2021. The number of internet users in Malaysia increased by 738,000 between 2020 and 2021.[2] The following graph explains the number of internet users in ASEAN countries as of 2021.

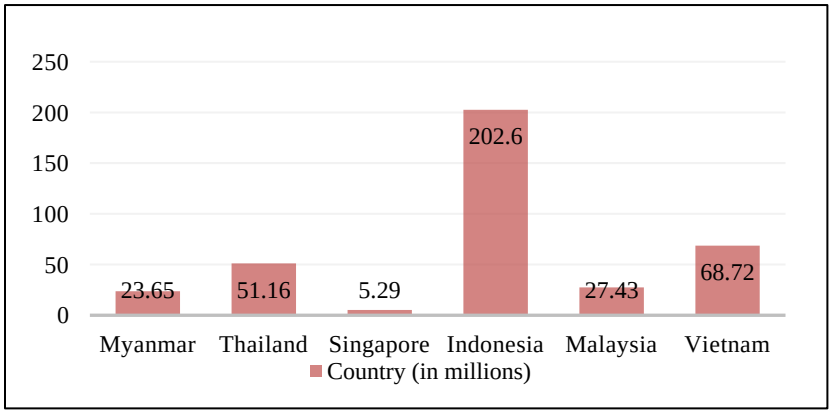

Figure 2. Internet Users in ASEAN in 2021

Myanmar: Myanmar, also known as Burma, located in the northwestern-most part of mainland Southeast Asia and is the second-largest country in Southeast Asia. Myanmar occupies an area of 676,578 square kilometers with many physiographic regions such as plateau, mountains, lowlands, basins, and coastal plains. The population in Myanmar is around 50 million based on 2014 census. Myanmar's population is identical to 0.7% of the total world population and it is the rank number 26 in the list of countries by population worldwide. Myanmar's population increased by 380 thousand (+0.7%) between January 2020 and January 2021. The 30% of Myanmar's population lives in urban areas, while 70% lives in rural areas as of 2020. Between 2020 and 2021, the number of internet users in Myanmar increased by 2.5 million (+12%). There were 29 million social media users in Myanmar in January 2021. The number of social media users in Myanmar increased by 7 million (+32%) between 2020 and 2021. The number of social media users in Myanmar was equivalent to 53.1% of the total population in January 2021. Myanmar had 22 million users in 2020 however, in 2021, the internet users become increase to 23.65 million.

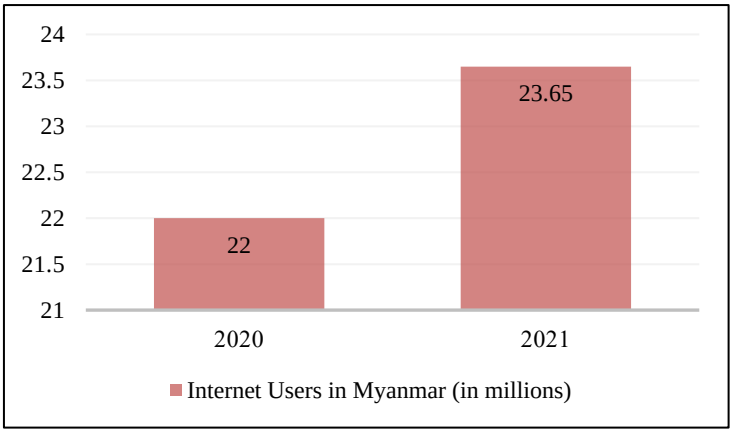

Figure 3. Internet Users in Myanmar

There are various Internet Service Providers (ISPs) in Myanmar. Some of them are Ooredoo, Telenor, Ocean Wave Communication co., ltd, Myanmar Broadband Telecom co., ltd (MBT), 5BB Broadband, Welink, Myanmar Posts and Telecommunications (MPT), Telecom International Myanmar co., ltd (Mytel), Myanmar Speednet, TrueNet, Yatanarpon Teleport, Myanmar Unilink Communication co., ltd, Yangon Net, Mahar Net, Tiger Fiber Internet, Horizon Telecom co., ltd, Ananda, Myanmar Link. Myanmar has 25,195 towers, according to the Posts and Telecommunications Department. MPT, Telenor, Ooredoo, Mytel, MEC, Eco, KBZ, Pan Asia, and others are among them. There are now three submarine cables landing in Myanmar, SEA-ME-WE 3 (SMW3), SEA-ME-WE 5 (SMW5) and Asia-Africa-Europe 1 (AAE-1). The incumbent telecom operator in Myanmar, Myanmar Posts and Telecommunications (MPT), is the landing party for the SMW5 and SMW3 cable systems in Myanmar. MPT lands SMW3 at Pyapon Cable Landing Station and SMW5 at Ngwe Saung Cable Landing Station on the Pyapon Cable Landing Station. The landing party for the AAE-1 cable system in Myanmar is China Unicom. AAE-1 is landed at the Ngwe Saung Cable Landing Station by China Unicom. Orient Link, a subsidiary of NTT (Nippon Telegraph and Telephone), is creating the Myanmar/Malaysia India Singapore Transit (MIST) cable line, which will land in Myanmar.

Study Area: The research study focuses on Yangon, which has long been regarded as the country's perfect location. Yangon is the country's second-newest capital; the administrative capital was shifted from Yangon to Naypyidaw in 2006. Yangon, however, remains the largest city and most important commercial center, with a population of over four million people. As of 2021, the Yangon Region comprises a total area of 10,171 km^2 and is divided into 45 townships and four districts. This region was chosen upon these criteria, the most densely populated region, and the most developed region in Myanmar. The townships of Yangon are classified into the following figure 4.

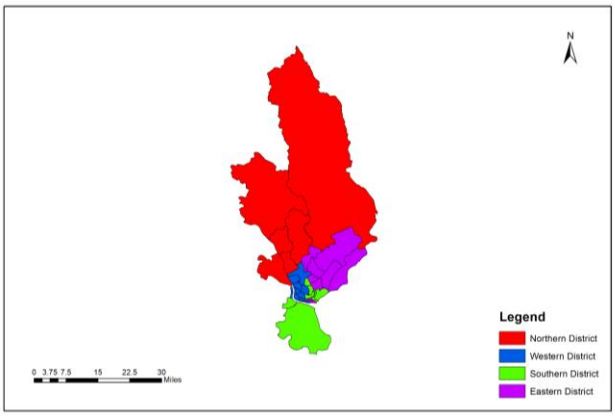

Figure 4. Districts in Yangon and its territories

For this study, primary data was collected in two stages. The first approach is to consult an ICT expert who is a colleague of EHS Myanmar. An ICT specialist was verbally interviewed for the research's primary data. Mr. Ye Lin Aung, currently the Senior Software Engineer of ceridian.com and a graduate of the University of Greenwich with a Bachelor of Science (Hons) in Business Information Technology, was interviewed. He is also officially working with AWS Startup Scout to support early-stage tech startups. Before that, he had additionally worked as Freelance Developer, Senior Android Developer and Software Engineer at some of the most well-known corporations in Myanmar. After a few interviews, the current situation in Myanmar as well as technical information such as how the internet works, how people connect to the internet, how many telecom operators are there in Myanmar, and what are the potential social and environmental impacts of the internet were obtained to greatly aid the study.

The second approach of the primary data was conducting questionnaires. The questionnaires were done by stratified random sampling method. This method was appropriate due to base on the stratified on the districts of the city. Moreover, to obtain a reliable sample size using Taro Yamanae equation to calculate as follows.

$$n = \frac{N}{(1+Ne^2)}$$

Where,
n= corrected sample size,
N = population size, and
e = Margin of error (MoE),

e = 95% confidence, 0.05 based on the research condition.

A total of 400 residents were surveyed based on this calculation. Unfortunately, 13 of them had erroneous data, and as a result, the samples were labeled as errors. Therefore, 387 samples of the Yangon Region were finally analyzed. The city is divided into 45 townships, it is easy to divide it into districts for easier data collecting. Because of COVID-19 and political concerns, the questionnaires were only performed online. The major data collection procedure includes online surveys, phone interviews and ZOOM meetings. The data collection townships based on districts are shown in the table below.

Table 3. Yangon townships and its districts

Eastern District	Western District	Southern District	Northern District
▪ Tamway ▪ South Okkalapa ▪ Dagon Myo Thit (Seikkan) ▪ Dagon Myo Thit (South) ▪ Dagon Myo Thit (North) ▪ Dagon Myo Thit (East) ▪ Dawbon ▪ Pazuntaung ▪ Botahtaung ▪ North Okkalapa ▪ Yankin ▪ Thingagyun ▪ Thakayta ▪ Mingala Taungnyunt	▪ Taikkyi ▪ Htantabin ▪ Mingaladon ▪ Hmawbi ▪ Shwepyitha ▪ Hlegu ▪ Hlinethaya (East) ▪ Hlinethaya (West) ▪ Insein	▪ Kyaunktan ▪ Kungyangon ▪ Cocogyun ▪ Kawhmu ▪ Khayan ▪ Seikkyi Khanaungto ▪ Twantay ▪ Dala ▪ Thanlyin ▪ Thongwa	▪ Kamayut ▪ Kyauktada ▪ Kyimyindine ▪ Sanchaung ▪ Dagon ▪ Bahan ▪ Mayangon ▪ Lanmadaw ▪ Latha ▪ Hlaing ▪ Ahlon ▪ Pabedan

Data Analysis and Results: A total of 387 respondents from Myanmar's Yangon Region were surveyed. The districts of Yangon are divided into four categories: east, west, north, and south. The east district received 30.7% of responses, while the west district received 28.4%. In these two districts, the respondent population is higher than in the other two districts. On the other side, the north and south districts had 23.3% and 17.6%, respectively.

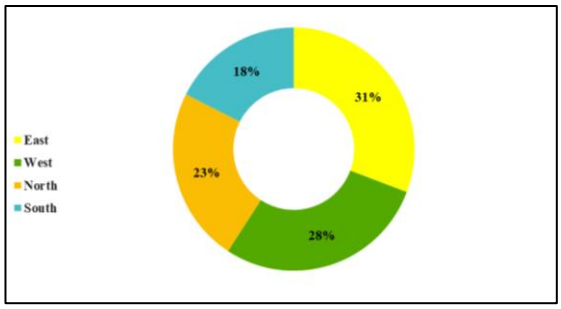

Figure 5. Population analysis by districts

The gender distribution was 65.9% female, 31% male, and 3.1% of residents would rather not identify while the majority of responses are female. In comparison, "female" respondents outnumbered "male" respondents by a factor of two, while "prefer not to say" had the least percentage of all. Figure (6) shows that most internet users (71.3%) were between the ages of 18 and 25. According to Figure, the majority are university students. Only 9% of respondents were under the age of 18. The 8.3% of the total responders were between the ages of 26 and 30. The percentage of people over 45 was 4.7%. With 2.5%, respondents between the ages of 31 and 35 came in second. The age ranges 36-40 and 41-45 each had 2.1% of the population.

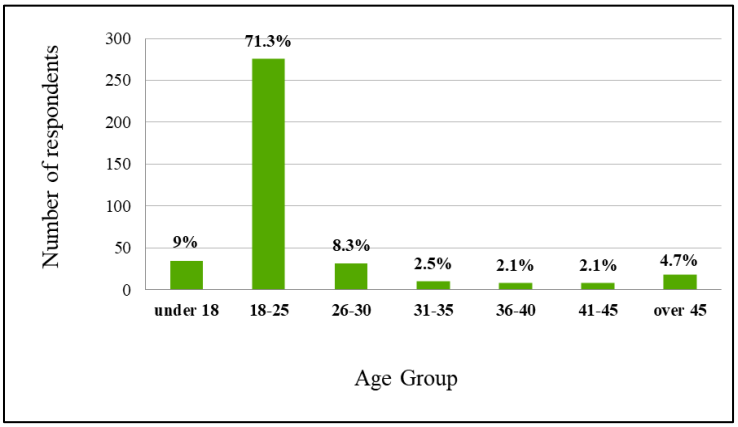

Figure 6. Analysis of respondents by age group

Figure (7) demonstrates the respondents' education levels. The majority of those who responded were university students. As a result, the biggest percentage of respondents (43.76%) are undergraduates. The 5.08% of the respondents are at high school level and 19.85% are at the level of passed matriculation exam. According to data collected from the survey, 20.35% of the respondents are at bachelor level and 6.36% are master's degree holders while 3.3% of the

respondents are at diploma level. The second least percentage of the respondents,1%, are at Ph.D. level and 0.3% of the respondents are at others education level.

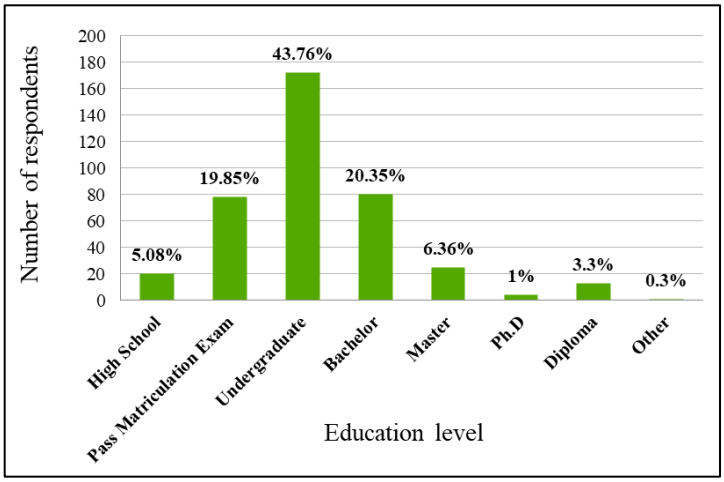

Figure 7. Respondents' education level

The income of the 60.5% of all respondents is with the biggest percentage earning less than 300,000 Myanmar Kyats (MMK) per month. The second-lowest number of respondents, 12.1 percent, indicate they earn between 300,001 and 600,000 MMK, while 17.2 percent say undisclosed. However, respondents who earn between 600,001 and 1,000,000 MMK and more than 1 million Kyats are 5.1% each. Figure (8) clearly shows that 35.5 % use MPT telecom to communicate with one another. Telenor is utilized by 45.5% of respondents, while Ooredoo is used by 18.2% of those surveyed. Mytel is used by only 0.8% of the respondents.

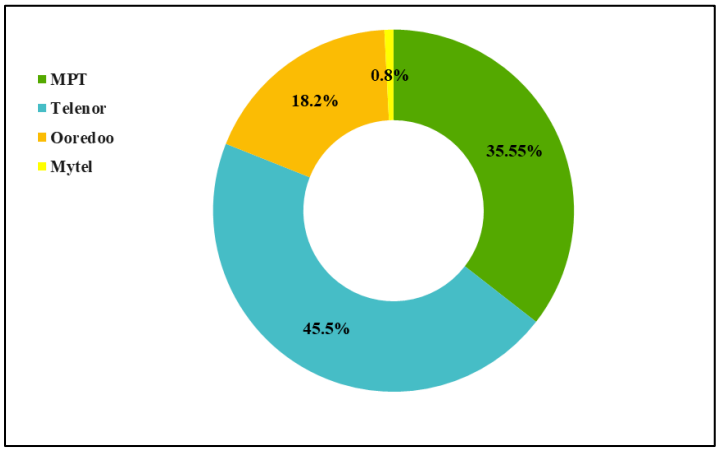

Figure 8. Types of different telecom users in Yangon

Then, participants were asked to reveal their primary source of internet connections. Fiber Internet is used by 40.3% of subscribers, while mobile data is used by 31.1%, according to this figure. Wi-Fi Hotspots (WLAN) are used by 23.6% of participants, whereas Broadband is used by about 5% of those surveyed.

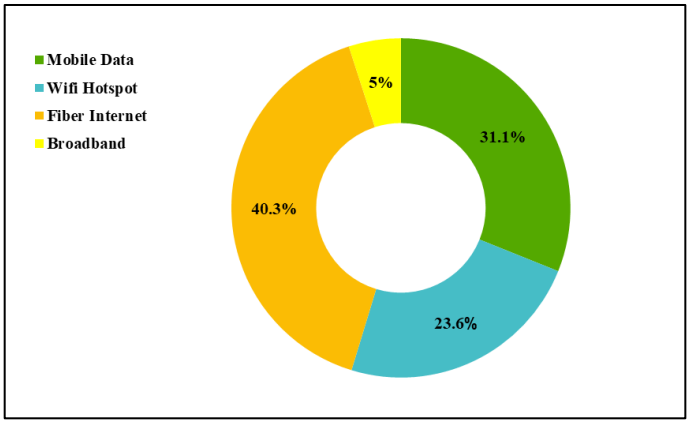

Figure 9. Types of internet connections

In addition, respondents were asked what devices they used for communication, education, job, and other purposes. Because we live in the twenty-first century, even children have cell phones, which are used by 57.6% of the participants. A PC, MacBook, or Laptop is used by 36.5% of users, while a tablet or iPad is used by 6%. For education, 25.7 % of the respondents use Google Search Engine, 26% use YouTube, 21% use Facebook, 12.4% use Wikipedia, 6.9% use Microsoft Edge Search Engine, 5.1% use LinkedIn, 1.3% use Yahoo, and approximately 1.5% use other online platforms for education. Only 0.2% of the respondents remained undisclosed. According to Figure 10, 35.4% of all respondents used the Zoom online platform for online meetings and online learning, while 19.4 percent used Facebook Messenger. Also, Google Meet was used by 15.7 percent of users since these three primary platforms are easy to use and allow you to engage with a single individual or a group of people. With 11% and 11.2% using Microsoft Teams and Viber, respectively, that came in second and third, with roughly 2% using Skype and 1.9% using WebEx Meeting. GoToMeeting was the least popular, with only 1.2% of respondents using it. And the last 2% of respondents use other online platforms for work. The data was calculated based on all the online platforms that were utilized by each of the respondents.

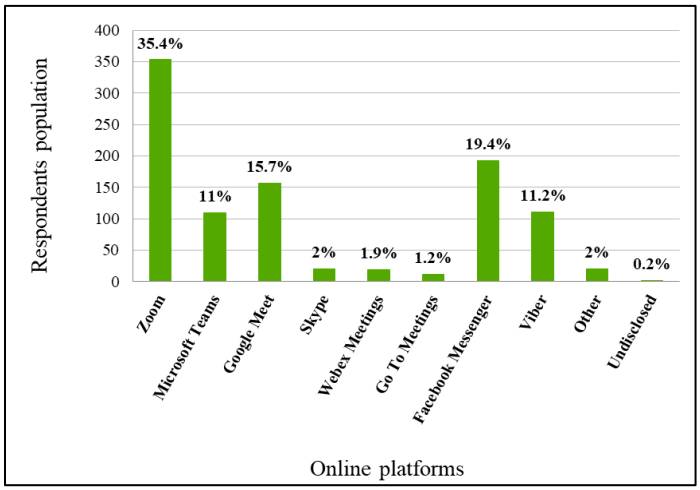

Figure 10. Usage of online platforms for work

According to the collected data, Facebook was the most often used social media app, with 12.63 % of respondents using it. YouTube was utilized by 11.6 % of them, and Facebook Messenger was used by 11.45 %. Furthermore, roughly 10.8%, 10.34% and 10.21% of people used Telegram, Gmail, and Instagram respectively. Viber and Twitter were used by 8.43 % and 6.51 % of those polled, respectively, while Discord was used by 4.9 %, Netflix by 3.52 %, WhatsApp by 3 %, Snapchat by 2.45 %, LINE by 1.64 %, Tik Tok by 1.43 %, and WeChat by 0.8 %. In addition, 0.23 % of respondents communicated with one another through other social media apps. Only 0.06 % of the total was not answered.

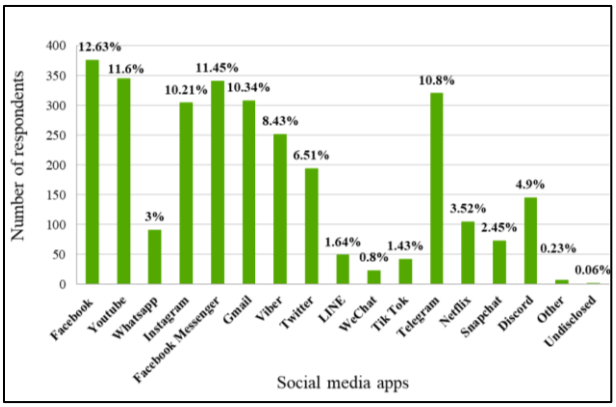

Figure 11. Social media applications

Additionally, the days on which respondents spent the least to the greatest time on the internet were then examined, ranked from 1 (least) to 5 (most). Because Monday is the first working day of the week, it had the least amount of online time, while Tuesday had the average amount of online time. And Sunday, the last day of the weekend, had the largest amount of time spent online as Sunday is a day off and many people don't work on the weekend since people use the Internet if they have nothing to do. In addition, figure 12 describes the percentages of hours spent on the internet by respondents. Each respondent chose more than one amount of time that they spent on the internet, therefore, this figure is illustrated based on the data of individual's spent hours. According to the data collected from the survey, 33.9% of respondents chose 5-7 hours, which is the highest percentage of all. Studies show that this amount of time is more than a person should use on the internet. However, the internet is being used for their own needs in the new normal lifestyle. Therefore, 5-7 hours can be considered as an insignificant amount at this time. 8-10 hours is the second highest with 22.9%, followed by 2-4 hours which came in third place with 17.6%. After that, 14-16 hours with 12.4%, 11-13 hours with 8.8% and 17-19 hours with 3.3% are in order of percentage from high to low respectively. Last in order, the percentages for ≤1 hour and >20 hours remain the same at 0.46%, the lowest number among respondents.

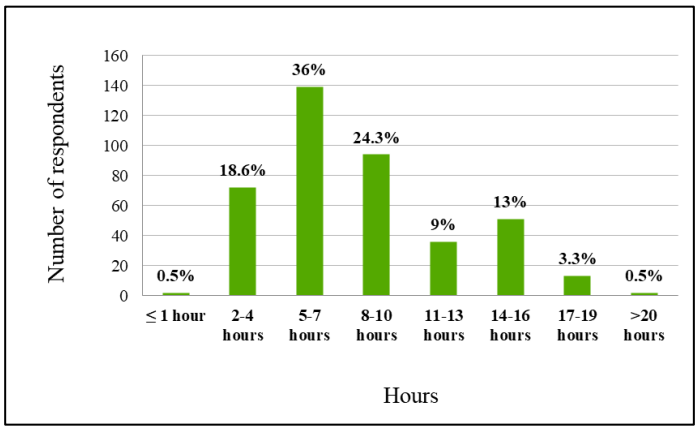

Figure 12. Internet usage on hours per day

The following pie chart figure 13, shows respondents' views on whether internet use has a direct or indirect impact on the environment in a pie chart. As seen in the graph, 54% of respondents believe that using the internet has a direct or indirect impact on the environment, while the remaining 46% believe it has no impact. As a result of the figures, it can be deduced that barely half of the poll respondents care about the environment.

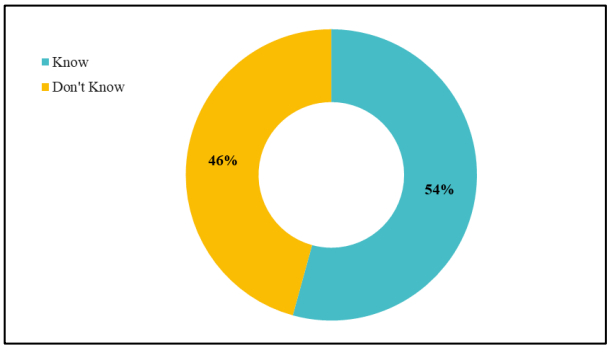

Figure 13. Users' opinion on internet emissions on the environment

After that, the respondents were asked to rank environmental issues such as carbon emissions, solid waste, air pollution, noise pollution, ecosystem, and biodiversity from (1) least to (5) most important in this following graph. Carbon emissions were mentioned by 59 respondents as a possible causing problem. The numbers of 68, 66, and 68 respondents, respectively, believe solid waste, air pollution, and noise pollution are improbable causes. The most common assumption among all respondents was that ecology and biodiversity are common environmental issues. Besides, the respondents' views on using the internet less to prevent environmental problems can be observed clearly in figure 14. 47.42% of respondents, the highest percentage of all, answered that there should be an average of reducing internet usage. 18.15% assumed that it is unlikely to reduce the use of the internet, followed by 13.3% who are likely to lower it. 12.46% of respondents are willing to reduce their internet usage. Only 8.67% of respondents indicated it was extremely unlikely that they would use the internet less.

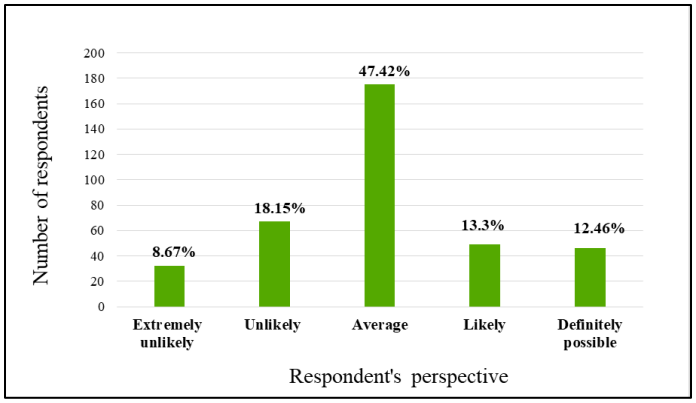

Figure 14. Users' opinions to reduce internet emissions

Summary of research findings and Conclusions: As the internet has become an integral part of our societies, it has become a fundamental part of our global economy, health, education, politics, culture, agriculture, recreation, transportation, and environmental conservation. Furthermore, thanks to the rapid flow and simple accessibility of information, people all over the world have become more informed than at any other time in human history. In comparison, the internet's negative social consequences have grown increasingly apparent. According to The Royal Society, a leading British scientific academy, reported that the digital technologies emit between 1.4% and 5.9% of global greenhouse gas emissions (GHGs). The International Energy Agency (IEA) estimates that Internet users will jump from 3.8 billion in 2020 to 5 billion by 2025. The IEA says video streaming and gaming services are pushing demand for data center services so it is estimated that the consumer internet traffic will reach 87% in 2022. On the other hand, in Myanmar, the economy, according to the World Bank, will contract by 18% in 2021. Myanmar's growth prediction for 2022 has been lowered downward by 4.4%, according to Fitch Solutions, a US credit rating service. Especially during COVID-19, practically everyone including Myanmar citizens now must rely on the internet for almost all their everyday chores. However, there are some negative impacts both in environmental and social. From information overload and higher global fake news to internet addiction, depression, social anxiety, fear of missing out (FOMO), cyber-bullying has eventually led to self-harming as well as suicide. Thus, well-rounded regulations on social media should be implemented to mitigate the social impacts. Theoretically, internet usage has an impact on CO_2 emissions in three ways: increasing production efficiency and energy usage efficiency and reducing the cost of energy usage. Being able to communicate with each other so quickly lets people do a lot of things that are good for the climate. For instance, the use of the digital messaging systems such as Messenger, WhatsApp and Line have made messaging between billions of people more convenient, instantaneous, and less energy demanding than ever before. For the next part, to discuss the negative environmental impacts of the internet, it can generally be divided into three parts, Devices, Data Centers and Communication Networks. The physical production, installation, and usage parts of them subsequently cause climate change from high electricity demands which frighteningly still derives from fossil fuels by emitting CO_2 into the atmosphere. Though the percentage of CO_2 contribution of the internet sector to climate change is low when compared to other sectors such as transportation, as the usage of the internet is getting more and more day by day, it could get worse if not handled properly. On the other hand, the majority of replies were "female," with more than twice as many as "male," according to the

questionnaires, and "prefer not to say" was also included. In terms of age group survey analysis, respondents between the ages of 18 and 25, popularly known as "Generation Z," were the most likely to reply, resulting in valuable and beneficial data. Because most responses were "Undergraduate" students, the sample was more current and accurate. In the analysis of telecom users, most of them used “Telenor” because Telenor offers more data packages for internet usage and phone calls with affordable cost for users rather than other types of telecoms. In terms of internet connection, the respondents used “Fiber Internet” as it is cheaper and more cost-effective than others. "Zoom" is the most often used online platform for work since it can be used for 45 minutes for free even if there is no private zoom account, and it is easier and easier to use for all age groups, including youngsters under the age of 18 for their online learning. For the social media application, most of the users mainly used “Facebook” as it can provide them with entertainment, knowledge, and access to all the news and information deals with socially, economically, politically, and other perspectives. In terms of daily internet usage, most of them use it more on "weekends" than on weekdays, with "Sunday" being the most highly regarded day because it is a public holiday. According to users' opinions on internet emissions on the environment, half of the respondents believe that internet usage can discharge internet emissions on the environment, while the other half do not accept this perception as well since they have very little environmental awareness, particularly in the internet emission sector. In terms of survey analysis on personal views on how to reduce internet emission, most respondents chose average, and the second most respondents chose unlikely to reduce internet usage to reduce environmental emissions, implying that the majority of them do not support internet emission reduction and that it may be more convenient to look for other alternatives instead. Finally, the researchers concluded, based on the survey and stakeholder meetings, that citizens have little knowledge of environmental experience and understanding and the possible impact of internet emissions on the environment. Furthermore, because the country's economy is likely to grow in the coming years, as does the number of internet users, the officials and other environmental organizations should be prepared for any environmental repercussions and mitigation measures.

Recommendations to mitigate environmental impacts due to internet emissions: The researchers in this study suggest the following three recommendations.

1. **Eco-Friendly Practices:** As previously stated, with the massive rise of the internet, individuals have begun to digitalize everything from personal use to the global economy. As a result, without effective controls, the internet will have more unintended, avoidable, and detrimental environmental consequences than beneficial ones. From personal control to government involvement, the internet can be utilized for environmental good rather than harm. More emails in one's inbox means more storage and processing power for the data centers, which in turn uses a lot more electricity and energy for the corporation that operates the system, increasing carbon footprints. Thus, to combat this, one should optimize his or her mailing usage by reducing or compressing the size of the contents such as attachments or video files when sending them. On top of that, one should also send less messages and delete old messages to reduce the CO_2 emissions by the internet. People can also reduce their video streaming consumption, which contributes to the data centers. As a result, you should either download the files or reduce the video quality. Audio calls should be used instead of video calls because they require less data. Not only that, but for the sake of individual's mental health and the environment, one should log out or temporarily unplug

from the internet. Finally, the researchers encourage that people keep their electronic devices for longer periods of time, as this will result in less e-waste and damage of the environment. Another option is to use a clean internet search engine. According to estimates given by Google, each internet search had a carbon footprint of 0.2g CO_2e a decade ago. Today, Google reduces its carbon footprint by combining renewable energy and carbon offsetting, whereas Microsoft, which owns the Bing search engine, has pledged to become carbon negative by 2030, and attempts are underway to determine whether this footprint is now larger or lower.

2. **Regulations and Enforcement:** The internet's environmental impact is not as severe as that of other modes of transportation, it could become so without adequate legislation and technical improvements. According to National EIA Procedures (2015), Section 21 of the Law and Articles 52, 53, and 55 of the Rules, all projects, field sites, factories, and businesses identified by the Ministry that may have an adverse impact on environmental quality and are required to obtain Prior Permission in accordance with Section 21 of the Law and Article 62 of the Rules with the potential to cause Adverse Impacts are required to conduct IEE or EIA or develop an EMP. However, there are no certain standards or regulations in place for the development of data centers and subsea networks for internet access in the country. Moderate environmental and social problems occur during the implementation and operation of the data center and subsea. As a result, an Environmental Impact Assessment (EIA) is required. Moreover, according to one of the study, data centers, with their massive electricity use, are the main cause of the internet's environmental problems. However, this might be prevented by utilizing Artificial Intelligence (AI) developments to cut data center electricity demand effectively and efficiently. Google and other internet corporations have begun experimenting with and using this strategy to better manage their CO_2 emissions. As a result of advocacy and regulations, Myanmar should likewise implement this new technology in data centers if the country has any. The researchers encourage that the Union Government and the Ministry of Natural Resources and Environmental Conservation (MONREC) reform and establish guidelines, procedures, and regulations for internet subsea cables and data centers towards the upcoming years.
3. **Environmental Knowledge in Myanmar:** People in Myanmar still have a limited understanding of the environment. Furthermore, on all fronts, there is still a dearth of awareness-raising efforts. At the time of writing this research on the title of internet emission, there were a lot of challenges due to various environmental vulnerabilities in Myanmar such as lack of environmental knowledge, lack of research papers, lack of data, and information vulnerabilities were found. Basic information about the internet emission such as the total number of internet users in Myanmar, the most used types of internet connections, the most used telecom brand, and the other essential basic data was not officially released by Myanmar. Therefore, the government should make a difference by supporting these necessary things themselves or cooperating with INGOs and NGOs to provide information and data support services and should be done in the field of research papers preparation and awareness-raising activities. The report proposes that development programs such as national environmental knowledge-sharing projects across Myanmar, as well as many other voluntary programs, do more to educate and raise environmental consciousness among Myanmar's citizens.

Limitations of the research study and recommendations of future works: The study's findings, according to the research team, will undoubtedly increase the overall efficiency and efficacy of research and analysis, particularly for the country. The study does, however, have significant limits and challenges. The first is that the type of research difficulty determines the number of units of samples used in the study. It should have a larger sample size to ensure a more representative distribution to the population and to be regarded representative of city residents. Second, official data and information on internet usage in Myanmar is hard to come across and try to implement into this study. However, the researchers make every effort to obtain current data and information about the country through international reports, research papers, and publications. Finally, there aren't many publications for the country that are like this research topic that have been done by other researchers or organizations. As a result, making literature reviews on previous works relevant to the topics is extremely challenging. Furthermore, because to political affairs, the research team was unable to observe the data center in Yangon. As a result, we recommend that future research concentrate on the state of Myanmar's data centers.

Keywords: *Emissions, Environmental impacts, Internet, Myanmar, Yangon.*

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APPENDIX I: Questionnaires

Informed Consent Letter Translated in Burmese

Environment, Health and Safety Myanmar (EHS Myanmar) သည် မြန်မာနိုင်ငံ၏ သဘာဝပတ်ဝန်းကျင်ဆိုင်ရာပညာပေးအဖွဲ့အစည်းတစ်ခုဖြစ်ပြီး အစိုးရမဟုတ်သည့် လွတ်လပ်သော ပြည်တွင်းအဖွဲ့အစည်း Non-Governmental Organization တစ်ခုဖြစ်ပါသည်။ ယခုအခါ EHS Myanmar သည် Advocates for Sustainable Lifestyle and Culture (SLC Advocates) ဟူသော လူငယ်အဖွဲ့အစည်းနှင့် ပူးပေါင်း၍ **"A Study of Environmental Impacts of Internet Emissions: a case study of Yangon Myanmar"** ဟူသော အသေးစားသုတေသန ပရောဂျက်တစ်ခုကို ပြုလုပ်ဆောင်ရွက် နေပြီး ယင်းသုတေသနနှင့် ပတ်သက်၍ စစ်တမ်းတစ်ခုပြုလုပ်နေပါသည်။ ဤမေးခွန်းလွှာ စစ်တမ်း၏ ရည်ရွယ်ချက်မှာ ကိုဗစ်-၁၉ ကပ်ဆိုးကာလ နှင့် ကိုဗစ်-၁၉ ကပ်အလွန် မြန်မာနိုင်ငံသားများ၏ အင်တာနက်ပေါ်အမြင်များ၊ သဘောထားများနှင့် ၎င်းကို မည်ကဲ့သို့ အသုံးပြုသည်ကို လေ့လာရန်၊ မြန်မာနိုင်ငံတွင် အင်တာနက် အလုပ်လုပ်ပုံအား စူးစမ်းလေ့လာရန်၊ အင်တာနက်သည် လူထုနှင့် ပတ်ဝန်းကျင်အပေါ် ကောင်းမွန်သော သက်ရောက်မှုများနှင့် ဆိုးရွားသော သက်ရောက်မှုများကို ဖော်ထုတ်ရန်၊ ပတ်ဝန်းကျင်ဆိုင်ရာထိခိုက် စေသော ပြဿနာများကို ရှောင်ရှားရန် ပိုမိုကောင်းမွန်သော နည်းလမ်းများကို အကြံပြုရန် ရည်ရွယ် ပါသည်။ ဤစစ်တမ်းတွင် မေးခွန်း (၁၅) ခု ပါရှိပါသည်။ လူကြီးမင်း၏ အချိန်ပေးမှုနှင့် ပူးပေါင်း ဆောင်ရွက်မှုအတွက် ကျေးဇူးအထူးတင်ရှိပါသည်။ ကောက်ယူရရှိသော ဒေတာအချက်အလက် များကို သုတေသနစာတမ်းတွင် သာအသုံးပြုမည် ဖြစ်ပါသည်။ စစ်တမ်းနှင့် ပတ်သက်၍ မရှင်းလင်းသည် များရှိ ပါက "ehsresearch.projects@gmail.com" သို့ အချိန်မရွေး ဆက်သွယ်မေးမြန်းနိုင်ပါသည်။

ဤစစ်တမ်းတွင်ပါဝင်ရန် လူကြီးမင်း၏ သဘောတူညီချက်ကို လိုအပ်ပါသည်။ ဤစစ်တမ်းတွင် ပါဝင်ခြင်းမှ ရုပ်သိမ်းလိုပါက ရှင်းလင်းချက်တစ်စုံတစ်ရာမလိုအပ်ဘဲ မည်သည့်အချိန်တွင်မဆို ပါဝင်ခြင်းမှ ရုပ်သိမ်းနိုင်ပါသည်။ ပါဝင်ကူညီရန်ဆုံးဖြတ်ခဲ့ပါက နေ့ရက်၊ အမည်နှင့် လက်မှတ်များကိုကျေးဇူးပြု၍ ဖြည့်ပေးပါရန် မေတ္တာရပ်ခံအပ်ပါသည်။ ကျေးဇူးအထူးတင်ရှိပါသည်။

စစ်တမ်းတွင် ပါဝင်ကူညီဖြေကြားခဲ့ပါသည်။
နေ့စွဲ _____
အမည် _____
လက်မှတ် _____

Questionnaires for determining Environmental Impacts of Internet Emissions
Target Group – Internet Users

Code No:_____. Date: _____.

No: _____. Township: _____. Districts _____.

Part 1. Demographic Factors

1. Where do you live? (နေထိုင်ရာမြို့နယ်) (နေထိုင်နေသော သို့မဟုတ် နေထိုင်ခဲ့ဘူးသော ရန်ကုန်တိုင်းအတွင်းရှိမြို့နယ်များ) _____.

2. Gender (ကျား/ မ)
   a) Female b) Male c) Prefer not to say

3. Age (အသက်)
   a) under 18 b) 18 – 25 c) 26 – 30 d) 26 – 30
   e) 31 – 35 f) 36 – 40 g) 40 – 45 h) over 45

4. Education Level (ပညာအရည်အချင်း)
   a) Passed Matriculation Exam (၁၀တန်းအောင်မြင်ပြီးသူ)
   b) Undergraduate (ဘွဲ့ကြို)
   c) Diploma (ဒီပလိုမာ)
   d) Bachelor (ဘွဲ့)
   e) Master's degree (မာစတာဘွဲ့)
   f) PhD Degree (ဒေါက်တာဘွဲ့)
   g) Other…
   h) Prefer not to say

5. How much money do you make each month? (တစ်လအတွင်းရရှိသောဝင်ငွေ။)
   a) ≤ 300,000 MMK b) 300,001 - 600,000 MMK
   c) 600,001 - 1,000,000 MMK d) >1,000,000 MMK e) Prefer not to say

Part 2. Consumer's Usage

6. Which telecom do you primarily use? (ဖုန်းထဲတွင်အသုံးပြုသော ဖုန်း SIM ရဲ့အမည်)
   a) MPT b) Telenor c) Ooredoo d) Mytel
7. Which type of Internet Connection do you use? (အသုံးပြုသော အင်တာနက်အမျိုးအစား)
   a) Mobile Data b) Wi-Fi Hotspots (WLAN) c) Fiber Internet d) Broadband
   e) Dial-up f) DSL g) Satellite h) Other…
8. Which devices do you use to access the internet the most? (အင်တာနက်ကိုချိတ်ဆက်ရန် အသုံးများသောဆက်သွယ်ရေးပစ္စည်း။)
   a) Smart Phone b) PC/ Laptop/ MacBook c) Tablet/ iPad d) Other…
9. Which platforms do you currently surf for education? Please tick all what you use. (ပညာရေးအတွက် လက်ရှိသင်အသုံးပြုသော အွန်လိုင်းပလက်ဖောင်းများ။)
   a) Google Search Engine b) Microsoft Edge Search Engine
   c) Yahoo.com d) Wikipedia.org e) LinkedIn.com
   f) Youtube.com g) Facebook.com h) Other…
10. In this COVID-19 era, which platforms do you mainly use for online meetings and online learning? Please tick all what you use. (ကိုဗစ်ကာလအတွင်း အွန်လိုင်းမီတင်နှင့် အွန်လိုင်းမှတစ်ဆင့်ပညာသင်ရေးအတွက် သင်အသုံးပြုနေသော ပလက်ဖောင်းများ။)
    a) ZOOM b) Microsoft Teams c) Google Meet
    d) Skype e) WebEx Meetings f) GoTo Meetings
    g) Facebook Messenger h) Viber i) Other…
11. Which social media apps do you currently use? Please tick all what you use. (လက်ရှိအသုံးပြုနေသော လူမှုကွန်ရက် အက်ပလီကေးရှင်းများ။)
    a) Facebook b) YouTube c) WhatsApp
    d) Instagram e) Facebook Messenger f) Gmail
    g) Viber h) Twitter i) LINE
    j) WeChat k) Tik Tok l) Telegram
    m) Netflix n) Snapchat o) Discord p) Other…

12. Which days do you spend the most time online? Please mark the days that you have spent the most time on. (1= the least amount of use, 5 =the largest amount of use) (သင် Internet အသုံးများဆုံးသောနေ့၊ အနည်းဆုံး -၁ မှ အများဆုံး -၅ သို့။)

Days	1	2	3	4	5
Monday					
Tuesday					
Wednesday					
Thursday					
Friday					
Saturday					
Sunday					

13. How many hours a day do you spend on the internet for any reason? (သင်တစ်နေ့တာအတွင်း Internet ကို မည်မျှအသုံးပြုပါသနည်း။)

a) ≤ 1 hour b) 2 - 4 hours c) 5 - 7 hours

d) 8 - 10 hours e) 11 - 13 hours f) 14 - 16 hours

g) 17 - 19 hours h) ≥ 20 hours

Part 3. Environmental Concerns

14. Do you realize that surfing the web has both direct and indirect environmental impacts? (Internet အသုံးပြုခြင်းကြောင့် သဘာဝပတ်ဝန်းကျင်အပေါ်တွင်ထိခိုက်မှုများရှိနေသည်ကို သင်သိပါသလား။)

    a) Yes b) No

    If you choose yes, how would you prioritize these environmental issues that concern you in such of internet emission? (From at least 1 to largest amount of 5) (ရှိတယ်လို့ သင်ထင်ပါက အောက်မှာဖော်ပြထားသော Internet ၏ သဘာဝပတ်ဝန်းကျင်အပေါ် ထိခိုက်မှုများကို သင်၏ထင်မြင်ချက်အတိုင်း ဦးစားပေး သတ်မှတ်ပေးပါ။) (အနည်းဆုံး ၁ မှ အများဆုံး ၅ အထိ)

Impacts	1	2	3	4	5
Carbon Emissions					
Solid Waste					
Air Pollution					
Noise Pollution					
Ecosystem and Biodiversity					

15. Would it be practical for you to use the Internet less in order to cut carbon emissions? (1= Extremely unlikely, 5=Definitely possible) (Internet ၏ သဘာပတ်ဝန်းကျင်အပေါ် ထိခိုက်မှုများကို လျော့ချနိုင်ဖို့ရာ Internet လျော့သုံးခြင်းသည် အဖြေဖြစ်သည်ကို သင်လက်ခံပါသလား။)

a) Very Unlikely b) Unlikely c) Neutral d) Likely e) Very Likely

APPENDIX II: Photos

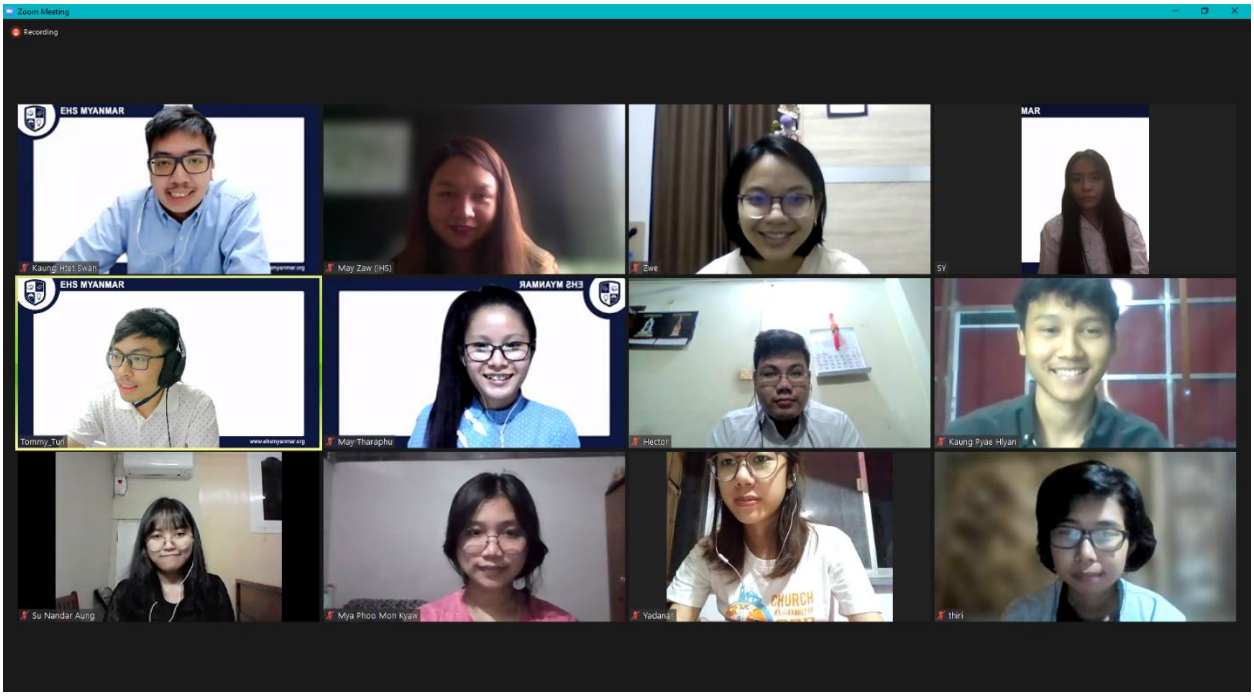

Figure 15. EHS Myanmar's Team Members

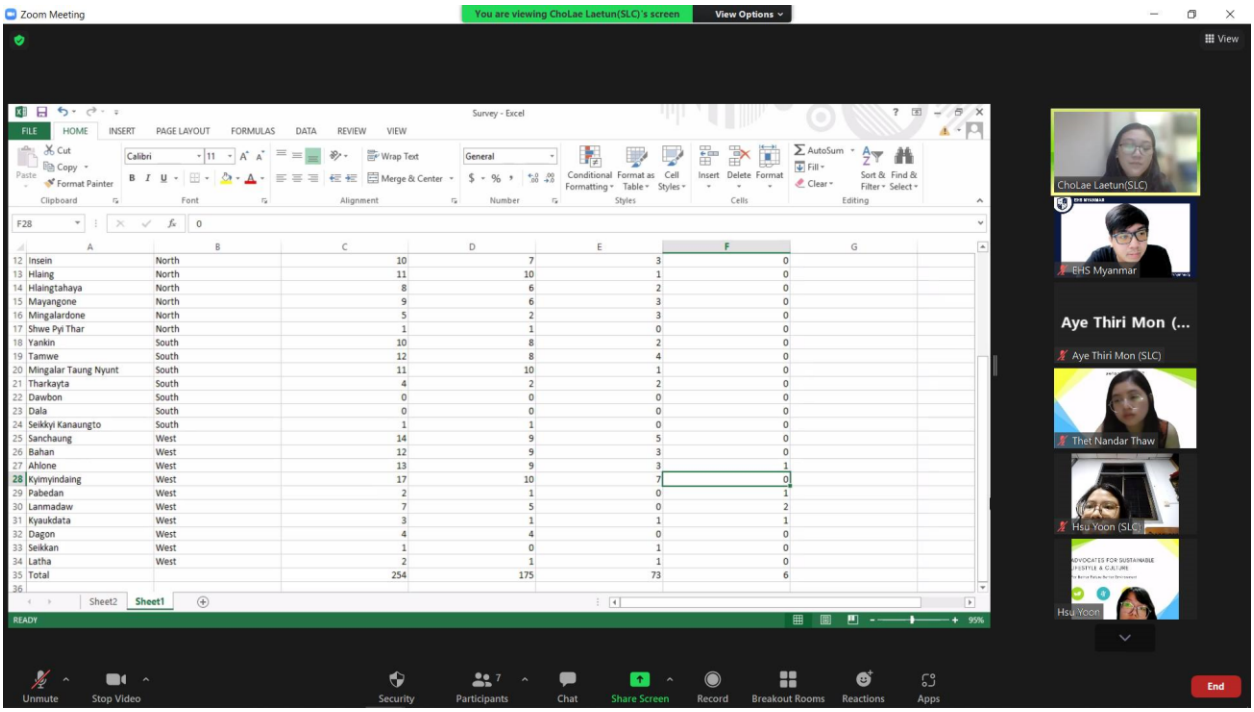

Figure 16. Discussion and Review Meetings between EHS Myanmar and SLC Advocates

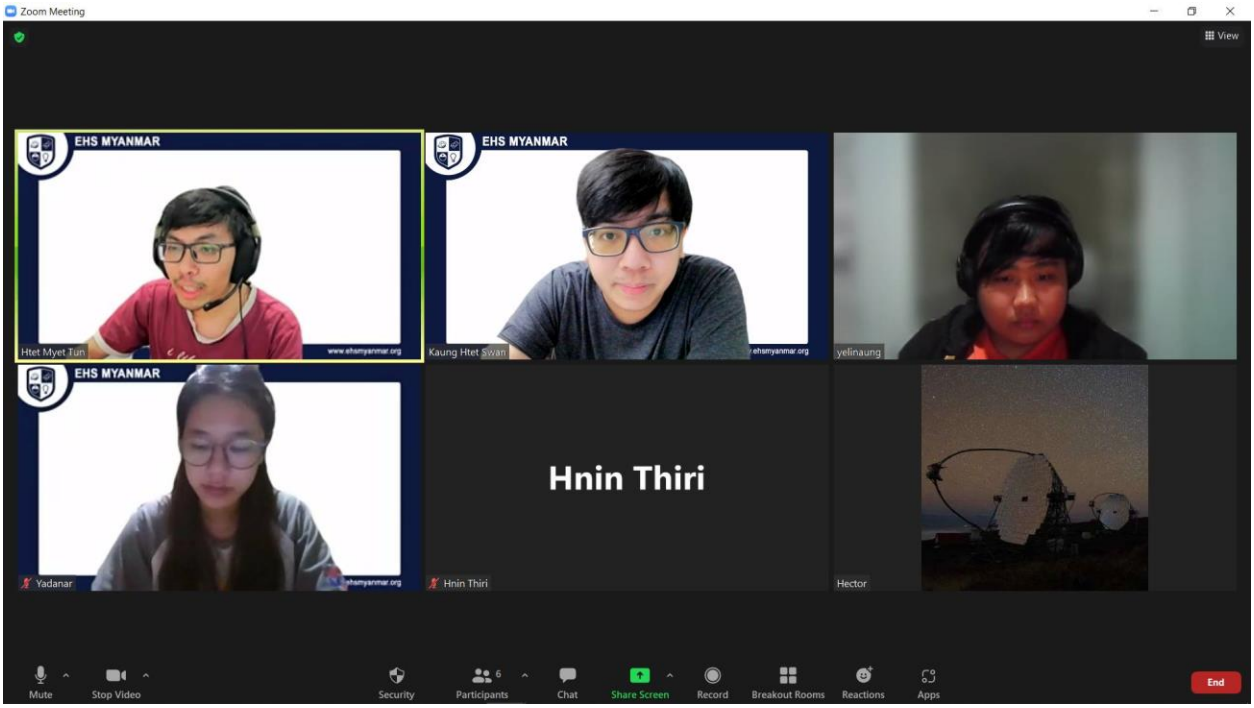

Figure 17. Data Collecting Meetings with IT Expert, Mr. Ye Lin Aung