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REPORT

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Interactive Qualifying Project
C-21

PROJECT TITLED:
Evaluating the Carbon Footprint of Centro Cultural Costarricense-Norteamericano

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Abstract

The Centro Cultural Costarricense-Norteamericano (CCCN) is working to decrease their carbon footprint in an effort to obtain a carbon neutral certification. By conducting surveys, interviews, and calculating the carbon footprint of the CCCN before and after the pandemic, our team was able to identify major sources of emissions that the CCCN could reduce to decrease their carbon footprint. Our team then developed a set of recommendations for the CCCN to follow to further decrease their carbon footprint, create a green fund for future projects, and make progress toward obtaining an ISO 14001 Certification.

Acknowledgements

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Executive Summary

Purpose

Although el Centro Cultural Costarricense-Norteamericano's (CCCN) primary goal is to promote English language learning in Costa Rica, the organization is aware of the growing climate crisis. As a result, the CCCN is seeking to reduce its carbon footprint, with the end goal of receiving the ISO 14001 standard for environmental management. The CCCN also has a goal of developing a Corporate Social Responsibility Program that will measure and evaluate their carbon footprint. To do this, they asked us, a team of WPI students, to determine the carbon footprint of two of their branches: the San Pedro and Sabana campuses. However, due to the global Covid-19 pandemic, the team decided that carbon footprints should be calculated both pre-pandemic and during the pandemic, to see if there are any changes due to the remote format the CCCN was forced to take on.

Goals & Objectives

The goal of this project was to estimate the carbon footprint of the CCCN and to make recommendations to help them move toward both obtaining the ISO 14001 certification and setting up a green fund. We used a mix of qualitative and quantitative data to analyze the major carbon emissions of the organization and to make recommendations based on both carbon emissions and the feasibility of continuing virtual classes. The following is a list of objectives we set in order to accomplish this project.

1. Find the carbon footprint of the San Pedro and Sabana Campuses and identify sources of high emissions;

2. Learn about online courses to help assess post-pandemic options;
3. Make ISO 14001 recommendations;
4. Make green fund recommendations.

Methodology

In order to calculate the CCCN's carbon footprint, environmental interaction and impact data from the past few years at both the San Pedro and Sabana campuses were obtained through our sponsors. From this information, the carbon footprint was calculated for both the pre-pandemic and during-pandemic data to determine any changes. Additionally, it was important to understand the impact of remote learning on their students and employees in making our recommendations for lowering carbon footprint. Once the world returns to some version of normalcy after COVID-19, our recommendation based on these data will give the CCCN an accurate picture of how to proceed with courses and how to continue lowering its environmental impact.

In order to get an accurate idea of the feasibility of a remote or hybrid format, the team interviewed students to understand their perspective about online learning and carbon footprints. To further understand how the pandemic has affected the CCCN, teachers were also interviewed. The team inquired about ideas the employees have to reduce the CCCN's carbon footprint and create a green fund. Questions regarding their opinions on online vs. in-person teaching were also asked. To reach a wider audience, surveys were used to collect information to develop a detailed plan for the CCCN.

Results & Analysis

We were able to calculate the carbon footprint of the CCCN from 2017, before the pandemic began. The calculations can be found in Appendix D. The carbon footprint that we calculated accounts for electricity, potable water, gas usage, and diesel usage from the San Pedro and Sabana campuses. It does not account for offsets such as existing solar panels and recycling efforts. Using the consumption data, we estimated that these two campuses together emitted a total of 137 tons of carbon dioxide (CO_2) into the environment in the year 2017. Electricity was by far the highest contributor, emitting 127 tons of CO_2, followed by gas, which contributed 8 tons of the total CO_2 emitted. There were also small emissions due to diesel and water.

In order to compare the carbon footprint in 2017 to the carbon footprint during the pandemic, our team collected emissions information from 2020. These emissions proved to be approximately one-third the value of the pre-pandemic emissions. In 2020, electricity, still by far the highest contributor, only resulted in 45 tons of CO_2 emitted. This is a significant decrease from the 127 tons of CO_2 emitted before the pandemic.

Through the use of surveys and interviews, our team evaluated remote and in-person learning as post-pandemic options, as well as opinions about sustainability. Our team determined that the majority of both students and teachers would be okay with the continuation of remote learning. Many students who were in support of virtual classes stated it was due to the amount of time they saved and the ease of taking the remote classes while working full time, while teachers who support virtual learning also cited more free time as a factor. One major concern we uncovered was in accommodating all students' learning styles. While virtual was by far the most popular learning method among the students, hybrid and in-person still had significant portions

of the student population. However, through interviewing teachers, it was mentioned that hybrid course options may do a good job of addressing these learning differences amongst the students.

In terms of sustainability, the survey and interview results showed high environmental awareness. In general, both teachers' and students' individual carbon footprints have decreased since starting remote teaching, largely due to reduced transportation demands and using less material products. Most participants showed an awareness of his/her own carbon footprint, and a passion to help slow the growing climate problems the world is facing. When addressing areas for improved sustainability at the CCCN, the most common themes between the two groups were paper usage, recycling, electricity usage, and water usage.

Recommendations & Deliverables

After finalizing our results, our team made three main recommendations which can be utilized by the CCCN to help them achieve their sustainability goals. These include recommendations for implementing a green fund, course formats, and the ISO 14001 certification process. To develop a green fund, monetary contributions should be made through the use of optional student green fees, fundraisers, grants, and campaigning. The team also outlined potential changes that the organization should implement using the green fund. Each of these works to reduce the organization's carbon footprint. These methods are of a range of required efforts and time, allowing the CCCN to work towards both small and large changes through incremental steps.

- Implement a gray water recycling system
- Improve recycling on campuses
- Add timers to lights

- Increase the number of solar panels at CCCN
- Create composting locations for employees
- Offer incentives to employees and students who walk, bike, or take public transportation
- Offer a green discount to students who continue remote classes after the pandemic
- Increase the number of trees at each campus
- Only buy green materials

After the pandemic and in order to minimize the CCCN's carbon footprint, we not only recommend the implementation of these suggestions, but also the continuation of remote learning and the addition of hybrid course options. Finally, to obtain the ISO 14001 Certification, we have outlined a plan for the CCCN, including utilizing a consulting company to guide them through the process.

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Introduction

1.1 The Problem of Global Warming

Global warming refers to the gradual increase of the average global temperature. It occurs when greenhouse gases become trapped in the atmosphere. These gases absorb infrared energy that is emitted by the Earth. This is a natural process. However, in the past 250 years, the concentration of greenhouse gases in the atmosphere has increased. This results in more heat being trapped, resulting in a higher average temperature (Riebeek, 2010). Since the time of the industrial revolution, the global temperature has risen about 1.15° C, but this small change has resulted in massive climate change (Lindsey, 2020). A number of human activities contribute to global warming, with the largest factor being the burning of fossil fuels for electricity. Fossil fuels produce about two billion tons of carbon dioxide (CO_2) each year. Another major factor in global warming is the use of transportation; specifically, the fossil fuels burned due to the use of cars contributes 1.7 billion tons of CO_2 per year (MacMillan, 2016). This CO_2 contributes to the build-up of greenhouse gases in the atmosphere and increases global warming. The raising of the average global temperature has a number of destructive effects. Rising sea levels threaten coastal regions with flooding, melting glaciers destroy ecosystems of arctic wildlife, and heat waves damage agriculture along with shortening and lengthening of growing seasons and lead to severe droughts and lack of snowfall (MacMillan, 2016). This problem must be tackled immediately, as the long-term effects of global warming will result in the destruction of ecosystems, extinction of species, and will eventually make the planet uninhabitable.

1.2 Climate Change as a Result of Global Warming

Climate change refers to the long-term changes in the weather patterns of the defined climates. It is a result of global warming and its side effects. While global warming refers to the cause of the problems, climate change is what is actually happening as a result. The increase of the average global temperature will have a damaging impact on all climates and can result in the destruction of ecosystems and the creation of new ones. Although the immediate impacts are often overlooked, the future long-term effects of climate change can be destructive. In the Southwest of the United States, heat waves and droughts will become more common. These effects of climate change can ruin agriculture and lead to water shortages, killing livestock and destroying land. Along with heat waves, hurricanes along the East Coast will become stronger and more frequent. This may result in the destruction of towns and cities and the loss of human life. Sea levels will rise everywhere, causing coastal regions and those below sea level to become flooded (NASA, 2008). Although the global projected path is towards these outcomes, they are still preventable if action is taken. This requires the cooperation and collaboration of all nations to work towards a more "green" future. The biggest solution is the push towards renewable energy sources. Two billion tons of CO_2 are pumped into the atmosphere from fossil fuel burning for electricity (MacMillan, 2016). This number can be cut down by switching to wind or solar energy production methods. A number of other actions can be taken to slow down climate change. These include: driving electric or hybrid vehicles, reducing water waste, reducing energy use, switching to LED lightbulbs and reducing your carbon footprint (Denchak, 2017).

Costa Rica, being a hotspot of biodiversity and many different ecosystems, will be greatly affected by climate change. The effects of climate change are already apparent in many parts of Costa Rica. For example, Monteverde has a very unique cloud forest that is credited to

the frequent rainfall. With the rise of global warming and climate change, this rainfall becomes less common and much more intense, resulting in longer dry periods. These dry periods decrease the thick moisture in the air which so many species rely on. As the moisture dissipates, more and more species move to a higher elevation, while those unable to move, are left to die (Quirk, 2017). Another recent effect of climate change was the first recorded landfall of a hurricane in Costa Rica since 1851. Hurricane Otto passed through Costa Rica in 2016, making history as the country's first hurricane (Fritze, 2016). This environmental anomaly shows the possible destruction of climate change and why it has become a large issue in Costa Rica and around the world.

1.3 Costa Rica's Stance on Climate Change

Due to the detrimental outlook of global warming, Costa Rica has taken a strong stance on climate change and its carbon emissions in the 20th century. Boasting one of the greatest concentrations of biodiversity in the world, Costa Rican policies work to preserve and build up its ecosystems. These policies work to promote restoration and growth by using taxes to manage protected land and fund environmental programs. For example, landowners are paid to protect old-growth forests and plant trees (Watts, 2010). This has helped increase today's forest coverage in Costa Rica to over half, up from 24% recorded in 1985 (Flores, 2016). This increase is important as it reduces Costa Rica's carbon emissions through more absorption of CO_2. Costa Rica has also emerged as a leader of environmental preservation through its goal for a net zero emission level. In 2009, Costa Rica announced its plan for carbon neutrality by 2021. However, more recently in 2019, they created the National Decarbonization Plan to outline the path to carbon neutrality by 2050 (Climate Action Tracker 2020). It forms an extensive plan for all sectors of the economy, including: the use of an electric public transportation system, improved

farming practices, improvements to the waste and agricultural sectors, and increased energy efficiency in the industry, transport and buildings sector (Climate, 2020). The plan lays out 10 focus areas to improve, falling into the four categories previously discussed. For example, by 2050, Costa Rica plans to transform a significant portion of their fossil fuel powered cars to zero emission vehicles (DCC, 2018). The goal is that 60% of all private vehicles will produce zero emissions, while the government sector percentage will be much higher (DCC, 2018). The National Decarbonization Plan requires both immediate action and long-term solutions to achieve their target goal of zero emissions.

1.4 CCCN's Carbon Footprint Goals

El Centro Cultural Costarricense-Norteamericano (CCCN) is a non-profit organization that was founded in October 1945. Over the past few years, the CCCN has been trying to find ways to become more carbon neutral. In fact, last year they implemented the "*Get Green!"* campaign. This campaign was created to encourage green activities and ecological sustainability within the organization. Now, the CCCN has a goal of developing a Corporate Social Responsibility Program that will measure and evaluate their carbon footprint. To do this, they asked us, a team of WPI students, to determine the carbon footprint of the San Pedro and Sabana campuses. However, due to the global Covid-19 pandemic, the team decided that carbon footprints should be calculated both pre-pandemic and during the pandemic, to see if there are any changes due to the remote format the CCCN was forced to take on. Once the carbon footprints were determined, the CCCN's goal became to develop a plan which reduces the environmental effects of running the organization, internally and externally. To do this, the CCCN considered obtaining an ISO 14001 Carbon Neutral Certification. The certification details specific requirements designed to ensure the reduction of the company's carbon footprint. A

plan for obtaining the certification was made, which will allow the company to take action before Costa Rica's 2050 deadline. Lastly, the CCCN requested that our group devise a plan for building a "green fund" for future projects. Once implemented, this will help them continue their role as a leader in Costa Rica's campaign for carbon neutrality, even after our part in the project is completed. The CCCN's goal through having us help them complete this climate change mitigation project was to become an inspiration for other organizations by showing them how CCCN achieved success in reducing the carbon footprint of the San Pedro and Sabana campuses, so that others can do the same.

Background

Although the organization's primary goal is to promote English learning in Costa Rica, the CCCN is aware of the growing climate crisis. It seeks to lower its environmental toll through the use of carbon footprint calculations and analysis, with an end goal of receiving the ISO 14001 standard for environmental management. This section explains the essential background concepts needed to understand the calculations, analysis, and recommendations. It addresses the mission of the CCCN, what carbon emissions and carbon footprints are, Costa Rica's carbon footprint history, the CCCN's current action plan and deadlines, ISO 14001 certification, and a plan for a green fund.

2.1 Mission of CCCN

El Centro Cultural Costarricense-Norteamericano (CCCN) is a binational organization which seeks to "enrich the quality of life through teaching of the English Language and the promotion of the cultures of Costa Rica and the United States of America" (CCNC, 2020). The CCCN focuses on teaching English, providing resources, and promoting cultural and social projection (providing an understanding of United States culture to Costa Ricans, regardless of socio-economic class). The organization has a variety of English programs for people of all ages and ability, allowing for mastery and application of the English language. This language learning is further enhanced through additional resources - including but not limited to: the Mark Twain Library, preparatory courses, and international tests. Finally, CCCN has a scholarship program, contributing to its pillar of social projection, which supports disadvantaged Costa Rican youth (CCNC, 2020). As for culture, cultural experiences are generated through the art and traditions in

North America. This is done with help of the CCCN's Sophia Wanamaker Gallery, which displays Costa Rican and North American art and The Eugene O'Neill Theater, which presents plays and concerts. In addition to teaching English, providing resources, and promoting cultural and social projection, the Centro Cultural Costarricense- Norteamericano organization has recently developed a passion for environmentalism and reducing their carbon footprint.

2.2 Carbon Emissions and Carbon Footprint

A carbon footprint refers to the net amount of carbon being released by an organization or an activity (Global, 2020). It is the sum of carbon emissions, or the measured amounts of CO_2 being released into the atmosphere for specific activities (Global, 2020). Most commonly, fossil fuels are the greatest cause of carbon emissions as burning them releases an immense amount of CO_2. Naturally, CO_2 is used by plants in photosynthesis, but the rapid carbon emissions caused by the burning of fossil fuels are too much for plants to process. There is simply not enough biocapacity for the emissions to be absorbed (Global, 2020). Accumulating carbon levels in Earth's atmosphere are causing climate change and an increase in global temperature. In order to counteract this, many countries are seeking to lower their net carbon emissions by examining and attempting to control their carbon footprints.

Currently, the planet lacks the ability to neutralize all of the CO_2 byproducts from fossil fuels, which is leading to climate change. In order to combat climate change, close to 200 nations signed the Paris Climate Agreement. The Paris Climate Agreement seeks to slow the progression of climate change by the year of 2050. The goal is to prevent an additional rise in global temperature greater than 2 degrees Celsius. Each country has individualized emission goals, allowing the greatest global impact to be made. While current projections seem discouraging, this goal may be achieved with the help of renewable energy sources (Global, 2020). If

implemented, these renewable sources would eliminate the need for fossil fuels, preventing unnecessary CO_2 release into the atmosphere.

2.3 Definition of Carbon Neutrality

Carbon neutrality is defined as any activity that produces an amount of carbon emissions that are offset or balanced so that a net zero carbon emission is produced (European Parliament, 2020). There are two main ways that carbon neutrality can occur. One way to achieve carbon neutrality is to simply produce no CO_2 emissions or to reduce CO_2 emissions (European Parliament, 2020). Some common ways that carbon emissions can be reduced are through minimizing driving and flying, buying organic foods, recycling, composting food, and installing solar panels (Global Stewards, 2020). A second way to reach carbon neutrality is to offset CO_2 emissions (European Parliament, 2020). A common method of accomplishing this is by planting more trees, as trees remove CO_2 from the atmosphere in the process of photosynthesis. Typically, it is difficult to cut out all carbon emissions at first, so a combination of reducing CO_2 emissions and offsetting the emissions that are released is recommended.

2.4 Costa Rica's Carbon Footprint History

Costa Rica has set itself onto a path toward carbon neutrality since 2006, when a new administration took office. This decision was triggered by the proven benefits of taking early steps to fight climate change. The comprehensive plan that the administration came up with includes 5 sections: metrics; mitigation; vulnerability and adaptation; capacity-building; and education, culture, and public awareness. These steps are put in place to not only achieve carbon

neutrality but maintain a competitive economy and transform human sustainable development (Mora, n.d.).

The first step, metrics, puts in place a reliable metrics system that can be monitored at all times. The second and most in-depth step is mitigation. Mitigation provides incentives to reduce carbon emissions directly from the sources, and also encourages the production of carbon sinks, which are areas in which more carbon is absorbed than produced. Some examples of carbon sinks are forests and other green areas. As far as mitigation action, Costa Rica has worked with the Avoided Deforestation Programme with the Coalition of Rainforest nations, and advocated for tree planting linked to environmental activist Wangari Maathai's UN campaign (Secretary-General Designates Wangari Maathai United Nations Messenger of Peace, 2009). Each of these organizations highly advocates and works to increase forest growth. As a result of these and other efforts, forest cover in Costa Rica has increased from 21% in 1986 to 51% in 2006. The third step, adaptation, is there to reduce any vulnerabilities in ecosystems by placing measures to mitigate the effects of climate change. This is done through research of climate change, and early warning systems to improve Costa Rica's economic, societal, environmental, and biophysical adaptive capacity (Mora, n.d.). Fourth in the list is capacity-building. Capacity-building sets society-wide capacities to respond and adapt to climate change, as well as to measure its causes in order to limit it. The last section in this plan is education, culture, and public awareness. People and their habits have a large impact on the environment, so these habits must be made compatible or adaptable to any plans to mitigate climate change. Education plays an important role in people's willingness to participate in climate change mitigation. Down the line, education can make way for more national policy commitments for climate change, like increasing renewable energy and reducing urban air pollution.

2.5 Costa Rica's Deadline for Carbon Neutrality and Certifications

While a small nation, Costa Rica hopes to be a model for larger countries, allowing its steps towards environmental sustainability to have a broader impact. As one of the nations that signed the Paris Climate Agreement, Costa Rica has a plan to decarbonize the country. This is especially important, as Costa Rica had the highest per capita deforestation rate in the 1960s and 1970s. However, the country has started the process of reforestation. Additionally, in 2018, 98% of Costa Rica's electricity was from renewable sources (Sinibaldi, 2019). In fact, in 2015, the nation pledged to be carbon neutral by the year 2021 (Fletcher, 2020), although this plan was ambitious and was later changed to a more developed plan.

In 2019, Costa Rica released a new decarbonization plan called the National Decarbonization Plan. As opposed to their previous deadline of 2021, this plan sought to eliminate fossil fuels by the year of 2050, as well as promote clean energy (Tcrn, 2019), with the overall goal of combating climate change. It considers the foundations that will be necessary for a new economy centered around a positive and innovative future. Benchmarks are set, including some for the year 2035. For instance, in terms of transport, by 2035, the country of Costa Rica intends to have 70% of public busses be zero-emission fleets, as well as an electric train system (Tcrn, 2019). These are designed to encourage residents to favor public transportation over private vehicles. Additionally, the 2035 goal ensures 25% of private vehicles will be electrically powered, and 60% of the trucks will be zero-emission. By 2050, electric energy will be the primary energy source for transport, as well as the residential, commercial, and industrial sectors of the economy (Tcrn, 2019). The National Decarbonization Plan is set in place to direct transformation of the economy in order to reverse the growth of greenhouse gas emissions.

All parties in Costa Rica must work together to experience a positive environmental impact. This includes individual companies. Costa Rica has stressed a need for conformity with the ISO 14001 standard of environmental management. Specifically, as of 2017, 63 companies had been granted ISO 14001 certification, mainly including banana producers, hoteliers, and other agribusinesses (*How*, 2017).

2.6 Calculation of Carbon Footprint

In order to accurately calculate a carbon footprint to achieve the certifications the CCCN is looking to receive, third-party consulting companies must be used. However, for this study, approximate calculations were used to determine the CCCN's carbon footprint and to find the areas that needed to be improved. The general steps to estimate a carbon footprint are as follows.

The first step in finding an estimate for a carbon footprint is to categorize emissions by scope. There are three categories of scopes that define most greenhouse gas emissions. As seen in Figure 1, scope 1 covers direct emissions like fuel combustion, company vehicles, and fugitive emissions. Scope 2 covers indirect emissions such as purchased electricity, heat and steam. Scope 3 covers a much broader range of indirect emissions including purchased goods and services, business travel, employee commuting, waste disposal, use of sold products, transportation and distribution, investments, and leased assets and franchises (*Briefing: What are scope 3 emissions?*, 2020).

Figure 1: The infographic above illustrates the 3 emission types considered when calculating a carbon footprint.

Essential data like gas, energy, water, and business travel will need to be collected to find the emissions in each scope. These data should all be from within a uniform time frame to ensure accuracy. With these data, an emission factor is used to convert each source of emission to tons of CO_2 (Harris, 2019). Emission factors convert to CO_2 by multiplying with activity rate, and tend to vary by each source of pollution (Olaguer, 2017). Once the emissions have been calculated, the carbon footprint is the total sum of them (Carbon Footprint Calculator, 2015). When evaluated, a carbon footprint gives insight on the emissions in each scope for CCCN which shows what needs to be improved to achieve carbon neutrality.

2.7 Current Methods of Reducing Carbon Footprints and Approaching Carbon Neutrality

There are many methods to reduce a carbon footprint. The two main methods are reducing carbon emissions, and increasing the absorption of carbon, since both help lead to net zero emissions. For many people, the most obvious solution is to reduce the amount of human-caused carbon being emitted into the atmosphere. There are many ways this can be done, but it is most commonly done by using clean energy, more efficient energy, and any other technologies that provide low carbon emittance (European Parliament, 2020). An example of a system that helps reduce the amount of carbon emittance is the EU Emissions Trading Scheme. This scheme holds power plants and factories accountable by making them purchase a permit for each ton of CO_2 they emit. The permits give companies financial incentives to reduce pollution, especially since the cost of the permits varies by demand (The EU Emissions Trading Scheme, 2018). This is a process similar to Cap and Trade, which is a method used to lower emissions in the United States.

The other way to reduce carbon footprints is to offset carbon emissions. To offset emissions, it is important to have carbon sinks in a system. A carbon sink is defined as an area that absorbs more carbon than is emitted. Some common examples of carbon sinks are soil and forests. These natural carbon sinks can absorb between 9.5 and 11 Gt (gigatons) of carbon from the atmosphere worldwide, annually (European Parliament, 2020). However, the method of offsetting emissions alone is still not nearly enough to fight global warming effectively. In order to combat global warming more effectively, more carbon sinks must be used in addition to significantly reducing carbon emissions. Furthermore, carbon stored in forests can be released in events like forest fires and logging, among other disasters, which must be combated and

prevented in order to keep these natural sinks as effective as possible (European Parliament, 2020).

2.8 ISO 14001 Standard

ISO 14001 is a standard for environmental management systems. Obtaining it requires organization, leadership, planning, support, operation, performance evaluation, and improvement. ISO 14001 has many benefits, including but not limited to: improving resource efficiency, reducing waste, and managing environmental obligations with consistency. Getting ISO 14001 certified is essential for the CCCN, as it is widely considered to be the most important environmental certification (ASQ, 2020). While the certification is broad, it ensures the organization is run so it is environmentally and economically sustainable (NQA, n.d.). While not a requirement to procure a certification, in Costa Rica, ISO 14001 certification may be procured by an independent consulting company, such as Certvalue. Certvalue is a consulting and certification company which works in major Costa Rican cities such as San Jose. They assist with implementation, training, gap analysis, and registration (Certvalve, 2020).

To further improve their carbon footprint, The CCCN aims to commit to the ISO 14001 program and gain a carbon neutral certification. In order to start bettering their environment, an Environmental Management System (EMS) must be put into place. The purpose of the EMS is to make sure that the organization is complying with the environmental policies and regulations with respect to carbon emissions (Andre & Valenciano-Salazar, 2020). If they do not comply, the EMS will generate actions that the user can complete to both correct and prevent the behavior in order to reduce the polluting emissions of the organization (Andre & Valenciano-Salazar, 2020). Once the CCCN is determined to consistently comply with all of the environmental policies regulated by the Environmental Management System, a certification will be granted. The hope of

the CCCN is that this certification will eventually make them CO_2 emission neutral to prevent further global warming and climate change. In terms of establishing an environmental policy, there were four main requirements in getting an ISO 14001 certification which were essential to consider for our proposal.

First, an environmental policy must be established. The environmental policy is a document that lays out the plans for implementation and improvement of the environmental management system. The EMS can be thought of as a database system that is "involved in the monitoring, tracking, summarizing, and reporting of environmental information to internal and external stakeholders" (Sroufe, 2003). The environmental policy must be understood by all who work toward maintaining the ISO 14001 standard (International Organization for Standardization, 2004).

Next, the organization must determine their potential and legitimate environmental impacts. These environmental impacts could include the organization's: "emissions to air, releases to water, releases to land, use of raw materials and natural resources, use of energy, [and etc]" (International Organization for Standardization, 2004). Once these environmental impacts are determined, the organization must look into national, state, and local governmental and environmental requirements with respect to these regulations (International Organization for Standardization, 2004). From there the organization can set objectives and goals to reach these requirements.

After a plan is set, the EMS implementation process can commence. First, a person will be appointed to be the EMS representative. This person will have "defined responsibility and authority for implementing the environmental management system" (International Organization for Standardization, 2004). Once the EMS is implemented all people involved in improving it

must be trained in accordance with the ISO 14001 international standard. The reason for the mandated training is that everyone involved has the potential to cause significant environmental impacts. In order to avoid mistakes that could lead to setbacks to the certification process and pollution that could harm the environment, this training is meant to ensure competence in all workers (International Organization for Standardization, 2004). In addition to training, the organization will have to implement a procedure for receiving, documenting and responding to relevant communications from interested parties. They will also have to document all EMS data including procedures to ensure that they are following their environmental policy. Finally, a set of emergency preparedness and response procedures should be put into place (International Organization for Standardization, 2004). This will allow for the quick response to environmental emergencies to prevent environmental damage.

After implementation of the EMS, it is important to keep monitoring the progress of the environmental management system. To do this, environmental factors will be measured frequently, and all data will be documented. This will allow the organization to assess their ability to achieve objectives and targets, and to improve their environmental performance over time (International Organization for Standardization, 2004). Monitoring environmental impacts further allows for the evaluation of compliance and will allow corrective action and preventive action when noncompliance is found. Furthermore, internal audits will need to be completed in intervals as another method of monitoring progress and a management review will be done when the organization is ready to obtain their certification.

2.9 The “Green Fund”

A green fund is a pool of money designated for future environmental sustainability projects aimed at preventing further climate change and other environmental implications (Yu,

2018). Commonly, it is used to reduce an organization's carbon footprint and environmental impact. Examples of successfully established green funds include some universities in the United States. For example, the University of California, in the United States has a "Green Initiative Fund," through which funds are raised for sustainability projects. This group put together a powerpoint that explains different ways they were able to raise money for their green fund including: collecting small campus green fees paid by students each year, finding cosponsors, applying for grants, and campaigning in various ways appropriate to their specific audiences whether they be teachers, students, or the community (Difalco et al., 2018).

Methodology

The goal of this project was to estimate the carbon emissions and ultimately the carbon footprint of the CCCN and to make recommendations that will help them move toward both accomplishing the ISO 14001 certification and setting up a green fund. We used a mix of qualitative and quantitative data to analyze the major carbon emissions of the organization and to make recommendations based on both carbon emissions and the feasibility of continuing virtual classes. The following is a list of objectives we set in order to accomplish this project.

1. Find the carbon footprint of the San Pedro and Sabana Campuses and identify sources of high emissions;
2. Learn about online courses to help assess post-pandemic options;
3. Make ISO 14001 recommendations;
4. Make green fund recommendations.

This chapter describes the approach we took to accomplish the project and to complete these four objectives.

3.1 Process of Identifying the CCCN's Environmental Interaction and Impacts

The CCCN has four campuses in Costa Rica. However we focused on the San Pedro and Sabana campuses for the purpose of this project. In order to find the carbon footprint of these campuses, the environmental interaction and impacts of the organization were determined. In order to calculate the CCCN's carbon footprint, environmental interaction and impact data from the past few years at both the San Pedro and Sabana campuses were obtained through our sponsors. These interactions included but are not limited to: their heating source, their electricity source and how much electricity they use, their waste disposal methods, their worker's methods

of transportation to the campuses, their paper usage each year, the amount of hardcopy textbooks they provide each year, and any additional emissions that are released to the land, water or air.

In addition to the data over the last few years, it was beneficial to get the same environmental interaction data pre-COVID-19 and during COVID-19 for each campus. These data allowed us to analyze the effects that working and learning remotely have had on the environment. Moving forward, this analysis allowed us to make recommendations about whether to implement a hybrid or fully remote version of the organization to lessen the CCCN's environmental impact.

3.2 Calculating Carbon Footprint

Calculating the carbon footprint to obtain certifications is usually done by utilizing a third-party consulting company. This is because third-party consulting companies provide a professional carbon footprint that is completed under tight standards. Their evaluation provides more reliable and accurate details for the consultants providing certifications like ISO 14001. Our team evaluated and recommended several companies to the CCCN for obtaining these carbon emission calculations including: SCS Global, Inteco, Carbon Trust, and Earth University (Henchy et al., 2020). However, it can take some time for companies to complete this, so for our time frame, we estimated the CCCN's carbon footprint. This estimation helped determine which type of emissions need to be improved, and the areas that are on track to achieve the certifications. The estimate divided each emission source into Scopes 1, 2, and 3. Then, an 'emission factor' (EF) was used to convert these emissions to the common unit of greenhouse gas emissions (GHG). The numerical values for each factor are located on the U.S. Environmental Protection Agency's website (Emission Factors for Greenhouse Gas Inventories, 2018). Since this is an estimate, there is a percentage of uncertainty. This uncertainty comes with

the limitations of our project, including what emissions information we are able to gather. For example, we were able to get data on the CCCN's water, electricity, gas, and diesel usage, but we have no quantitative data on their business travel or waste generation. Without these data, we will not be able to incorporate these two utilities into the carbon footprint, but the qualitative findings we gather can still be used to draw conclusions from. So, in order to get the certifications at hand and the most accurate carbon footprint, there must be a consulting company involved (Clim'Foot, 2016). A series of equations were utilized to determine the carbon emission estimates for each emission category. These equations can be found below.

According to the 2020 IQP with the CCCN, all Scope 2 emissions have been eliminated by the use of solar panels in the dry season, and a backup diesel generator for the rainy season (Henchy et al., 2020). For Scope 1, the diesel generator's emissions were calculated as:

$$\text{Emissions} = \text{Fuel Consumed} * \text{EF}$$

(Henchy et al., 2020)

Fuel consumed is defined as the total amount of diesel or gas consumed, measured in mass or volume. The emissions factor is fuel specific.

For Scope 3, there were several equations involved in analyzing the carbon emissions considering it is the broadest scope. We considered the business travel of employees and students, and waste produced at the facilities. There were multiple ways to calculate emissions due to business travel, but finding the total distance of each employees' and students' commute would be the best way to collect these data. This is done with the equation:

$$\text{Emissions} = \text{Total Distance} * \text{EF}$$

(Henchy et al., 2020)

The total distance in this equation is the total daily commute distance per employee or student. The emissions factor is specific to the type of car one drives.

The second part of Scope 3 was calculating waste production emissions. There are two different kinds of waste (solid and liquid), which can both be encompassed in the following waste emissions equation:

$$\text{Emissions} = \text{Waste Generated} * \text{EF}$$

(Henchy et al., 2020)

Like fuel, waste generated is measured by mass or volume. The emissions factor varies based on type of waste, along with whether it is a liquid or solid.

After calculating the emissions for each of the different scopes, the carbon footprint is calculated by finding the sum of all of the emissions (Global, 2020). Because of this, a reduction of the CCCN's carbon emissions is directly linked to the reduction of their carbon footprint as a whole.

3.3 Reducing the CCCN's Carbon Footprint Post COVID-19

In order to do their part in reducing the spread of COVID-19 and keeping students and employees safe, the CCCN has moved their classes to a remote format. As a result, many resources have become remote, students and employees are not driving to campus for classes, and less energy is required to operate their facilities. This reduction in the CCCN facility use yields a change in carbon emissions in comparison to the pre-COVID-19 era. In order to predict how the CCCN's carbon footprint may change after the pandemic ends and to give them helpful recommendations, we calculated their carbon footprint before the pandemic and compared it with their current carbon footprint. This was essential as their carbon footprint could revert to the old value, should the company return to in-person learning. Additionally, it was important to

understand the impact of remote learning on their students and employees in making our recommendations for lowering their carbon footprint. Once the world returns to some version of normalcy after COVID-19, our recommendation based on the data will give the CCCN an accurate picture of how to proceed with courses and how to continue lowering its environmental impact.

3.3.1 Interviewing Students - Is Remote Learning an Option?

As mentioned before, students at the CCCN were forced to move to virtual classes at the start of the pandemic. During this time, having students attend classes remotely may have greatly reduced the carbon footprint of the CCCN. The purpose of this study is to assess whether continuing remote or hybrid classes will be a feasible option after the pandemic. The team decided to interview students to understand their perspective about online learning. CCCN has students of all ages, but after sponsor recommendation, we focused on their adult population, with a total of five interviewees. As courses have been moved onto zoom, the team conducted virtual interviews using this platform. We gave the interviewees the option to conduct the interviews in English or Spanish, and requested to record the interviews for later analysis. The team collected qualitative data on the following topics: how the quality of education has changed since the pandemic began; if students would be willing to continue a remote or hybrid learning platform after the pandemic; if students have noticed a change in their carbon footprint since virtual learning began; student's opinions on the implementation of a green fund; and if they still place the same value on their English learning as prior to the pandemic. To obtain this information, we asked the participants a series of 12 questions that included both closed fixed-response questions, to ensure responses from the students, and open-ended questions to

further support the conclusions we gathered (Valenzuela, n.d.). A copy of the interview questions is provided in Appendix C.

3.3.2 Interviewing Teachers - Is Remote Teaching an Option?

To further understand how the pandemic has affected the CCCN, five teachers were also interviewed using the zoom platform. The participants were given the option to conduct the interview in English or Spanish, and they were asked if it was okay to record the session. From there, a series of 14 open-ended questions were asked to each participant (Valenzuela, n.d.). A copy of these questions can be found in Appendix C. The questions ranged in topic assessing the following: employees' feelings regarding remote teaching, their willingness to continue a remote or hybrid format, how working from home has impacted them, their views on becoming carbon neutral, any ideas they have to reduce the CCCN's carbon footprint, and their willingness to create a green fund or join a green fund committee. This feedback was vital in reaching conclusions about the teachers' stances on carbon neutrality and in understanding the options for post-COVID-19 class structures.

3.4 Surveying Teachers and Students - Is Remote Learning an Option?

To reach a wider audience, we conducted surveys to collect information that would be used to develop a detailed plan for the CCCN. The CCCN worked with us to finalize the translations according to the Costa Rican dialect and distributed the surveys through Survey Monkey. Both qualitative and quantitative questions were asked to create a full picture of the carbon footprint of the organization. We asked similar questions to the students and the teachers. A copy of these questions is provided in Appendices A and B. For students, questions focused on qualitative questions relating to their daily life at the CCCN campus and at home, how they feel

about remote learning, and how these lifestyles compare. For teachers, questions were focused on how students learn, challenges of teaching remotely, and changes in their carbon footprint before and after the pandemic.

3.5 ISO 14001 Recommendations

The main goal of our project was to evaluate CCCN's carbon footprint and make recommendations that would improve it enough so that they could obtain an ISO 14001 Carbon Neutral Certification. The ISO 14001 Certification process requires time and resources to complete, so our team focused on the preparatory work that the CCCN must complete to obtain the certification. In order to understand what needs to be done, we first had to familiarize ourselves with the ISO 14001 Certification requirements, as described in the background. We next focused on how to improve the CCCN's carbon footprint and the initial steps to get the certification. These were then incorporated into recommendations.

3.6 Proposing a Green Fund

A green-fund, as detailed in section 2.10 of this report, is a bank of money allocated for the continued improvement of environmental sustainability. Given the timeline for the project, the team was not able to develop a green fund. Instead, we proposed a plan to create a green fund. In order to recommend this, a process similar to that which has been employed by the UC Berkeley green fund was evaluated. The team talked to our contacts at the CCCN about the need to apply for grants, persuade private funders and individuals and/or the government to sponsor them, appeal to different groups through various outreach programs, and promote transparency as to how the money will be spent. Furthermore, after calculating the carbon emissions of the San Pedro and Sabana Campuses, the best methods for improving the CCCN's carbon footprint

were determined by the team. These methods focus on both offsetting their carbon emissions or reducing them, as discussed above. Based on the source of CCCN's carbon emissions, they may be able to implement some carbon emission reduction techniques like recycling, composting, and using more renewable energy (Global Stewards, 2020).

After sponsor input, a recommendations report was developed. This report makes suggestions for the CCCN to follow based on their estimated carbon footprint, their student and employee perspectives on class formats and implementing a green fund, and their goal to become ISO14001 certified. A copy of the recommendations report can be found in Appendix F. All potential options were reviewed by the CCCN for feasibility. The proposal details the sources of income (sponsors, grants, donations), as well as potential uses of the green fund to help the CCCN's end goal of becoming carbon neutral.

3.7 Developing Recommendations and Strategies

Once the information was collected from the CCCN employees and students and the carbon footprints were calculated, an extensive plan was created to develop recommendations and strategies to achieve carbon neutrality. This plan consists of both general and specialized solutions to reduce their carbon emissions. General solutions were given as ideas to implement organization-wide such as planting trees and changing to LEDs, while specialized solutions implement information gained through interviews, surveys and emissions data to create a custom plan for specific sectors. By looking at the carbon footprint along with the qualitative and quantitative data received from the interviews and surveys, we identified the main contributors of the CCCN's carbon emissions. From these conclusions, we created a list of changes to either balance out the carbon emissions through carbon sinks or reduce the emissions in general. These recommendations will help the CCCN achieve both the ISO 14001 certification and carbon

neutrality. Our plan also provided the organization with guidelines to implement our ideas into future campuses and new divisions of the company to remain within the certification requirements. Through successful implementation of our green fund, all future implementations of our plan will be covered financially and permit the CCCN to continue focusing expenses on their students and organization goals. This will position the CCCN to be a leader of change in the Costa Rican community and be an example for other businesses to follow.

Results and Analysis

In order to evaluate the CCCN's carbon footprint and create recommendations for the future, our team used a combination of surveys, interviews, and carbon footprint analyses. The team then analyzed the results of each survey, interview, and carbon footprint calculation to draw the following conclusions:

1. Moving to a virtual format has significantly decreased the CCCN's carbon footprint.
2. Solar panels have reduced the CCCN's environmental impact, most significantly in 2020.
3. Both students and teachers at the CCCN are environmentally conscious and want to reduce their own carbon footprint.
4. The CCCN is perceived as an environmentally-friendly organization which is seeking to reduce its carbon footprint.
5. The student population has a mix of learning preferences. Although virtual is the most popular, hybrid courses were preferred by a significant portion of the students.
6. Many teachers are in favor of the hybrid teaching model, so they can better fulfill all the needs of their students and reach a larger population.
7. While only half of the teachers prefer remote teaching over the traditional format, the vast majority are willing to continue teaching remote courses.

The sections that follow detail the process and results from which our team based these conclusions.

4.1 2017 Carbon Footprint - Before the Pandemic

Using the method specified in section 3.2, we were able to calculate the carbon footprint of the CCCN from 2017, before the pandemic began. The calculated carbon emission values can

be found in Appendix D. The carbon footprint that we calculated accounts for electricity, potable water, gas usage, and diesel usage from the San Pedro and Sabana campuses. It does not account for offsets such as existing solar panels and recycling efforts. Using the consumption data, we estimated that the total carbon footprint of the San Pedro and Sabana campuses combined, is 137 tons of CO_2 in the year 2017. The greatest emissions were created by the electricity usage - specifically in the San Pedro campus. Between the San Pedro and Sabana campuses, electricity makes up about 127 tons of the overall amount of CO_2 emitted. At the time that these data were collected, the CCCN had already implemented solar panels to offset some of these emissions, but the expansion of these panels in the future could further reduce their footprint. The second greatest contributor to the CCCN's carbon footprint was their gas usage, emitting 8 tons of the total CO_2 emitted in 2017. Lastly, potable water and diesel emitted 0.7 and 1 ton of CO_2 respectively. These results for each campus are illustrated in Figure 2 and Figure 3 for better understanding.

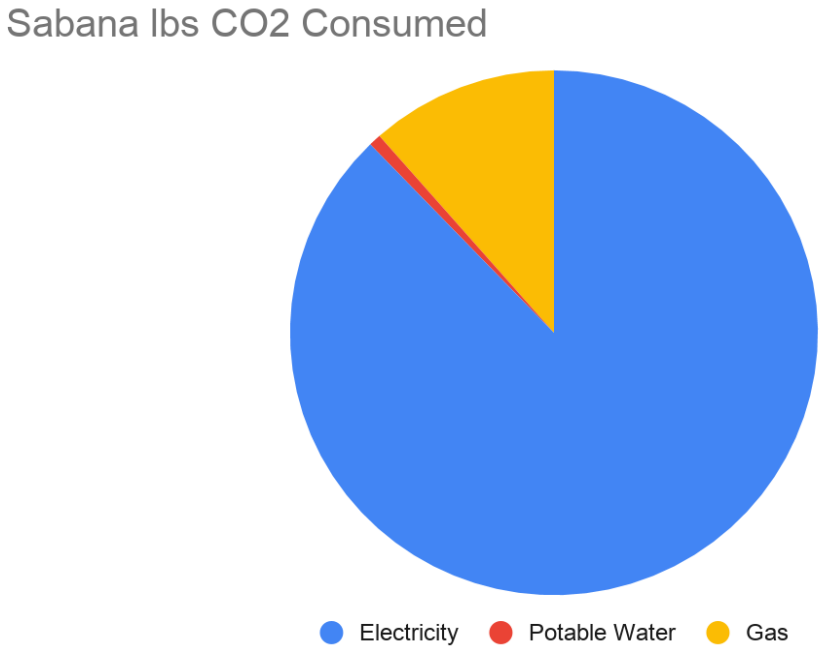

Figure 2: Pie chart of the distribution of carbon emissions at the Sabana campus.

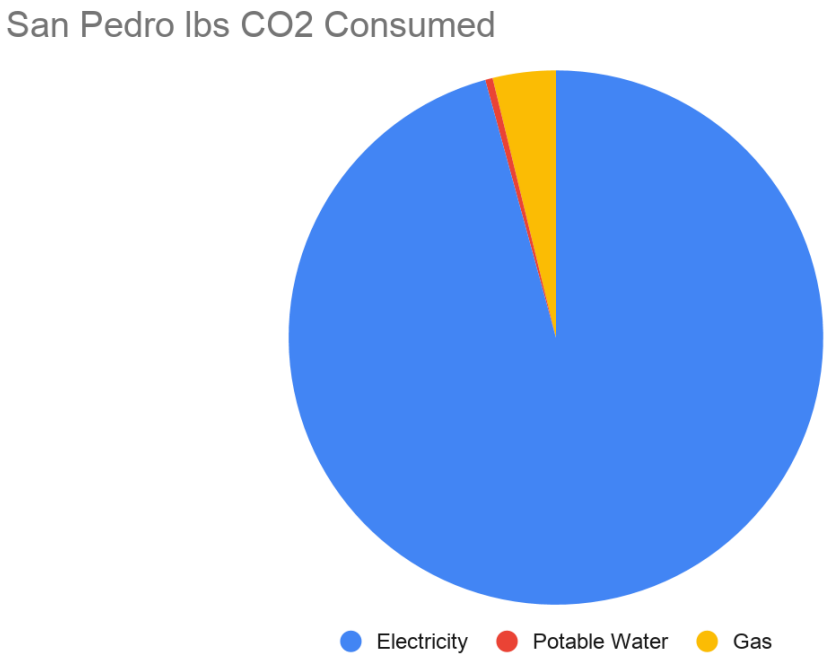

Figure 3: Pie chart of the distribution of carbon emissions at the San Pedro campus.

4.2 2020 Carbon Footprint - During the Pandemic

Using the same method as the pre-pandemic carbon footprint calculations, we were also able to calculate the CCCN's footprint from 2020 during the COVID-19 pandemic. We were not able to get the data for the gas and diesel usage, so this analysis is purely based on electricity and water data. As, expected, the consumption of these utilities dropped greatly due to the onset of remote classes and quarantine. Figures 4 and 5 illustrate how drastically these utilities' usage dropped. The CCCN produced 46 tons CO_2 from these utilities in 2020, which can be compared to the 128 tons CO_2 produced in 2017 from the same two utilities. Of this 2020 total, 45 tons CO_2 was produced by electricity, while only 0.2 tons CO_2 originated from water consumption. Electricity remains the highest emitting utility, even during the pandemic. Since the CCCN has implemented solar panels, it is also beneficial to look at their effectiveness. This better helps us understand what portion of the electricity emissions are offset by the solar panels.

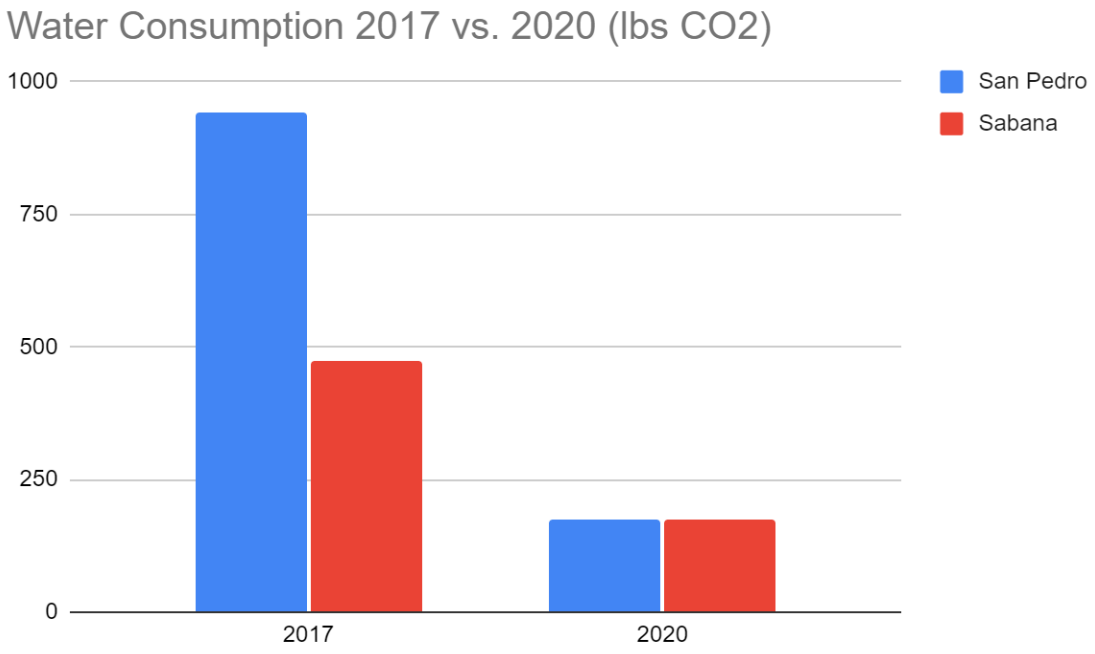

Figure 4: Comparison of the 2017 and 2020 carbon emissions produced by water at the San Pedro and Sabana campuses.

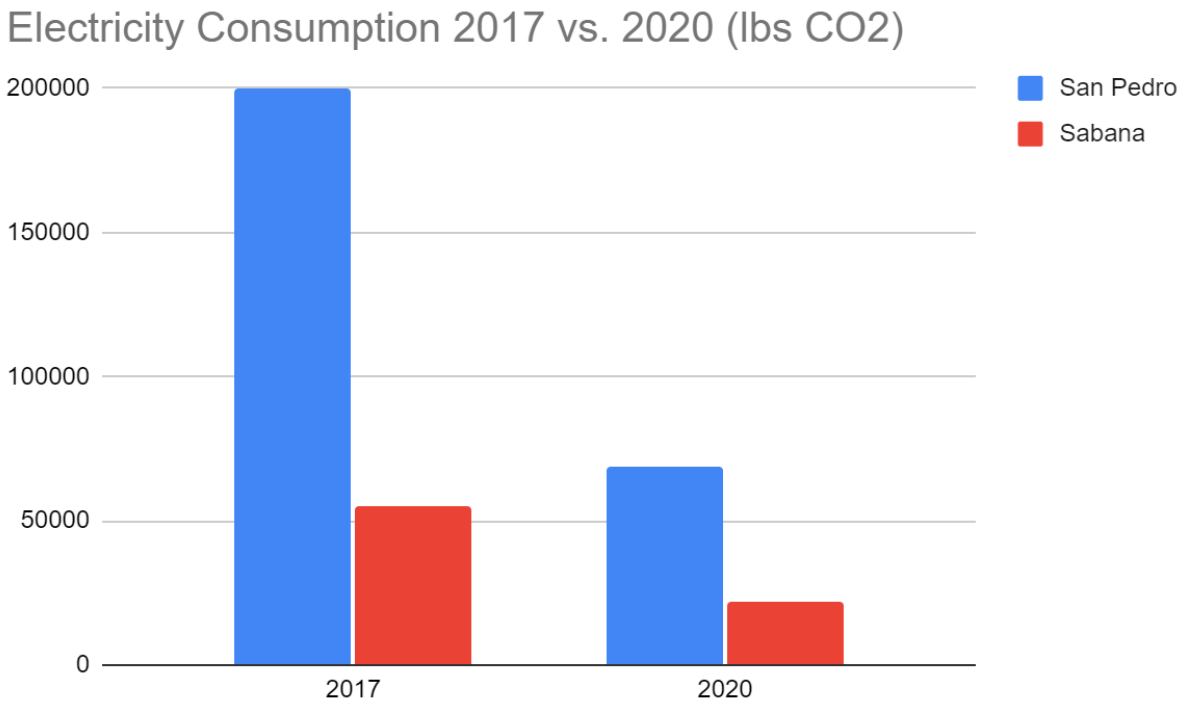

Figure 5: Comparison of the 2017 and 2020 carbon emissions produced by electricity at the San Pedro and Sabana campuses.

From the surveys, it is notable to mention that most adults noticed a slight increase in their utility bills since the pandemic began, which has a small impact on their personal carbon footprints. They have also noticed a significant decrease in the amount they travel, whether it be by car or public transport, resulting in net lower bills as highlighted in section 4.2 of this paper. While we have no quantitative data on their utilities and travel, it is important to note how these aspects are affected by the virtual class format.

4.3 Effect of Solar Panels on Electricity Usage

There are 459 solar panels located at the San Pedro campus of the CCCN which are currently being used in an effort to combat the high carbon emissions produced by electricity. It is estimated that each year, the solar panels will offset the electric carbon emissions by 9.1 tons

CO_2 (18,200 lbs CO_2). This reduces the 2017 carbon emissions produced by electricity to 128 tons CO_2, and the 2020 emissions to 36 tons CO_2. This is a significant reduction, especially in comparison to the 2020 emissions when classes held a remote format. Figure 6, shown below, is an infographic created by the CCCN to highlight the functionality of these solar panels.

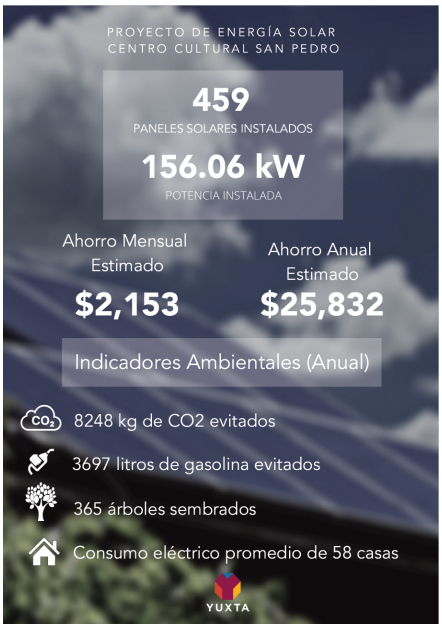

Figure 6: Poster created by the CCCN highlighting the effects of their solar panels.

4.4 Adult Student Survey Results

In order to evaluate whether virtual or hybrid class structures are an option for future classes, 403 adult students at the CCCN were surveyed. The analysis of the responses are given below:

What is your ideal learning environment?

According to the survey, 41% of the participants prefer virtual classes, 32% of participants prefer a hybrid format and 27% of participants prefer in-person classes. Although the greatest number of students prefer remote learning, the other options had very comparable

results, as seen in Figure 7. With such an even spread of results, a hybrid format would likely be the most effective going forward, as it encompasses all of the student's preferences.

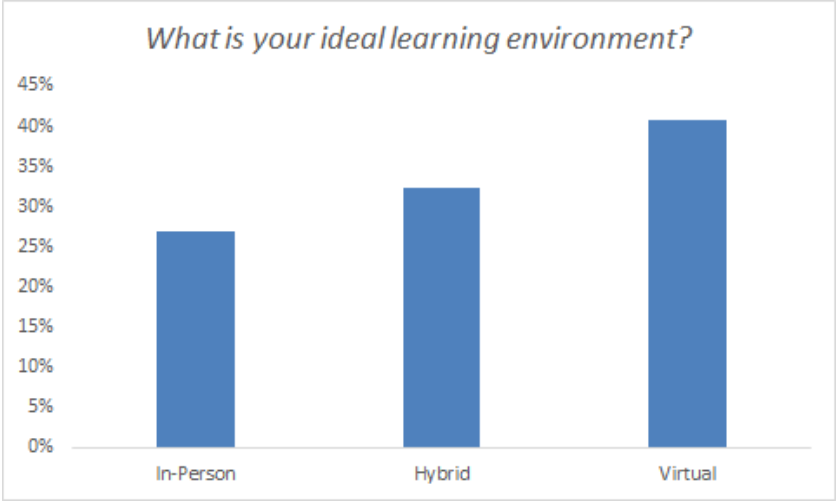

Figure 7: The image above illustrates the preferences of students for different class formats.

Following this question, we asked the participants to explain why they chose their specific answer. For the students who preferred in-person classes, many of them stated that there were too many distractions at home. They indicated that they focus better in class when they have personalized connections with the teacher and their fellow students. Notably, one student stated that learning a language is not only about knowing the language, but also the cognitive, physical and social skills associated with it. Students are not receiving the types of interactions that they need in this type of class. Another common point was the ease of in-person classes. Most students are used to going to class every day, so a shift away from this routine is difficult and can affect the learning ability of the students.

The same question was asked of those who prefer virtual classes. Among the students, many of them stated that the ease of virtual classes was an important factor. One advantage is that students no longer feel stressed about getting to campus on time. Also, some students have

other obligations such as jobs and families, and taking online classes allows them to be more flexible. Related to this point, many students conveyed that they feel much more comfortable in their own homes. This reduces the stress they feel during classes and exams. Another common point brought up by participants was the fact that they were saving time and money. By no longer having to go to campus, many students save money normally spent on public transportation. They also do not spend any time traveling to and from campus.

Finally, the question was asked of those students who prefer a hybrid option. There were a variety of answers received, but they all generally fell in two categories. The first group of responses outlined the importance of both in-person and virtual classes. These students stated that some content can be taught online and benefits more from the virtual format. Other content requires in-person interactions to really be solidified. A hybrid format would allow for a mix of online and in-person classes depending on the lesson being taught that day. The second group of responses pointed towards a format where in-person and online classes are taught simultaneously. This would allow those students who live very far away or have other obligations to continue learning online to accommodate for their schedules. However, there would also be in-person classes at the same time to allow for students to return to campus if they choose. Both groups of responses agreed that both formats are necessary for all students to succeed. We recommend that the CCCN select a hybrid format following the pandemic not only to accommodate all students, but to continue to grow their education program and be an example for many other schools in Costa Rica.

After the need to be remote due to the pandemic is over, would you like to continue learning from home, and with what frequency?

Despite the results to the previous question, only 32 students or 9% of the participants responded that they would never want to work from home again after the pandemic. In opposition, 174 students or 48% of the participants stated that they wish to work from home all the time, and 43% of the participants opted for a partially remote and partially in-person option. These results are illustrated in Figure 8. From this, we can conclude that although many people prefer working in-person, they do not mind working from home. Only a handful of students feel that they can only work while on campus. This further supports the implementation of a hybrid format.

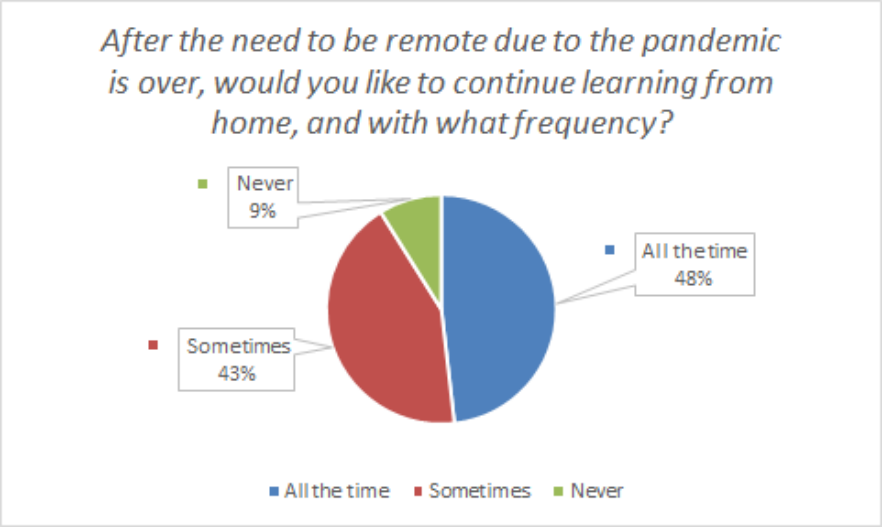

Figure 8: The image above illustrates the students' preferences on the frequency that they will learn virtually after the pandemic.

How has the quality of your education changed since the pandemic began?

According to our survey, 12% of the students stated that their quality of learning has decreased since the pandemic began. 39% of the participants stated that the quality of their

education has stayed the same, and 49% of the students cited a degree of increase in their quality of education. These results can be seen in Figure 9.

Overall, virtual learning has been more beneficial for about half the students as compared to in-person classes. This could be tied to a number of reasons. One reason that was throughout the survey responses was the different types of learning styles of students. Some students are kinesthetic learners who learn better through hands-on and physical experiences (Griss, 1994). Other students are visual learners who learn better by seeing the material and having more visual illustrations. There are also auditory learners who thrive when they can hear the lesson through discussion, rhymes and music (Shaw, 2018). Each type of learner may excel in either in-person classes or virtual classes due to their respective learning style. In-person classes allow students to learn physically and participate face-to-face. Virtual classes allow students to learn through illustrations, PowerPoint, and videos. Other reasons that students may have responded as they did could have been due to the difference in learning environments or the different methods of teaching. This question further solidifies the importance of a hybrid format after the pandemic, so that different types of students have their needs fulfilled.

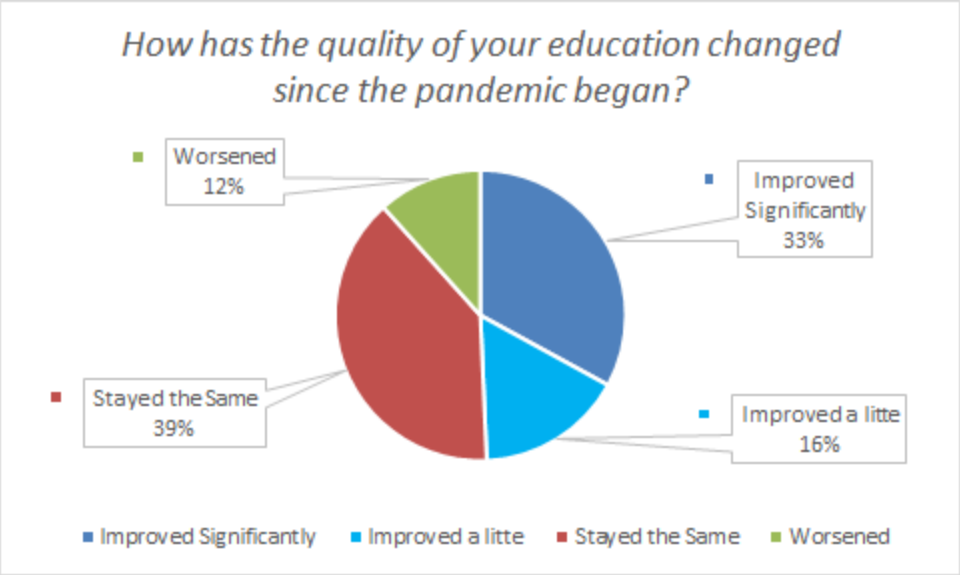

Figure 9: The image above illustrates the students' perspective on how their quality of education has changed since the pandemic began.

How do you feel about the following statement?: The CCCN is passionate about reducing its carbon footprint and lowering its environmental impact.

There is evidence that the students at the CCCN believe that their organization is passionate about reducing its carbon footprint. When asked their opinion on the statement above, 40% of the participants strongly agree that the CCCN is passionate about reducing its carbon footprint, 56% agree, 3% disagree, and 0.9% strongly disagree, as seen in Figure 10. This suggests that the efforts in the past by the CCCN to reduce their carbon footprint have been effective amongst their student body and have had a lasting impact.

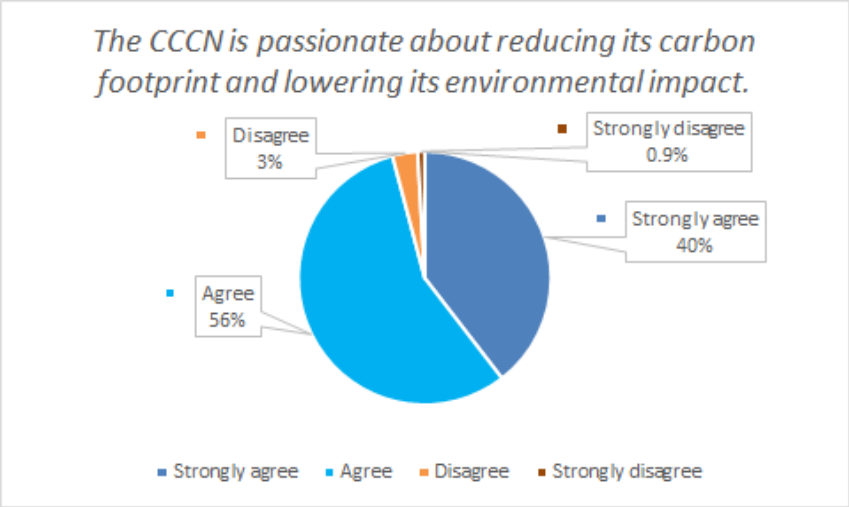

Figure 10: The image above illustrates the students' perspective on how passionate the CCCN is about lowering their carbon footprint.

How do you feel about the following statement?: I am passionate about reducing my personal carbon footprint and lowering my environmental impact.

There is also evidence that many students are passionate about reducing their carbon footprints. When asked their opinion on the statement above, 70% of the participants strongly agree that they are passionate about reducing their carbon footprint, 29% agree, 0% disagree, and 0.9% strongly disagree. These results can be seen in Figure 11.

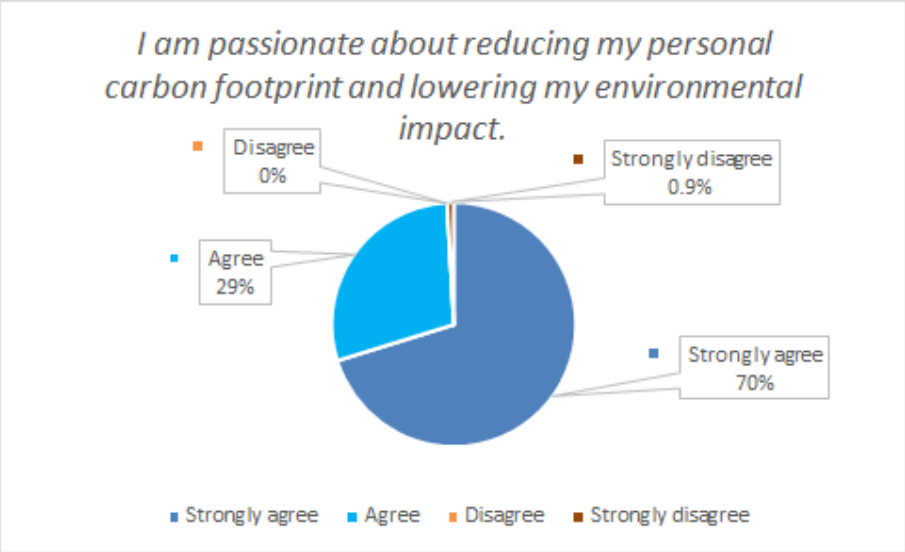

Figure 11: The image above illustrates the students' perspective on how passionate they are about lowering their personal carbon footprints.

These results can largely be credited to Costa Rica and the CCCN's attempts to reduce their carbon footprint. This indicates that the students are open to change at the CCCN to further improve the company's environmental impact.

How could the CCCN become more environmentally friendly?

The students provided a wide range of answers to this question, but the general consensus seemed to be that the CCCN should continue virtual classes, use more digital materials to reduce paper use, and allow for less transportation usage. Some students went more in-depth with their answers, stating that the CCCN can get involved in reforestation and tree planting or use more biodegradable materials. One student notably said that the CCCN should become involved in the community by collaborating with organizations that pledge to reduce their environmental impact. Since most students were able to produce a knowledgeable answer for this question, this demonstrates that the CCCN has successfully educated their students on the importance of being eco-friendly.

Describe how the quality of your education changed since the pandemic began.

There were mixed responses from the students for this question. Multiple students stated that teachers have become much more creative and have done a good job adapting to the virtual classes. For example, they create new learning materials online that make it easy to understand the lessons. On the contrary, some students stated that virtual classes are much harder due to an abundance of distractions and difficulty adapting to the style. A few students stated that it has remained the same. Overall, the responses varied greatly depending on the student's view on online classes. A hybrid format would allow all students to feel comfortable learning again following the pandemic and satisfy all preferred learning conditions.

4.5 Teacher Survey Results

In order to evaluate whether virtual or hybrid class structures are an option for future classes, 63 teachers at the CCCN were surveyed. The analyses of the responses are shown below:

How much has your method of teaching changed since the pandemic began?

According to the survey results, 90% of teachers surveyed said that their teaching methods have changed a lot since the pandemic began. 5% of teachers said that their teaching has stayed the same. 3% of the teachers surveyed said that their teaching style changed a little, and 2% said nothing changed at all. These results can be seen in Figure 12.

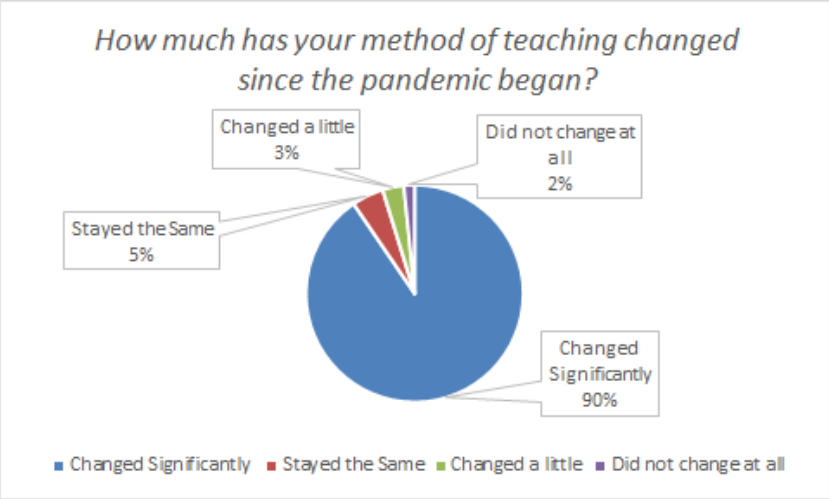

Figure 12: The image above illustrates the teachers' perceptions of their methods of teaching since the pandemic began.

Since over 90% of the teachers surveyed said that their teaching style had changed markedly, this supports the conclusion that these teachers adapted to the virtual world, and that the way they taught had been significantly altered.

How do you feel about the following statement?: Compared to in-person learning, students are learning the same material and objectives remotely.

There is evidence that teachers believe that their students are learning the same material and objectives remotely compared to in-person learning. According to the survey results, 28% of the participants strongly agreed with the statement and 67% of the participants agreed with the statement. Only 5% of participants disagreed with the statement, and 0% strongly disagreed. These results can be seen in Figure 13.

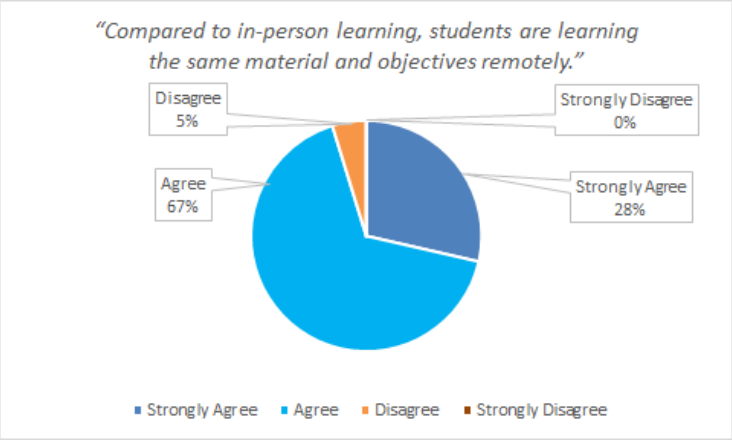

Figure 13: The image above illustrates the teacher's opinions on whether their students are learning the same material and objectives remotely compared to in-person.

Given that 95% of the 63 teachers agreed somewhat with this statement (as seen by the blue areas in the pie chart), it can be concluded that students are learning the same materials and objectives remotely compared to in the classroom.

Would you rather teach remotely, hybrid, or in-person?

In response to this question, 51% of the participants preferred to work remotely. 41% of the teachers surveyed opted for a hybrid format, while the final 8% of participants wish to work in-person as seen in Figure 14 below.

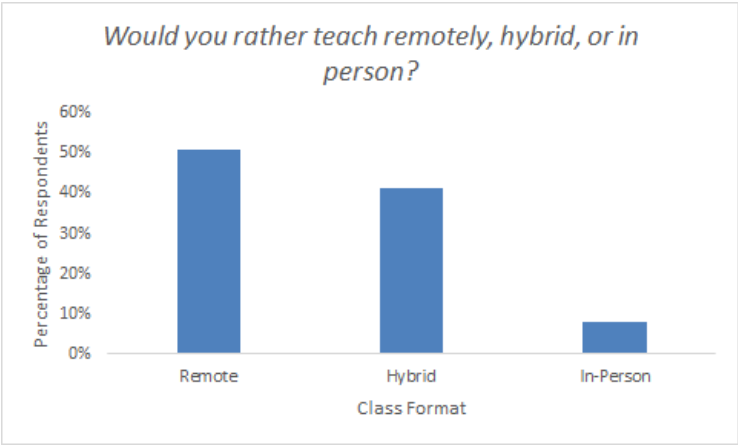

Figure 14: The image above illustrates the preferences of teachers for different class formats.

So, if it were determined that hybrid or virtual teaching were ideal for reducing the carbon footprint of the CCCN, it can be concluded that a majority of the teacher population would support a decision to move to some amount of virtual learning.

Would you be willing to continue working in a virtual or hybrid format after the pandemic?

Approximately 92% of the 63 surveyed teachers responded that they would be willing to continue working in a hybrid or virtual format after the pandemic, while the same 8% would not be willing to do this. Therefore, it again can be concluded that teachers will generally support a hybrid or virtual teaching environment. These results can be seen in Figure 15.

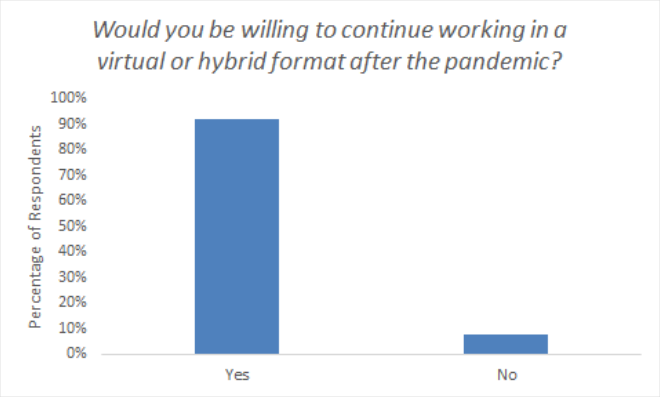

Figure 15: The image above illustrates the teachers' willingness to work in a virtual or hybrid format after the pandemic ends.

Do you support the continued use of remote learning in place of in-person learning after the pandemic?

Similarly to the last question, 95% of participants responded that they would support a completely or partially virtual class format after the pandemic, and 5% of the participants disliked the idea of having any virtual classes at all, as seen in Figure 16. So, if it were determined that a virtual teaching format were ideal for reducing the carbon footprint of the CCCN, it can be supported that a majority of the teacher population would support a decision to move toward some amount of virtual teaching.

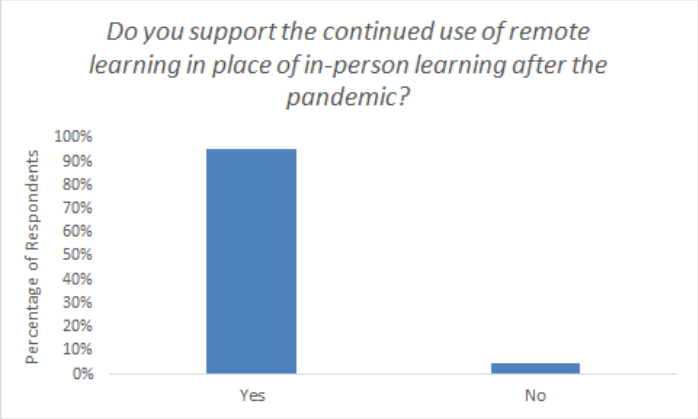

Figure 16: The image above illustrates the teachers' willingness to work in a virtual format in place of in-person learning after the pandemic ends.

In a typical year (not Covid), how often do you travel to the CCCN campus?

Before the pandemic, 71% of the survey participants stated that they traveled to the CCCN campus 5-6 days a week, 17% of participants stated that they went to the campus 1-2 days per week, and 11% of the participants went to the campus 3-4 days a week. These results can be seen in Figure 17.

With teachers traveling significantly less due to virtual classes, there is less worry of pollution due to travel since less people are taking busses, Ubers , cars, or other public transportation.

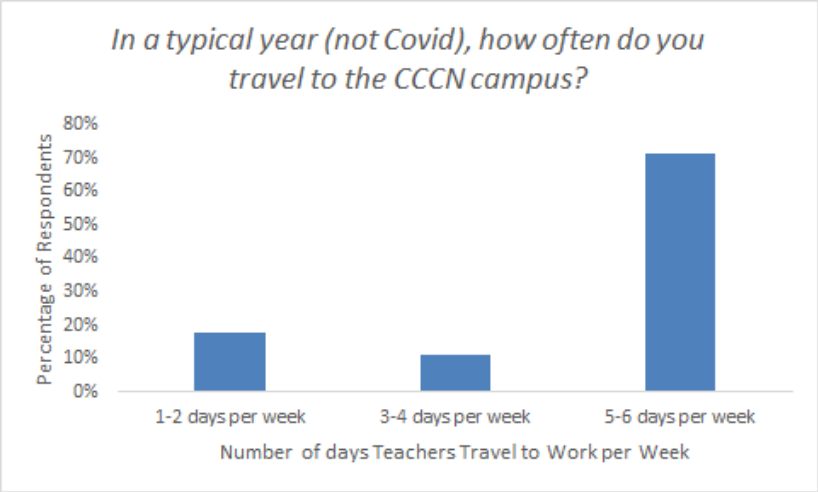

Figure 17: The image above illustrates the amount of days per week in a typical year that teachers travel to the CCCN campus.

How have your bills been impacted when working from home compared to going to work?

According to the survey results, it can be supported that the teacher's bills have generally decreased since they began teaching virtually. Of the 63 participants, 41% said that their bills decreased significantly, 40% said that their bills decreased a little, 13% said that their bills have increased, and 6% said their bills have not changed. These results can be seen in Figure 18.

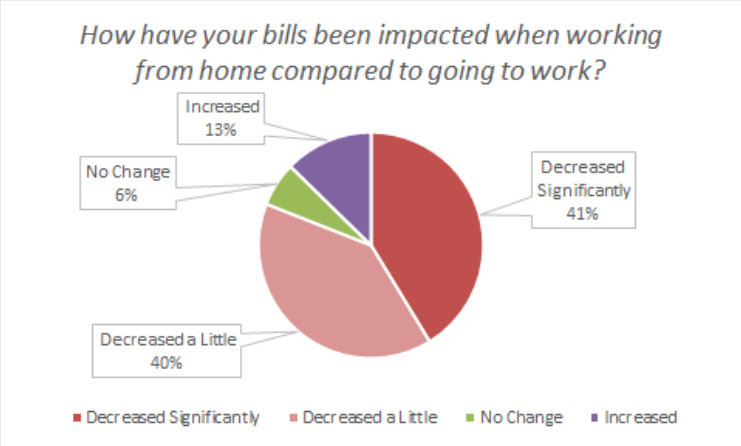

Figure 18: The graph above illustrates the impact working virtually has had on teachers' bills.

With 81% of the participants experiencing a decrease in their bills since they began teaching virtually (as seen by both shades of red), this could be a reason that teachers would consider a virtual or hybrid version of classes in the future.

How do you feel about the following statement?: The CCCN is passionate about reducing its carbon footprint and lowering its environmental impact.

There is evidence that the teachers at the CCCN believe that their organization is passionate about reducing its carbon footprint. According to the survey results, 54% of the participants strongly agree that the CCCN is passionate about reducing its carbon footprint, 43% agree, 3% disagree, and 0% strongly disagree. These results can be seen in Figure 19.

With a majority of teachers perceiving the CCCN as passionate about reducing its carbon footprint, this may make the teachers more inclined to help reduce the CCCN's carbon footprint. For example, they may be more open to: transitioning to hybrid or remote classes, taking steps toward making a green fund, and joining a green fund committee.

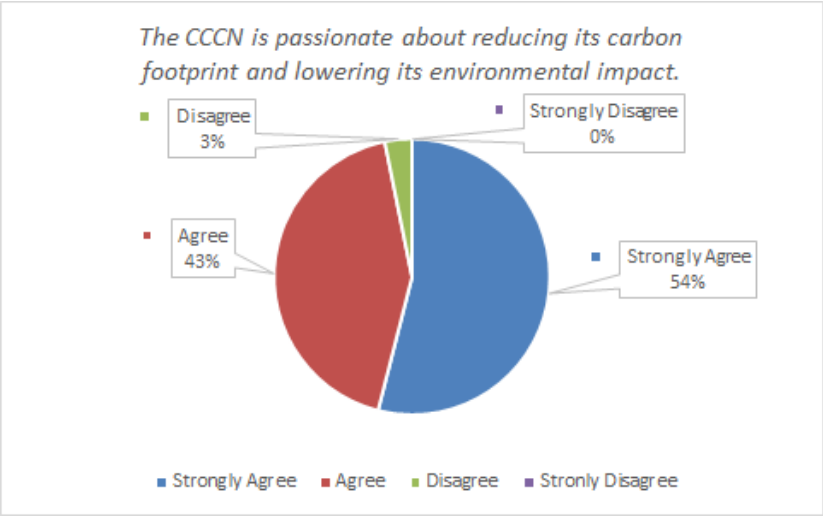

Figure 19: The image above illustrates the teacher's perception of the CCCN's passion for reducing their carbon footprint.

How do you feel about the following statement?: I am passionate about reducing my personal carbon footprint and lowering my environmental impact.

There is evidence that many teachers are passionate about reducing their carbon footprints. According to the survey results, 67% of the 63 participants strongly agreed with the statement, 32% agreed, 1% disagreed and 0% strongly disagreed.These results can be seen in Figure 20.

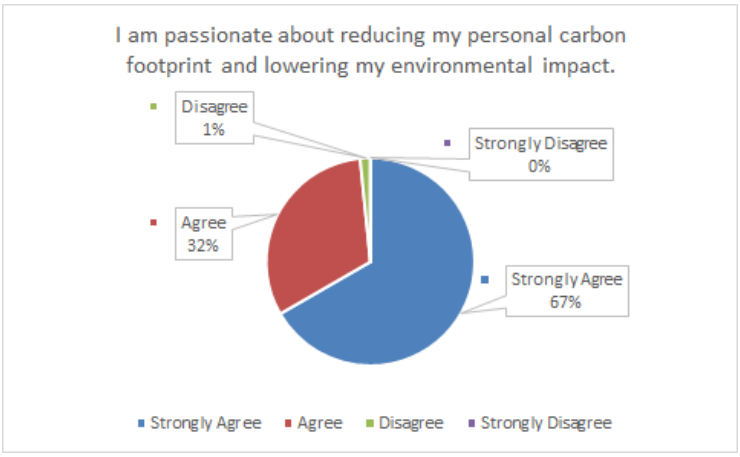

Figure 20: The image above illustrates the teacher's perception of their passion to reduce their carbon footprint.

With evidence that teachers are passionate about reducing their carbon footprint, this may make them more likely to agree to hybrid or remote classes if they are determined to lower the CCCN's carbon footprint. These teachers may also be more receptive to joining a green fund committee.

There were also a series of open response questions that were asked to the participants. With over 60 participants, we decided to summarize the data below.

When asked how the transition to virtual classes had impacted the teacher there were a variety of responses. A majority of the participants had positive responses mentioning: how virtual teaching has given them more time in the day; how they have saved money on transportation; how they have learned to adapt and become better teachers; and how they have been able to explore new resources to use in their classes. However, some negative responses included: how they enjoy their work less in a virtual format; how sitting in front of a computer screen all day is very tiring; and how converting to virtual learning has been a lot of work.

When asked what type of cars they drive, there were some common answers. Approximately half of the respondents, or 31 out of the 62 respondents, stated that they did not have cars or didn't drive. Three participants drove Hyundais. Five participants stated that they drive a personal vehicle, but they did not specify the type. Four respondents said they drove sedans, and two stated they rode motorcycles. While there were other responses, these were the most popular.

When asked for recommendations on how the CCCN can reduce their carbon footprint, there were a multitude of different responses. Some of these responses were: carpooling, reducing air conditioner and projector use, reducing the use of paper, moving to remote or hybrid

classes, using more renewable energy sources, using more biodegradable materials, campaigning, and more.

From these responses we have gathered that a majority of teachers would be in support of hybrid and virtual courses in the future. We also saw that car usage was not as much of a problem as we initially thought, but one participant offered carpooling as a method of reducing car related carbon emissions. Finally, we have compiled a list of the participants' ideas on how to reduce the CCCN's carbon footprint, which will be useful in recommending to the organization for future projects.

4.6 Adult Student Interviews

Five adult English learning students were interviewed for the purpose of this study. All the students were in their first semester at the CCCN, and four of the five requested that the interviews be conducted in Spanish. The fifth participant elected to conduct the interview in English. Given the research team's limited understanding of the Spanish language, and that the students are English language students, it is possible that the language barrier between English and Spanish altered some of the responses. A series of 12 questions were asked to each student, with the same types of questions being asked regardless of language. The English and Spanish questions can be found in Appendix C.1 and C.2, respectively. For reference, the interview transcripts are located in Appendix C.3. Once the interviews were conducted, the following major themes were identified: the benefits of virtual classes over in-person classes, waste management methods, environmental awareness, and the reduction of vehicle usage. These themes are further analyzed in the following sections.

4.6.1 Students' Opinions on Remote, Hybrid, and In-Person Learning

In terms of in-person versus virtual classes, virtual classes seemed to have more benefits among the interviewees. In fact, none of the participants had difficulty learning at home, although one did cite an adjustment period to get used to it. Additionally, three out of the five participants mentioned they would prefer virtual classes over in-person classes, with interviewee 1 stating that an in-person or hybrid class would be better for focus, and interviewee 5 stating that hybrid courses would be ideal. In terms of why virtual classes are better, two of the students explained that they prefer virtual learning because they live far away and are able to save time not having to commute to campus. Specifically, a translated quote from interviewee 2 states: "I love virtual classes. I believe that they facilitate it for students, as it does not work as well to travel from work to home and on time. It gives a lot of ease and practicality." Furthermore, interviewee 4, who lives two hours from the campus, stated: "[Translated from Spanish] Virtually, it is very easy for people who live far from el Centro Cultural."

Although these students represent a small fraction of the student population at the CCCN, their responses indicate that even once the pandemic ends, virtual classes should remain, and hybrid classes should be offered. Virtual classes, in this sense, would continue to allow the CCCN to reach a broader audience of people who cannot commute to the CCCN. Additionally, it would help students who are already thriving under virtual formats, and cater to the working adult. Hybrid courses, alternatively, will allow for students with different learning styles to thrive with some face to face interaction. Therefore, the student interviews indicate that having both hybrid and virtual courses will cater to the majority of students.

4.6.2 Students' Environmental Impact Amidst the Pandemic

Throughout the interviews, all five of the students indicated that they had noticed a reduction in their personal environmental impact throughout the course of the pandemic. Specifically, reduction of vehicle usage was apparent among the interviewees with four out of five of the participants citing a decrease. Individually, the interviewees indicated that since the pandemic began, there has been less need to travel. As interviewee 3 stated: "[Translated from Spanish] Our transit is more accessible because less people are working. In fact, it was the situation due to the pandemic which I believe that our country, in a way, has benefited a lot…" This in turn helps to reduce traffic, as well as helps economically by reducing fuel consumption.

In terms of environmental awareness, each participant showed an awareness of his/her own carbon footprint, and a passion to help slow the growing climate problems the world is facing. When asked about how the CCCN could become more green, Interviewee 1 answered with a need for increased environmental awareness among the community, stating: "[Translated from Spanish] I believe that the only way to avoid these behaviors is by educating people." Interviewee 1 also proposed an idea to invest money into an educational campaign to teach students and employees how to be more environmentally friendly. For example, recycling and conscientiousness on the part of the individual can lead to larger changes in the long run. Furthermore, when asked if they would be willing to add a voluntary donation to a green fund for the CCCN, each participant said they would be willing to donate, especially if the monetary contribution were small.

4.6.3 Students' Views on the CCCN's Carbon Footprint

Many of the interview questions focused on the CCCN's carbon footprint and methods of reducing the organization's environmental impact. Throughout the course of the interviews, many waste management methods were suggested by the students, including methods such as reducing paper usage, improving recycling, and the topic of water usage being the most frequently suggested. Interviewee 3 suggested implementing virtual textbooks, while interviewee 1 also stressed that the amount of paper being used in schools should be reduced. In terms of recycling, interviewee 2 detailed the improvement of the recycling process, stating: "[Translated from Spanish] I believe you could train [people] about depositing waste in the correct bin so they can be recycled." Generally, at the CCCN, recycled items are not placed in the correct bins, resulting in more materials being thrown away. Another popular theme, electricity usage, was mentioned four times in the interviews. Students mentioned topics from renewable energy implementation to being conscious of energy usage and turning off lights. Finally, water usage was addressed by both interviewees 1 and 3, indicating the CCCN could implement systems to either limit or reuse water. In particular, interviewee 3 stated:

> "[Translated from Spanish] Water worries me personally. I believe it is super important and many times, living in a country where we have the privilege to live in Costa Rica, where we do not have so many resource limitations like in other countries and we believe that this is not going to come to pass, right. So, we do not do a good job with water collection."

Overall, the student interview results yielded potential areas in which the CCCN could work to improve its carbon footprint. These areas include waste management methods (recycling, water reduction, and the reduction of paper), electricity reduction, and increasing

environmental awareness. Using an environmental campaign to educate people and increase awareness of sustainability may facilitate these steps. New techniques and devices may also be used to facilitate these reductions in carbon footprint, and improve electricity usage and waste management.

4.7 Teacher Interviews

Our team interviewed five teachers from the CCCN to evaluate whether the teachers believe that the CCCN could feasibly continue with hybrid or remote learning after the pandemic. We also tried to gauge whether teachers saw a change in their carbon footprint while working remotely vs in-person. Finally, we wanted to gauge interest in creating a green committee and what projects a green fund could be used to support. A series of fourteen questions were asked to each interviewee. The questions are listed in Appendix C.4 and C.5.

4.7.1 Teachers' Opinions on Remote, Hybrid, and In-Person Learning

Based on the teachers' responses, we found that all five of the teachers would teach remotely if remote learning greatly reduced el Centro's carbon footprint. If it were not based on the student's needs, three of the five teachers mentioned that they would rather teach remotely. Interviewee 4 stated that he prefers remote teaching because "I have time for myself and for my family," and "I now have time for exercise." In addition to that Interviewee 4 states that "[he has] saved a lot of time, energy and even money due to the pandemic." Interviewee 1 stated "if I just have to think about myself, virtual teaching has been better in many ways. You know, no commuting, no worrying about certain times I have to do things..." For these teachers, the remote teaching lifestyle works better as it gives them more time.

While three of the teachers said that they would personally prefer remote teaching when it comes to the students' needs, all five teachers were in favor of implementing a hybrid version of teaching after the pandemic ends. Two of the teachers mentioned that a hybrid learning style would best target students' learning needs, as everyone learns differently. Specifically, Interviewee 4 stated:

> "I think hybrid format can give all the students the chance to actually learn based on their learning style, kinesthetic learners will actually have the chance to have that kind of exposure to those kinds of activities. Virtual classes can give auditory and visual learners a chance to learn in their own way. So, a hybrid format can be meaningful in that sense, where we can tackle all the different learning styles at one time."

One of the five teachers, Interviewee 2, mentioned that she would like to see a hybrid or in-person version of classes, due to the student's personalities. Interviewee 2 states, "students who are shy tend to be kind of protected by the computer." Being completely online, students have the ability to mute themselves and turn off their cameras. For shy students, virtual classes may make it easier for some students to avoid participating. Interviewee 5 offered a slightly different reason for choosing the hybrid model, pointing out that students who live far away could still have access to the classes but would not have to go in-person every time. This could be easier on some people's schedules.

4.7.2 Teachers' Environmental Impact Amidst the Pandemic

Each of the five teachers interviewed stated that his/her carbon footprint has decreased while teaching remotely. There are factors relating to both transportation and teaching which have decreased their carbon footprints. When asked about transportation methods before the pandemic, there were a variety of responses: traveling by car, Uber, bus, and other methods of

public transportation. When asked about their frequency of travel since the pandemic began, the five teachers stated that they travel significantly less. Few of them have to travel to el Centro anymore (unless it's to drop off or pick up books) and have less reason to travel, with the exception of getting groceries or going to green areas. Two of the teachers mentioned that their gas consumption has decreased, with Interviewee 4 stating "I'm not commuting every day, so my fuel consumption has decreased a lot."

Four of the five interviewees also commented about how their carbon footprint as a teacher has decreased. Three of the five teachers mentioned that they use less paper and their students use less paper. Interviewee 1 noted that during virtual classes she has stopped creating flashcards, games, and physical things to use in class. Interviewee 4 and Interviewee 5 stated that they use less energy teaching remotely, as the smart boards at el Centro wasted a lot of energy. Interviewee 4 also noted that the pollution due to fashion has lessened stating: "To be honest, I haven't bought shoes in a year. Sometimes I work barefoot and I know fashion pollutes a lot…" Lastly, Interviewee 3 mentioned that they used fewer sticky notes and less paper. They also stated: "Now I use lots of other resources, technological resources, which reduces my carbon footprint," which applies to all of the teachers and students who have had to convert to virtual schooling.

4.7.3 Teachers' Views on CCCN's Carbon Footprint

When asked if they knew any ways that the CCCN is trying to reduce its carbon footprint, there were a lot of similarities in the responses. Four out of five teachers said that they were aware of recycling practices at the CCCN. Three out of the five teachers mentioned that the CCCN had implemented solar panels. Finally, two responses mentioned the reduction of paper use. Specifically, Interviewee 1 mentioned the effort to reduce internal paper usage, stating

“years ago we started the process of eliminating printed documents for internal use as much as possible, so all the internal communication goes online.” Interviewee 1 mentioned the use of QR Codes and digital material that is now used in their training. Interviewee 5 mentioned reducing paper usage by reusing it, explaining that “if we print something and then we don't need that paper, well we continue using that paper on the other side.” Either way, both methods have had an impact on the CCCN’s paper usage.

Building on this question, we also asked the interviewees if they saw any environmental problems at the CCCN. Interviewee 3 and Interviewee 5 answered no, but the rest of the interviewees saw at least one problem. Interviewee 2 mentioned that water waste could be a problem at the CCCN and stated “We don't have any type of tool or any special taps to help you save water… Or the toilets as well - just the water we get in the toilet, there is no special toilets to save water.” Interviewee 1 mentioned that there is a lot of sonic contamination in the area and that some employees drive cars to work. Finally, Interviewee 4 spoke of the large amount of paper that the CCCN uses. Interviewee 4 did offer an idea to act as a partial solution to this problem by stating “After the pandemic, the exams can continue to be done online.” While this will cut back on some paper usage, more will need to be done.

We then asked this question again in a different way: If there were a fund of money for the Get Green project, where would you like to see it go? Interviewee 1 stated that they were not informed enough to answer this question. Interviewee 5 misunderstood the question and stated that we could campaign in order to build these funds. Interviewee 2 suggested putting this fund toward implementing water decontamination products. Interviewee 3 mentioned using the fund for educating the students on being green. Lastly, Interviewee 4 mentioned planting more trees.

In order to create a green fund, the CCCN will need to assemble a committee to handle this fund. So, the last question gauges the willingness of each teacher to volunteer for a committee like this. Out of the five teachers interviewed, all five were interested in the idea but only three would be willing to commit. Interviewee 1 said that she was interested but did not have the energy to add to the committee in addition to her workload. Interviewee 5 mentioned that she was interested but she did not have the time. In opposition, interviewees 2, 3 and 4 were all very interested and wanted to help. Interviewee 3 showed the most enthusiasm and passion responding:

> "I am interested in it because it is something that worries me. Global warming and climate change, it's something that we have to start doing something. I know this is a cliche or cheesy but we actually have to do something about that… I think that it's a wake up call that we should and have to start doing something and if I can be a part of that, I'm totally in."

Since there exist teachers with great passion for the environment and joining the committee, making a green fund committee seems to be a reasonable goal.

4.8 Conclusion of Results

Our group has assembled a list of recommendations for the CCCN to follow based on the estimate of the CCCN's carbon footprint before and after the pandemic, the survey results, and the interview results. These recommendations are broken down in the Recommendations and Deliverables chapter that follow.

Recommendations and Deliverables

Our team broke our recommendations into three main sections, which will permit the CCCN to work toward the goal of carbon neutrality. These recommendations outline our suggestions on:

- How to start and use a green fund;
- Course format suggestions for after the pandemic; and
- Obtaining an ISO 14001 certification.

To further assist the CCCN with these processes, a total of six recommendation reports were generated. All the reports are located in Appendices D through G. This section follows those reports and details our recommendations.

5.1 Recommendations for Starting a Green Fund

Similar to the University of California, Berkeley, the CCCN can build their green fund through the use of campus green fees, campaigning, and applying for grants. (Difalco et al., 2018).

After conferring with the CCCN, it was determined that asking students for a yearly campus green fee donation of around $0.50 per student would be reasonable. This fee is not mandatory, but for those who want to donate, it will help to raise money. These donations can also be directed towards specific projects that the donors wish to see implemented on campus. This way, people would be more likely to donate if they knew what changes their money would be going to.

The CCCN can also campaign in order to raise money for their green fund. There are multiple strategies that could be used to campaign including: making small videos showing the

impact of having greener campuses, and videos that show the negative impact of a large carbon footprint. Other methods include Ted talks, seminars, presentations, providing incentives, writing articles etc. The CCCN's primary campaigning strategies will depend on their target audience: students or staff members. By using a wide range of strategies to convey the importance of going green and raising money for the green fund, the CCCN can successfully get their message across to their students and staff.

In addition to these methods, the CCCN could make posters to promote the green fund and going green to the students and staff members. These graphic posters would be short and informational to convey a message as students and staff walk by.

Fundraisers are also a great way to raise money for the CCCN's green fund. These fundraisers can range from pledging to plant trees depending on how much money is donated, to collecting old electronics and selling them to a recycling company. These fundraisers can get the whole community involved and raise awareness about living a greener lifestyle.

Lastly, the CCCN could campaign through the use of social media. CCCN has over 6700 followers as of February 2021 on the Instagram platform alone, so posting about their green goals and facts about the environmental impacts of being green would reach a very large audience.

The CCCN should also apply for grants to raise money for their green fund. There are multiple green grants available including: The Inter-American Foundation, US Embassy in Costa Rica, Global Climate Partnership Fund and the Small Grants Program. These grants vary from a few thousand USD to 15 million USD. Applications would need to be filled out for each respective grant and the money would be issued at a later date. This makes grants a viable

long-term option for the CCCN when it comes to funding. More immediate sources of income such as green fees, donations, and fundraisers would be needed to sustain the green fund.

5.2 Recommendations on How to Use a Green Fund

After calculating the CCCN's carbon footprint data and conducting the interviews and surveys, the team identified potential changes that they could implement using the green fund. Each of these works to reduce the company's carbon footprint. These methods are of a range of required efforts and time, allowing the CCCN to work towards both small and large changes through incremental steps. While all these methods will work to reduce the company's carbon footprint, the CCCN was most interested in the gray water recycling system implementation, improving recycling efforts, and reducing electricity consumption. However, a complete list of all recommended green fund uses is as follows:

- Implement a gray water recycling system
- Improve recycling on campuses
- Add timers to lights
- Increase the number of solar panels at CCCN
- Create composting locations for employees
- Offer incentives to employees and students to walk, bike, or take public transportation
- Offer a green discount to students who continue remote classes after the pandemic
- Increase the number of trees at each campus
- Only buy green materials

5.2.1 Implementing a Grey Water Recycling System

One option for using the CCCN's green fund could be implementing a grey water recycling system. Grey water is any type of waste water that has not been in contact with human waste. According to Allen et al., "grey water may contain traces of dirt, food, grease, hair, and certain household cleaning products." (Allen at al., 2018).

The purpose of the grey water recycling system is to filter and purify the grey water by "[removing] all impurities, such as bacteria, hair, suspended solids, turbidity and odour" (Alsulaili et al., 2019). Once this grey water is purified it can be reused for different purposes including flushing toilets and irrigation.

While this option would be more expensive, as it requires a complex implementation process, one study done in Kuwait found that by recycling their water by using a greywater system, they saved 46.3% of their total water consumption daily (Alsulaili et al., 2019).

5.2.2 Improving Recycling on the Campuses

The CCCN has indicated that pre-covid, recycling was an issue on their campuses. Students were not aware of what was to be recycled where, and there were issues with entire bins being filled with the wrong material. This resulted in fewer recycled materials than expected and, in some cases, ruined entire bins of recycling. In order to improve recycling efforts within the CCCN, our team has come up with two methods for the CCCN to use. The first is the continuation of their "*Get Green!"* campaign. This campaign was created by the CCCN before the pandemic in order to encourage green activities and ecological sustainability in the community. This campaign should be continued through both the use of posters around campuses once classes are resumed, as well as the implementation of the campaign over social media. The

CCCN has over 6,700 followers on social media, which would allow them to reach a broader audience. Ideally, the implementation of posters can encourage students in-person at the facilities to follow recycling guidelines, while expanding to social media can encourage recycling and green activities at home as well as at the CCCN. Posters and posts could be based around “What does the CCCN recycle?”, “What are the consequences of not recycling?”, “What happens when recycling is not sorted properly?”, and “What are the benefits to recycling?” As seen by the titles of these posters, their goal is to educate students and followers as to why recycling is important. Additionally, the team has made a sample post from paper recycling statistics provided by the CCCN, as seen in Figure 21.

The second method to improve recycling at the CCCN is to improve the labeling on the bins to make the sorting of recyclable materials clearer. As seen in Figure 22, the CCCN has 4 types of recycling bins, for paper and cardboard, plastic, aluminum, and glass. However, the bins are not clearly labelled, making it hard to tell quickly which bin is which. To improve this, the team recommends a labeling system closer to eye level, similar to the WPI campus center trash and recycling bins, as seen in Figure 23. Ideally, it should have images, as in the WPI example, which show what can be disposed of in each bin. By providing clear labels closer to eye level, less energy is required on the part of the user to locate the correct location. Combining this with the poster and social media campaigns, our team believes the CCCN can significantly improve recycling efforts among their community.

Figure 21: Sample "Get Green!" Post Generated by our WPI Team

Figure 22: Recycling bins at the CCCN

Figure 23: Recycling bins at WPI

5.2.3 Adding Timers to Lights

Another way that the CCCN could use their green fund is to implement more energy efficient lighting. Three ways that lighting could be made more efficient is through the use of LED light bulbs, light timers, and motion sensors. While the CCCN already has LED lighting, they do not yet have light timers or motion sensors.

The benefit to having light timers is that the lighting can be programmed to be in use for specific parts of the day so that no light energy is wasted during times that the lights are not needed. Similarly, light sensors can be used so that the lights can remain off unless motion is detected.

According to a study done by Alsulaile et al., "Energy waste from light consumption was reduced by approximately 86% by using LED lights, timers and sensors..." (Alsulaili et al., 2019). Reducing this energy waste from lighting is important because "Greenhouse gases (especially CO_2) are produced throughout different stages of light use." (Alsulaili et al., 2019).

By adding in this technology, the hope is that the CCCN will be able to further reduce their carbon emissions.

5.2.4 Increasing the Number of Solar Panels

The CCCN has installed 110 solar panels at their San Pedro campus. In one year, these solar panels have decreased the CCCN's carbon emissions by 6.9 tons, and have generated over 53kWh of electricity a year (Sunshine, 2018). Considering these data, the ecological impact of having solar panels is evident. Therefore, another step the CCCN can take to further reduce its carbon footprint is installing solar panels at its other locations. Not only will this help to reduce the organization's carbon footprint, but it will also reduce the amount of money that the organization spends on electricity over time.

5.2.5 Creating Composting Locations for Employees

Currently, composting is not highly utilized within the CCCN. It is not highly necessary for students, as they tend to only be around for their specific class, and do not eat meals on campus. However, in highly trafficked areas, adding compost bins could decrease the amount of material thrown away. In order to implement this in campuses, we recommend using a series of small indoor composting bins in locations such as break rooms and cafeterias. Once full, there should be a larger compost bin at each location to put the contents of the indoor composting bins into. Ideally, the indoor composting bins will be large enough to hold a few days worth of food scraps, and be emptied to the outdoor bin at least once a week. There are indoor composting bins available with filters, which work to reduce any odors. The outdoor composter will need to be turned regularly, and guidelines should be established as to what can and cannot be composted.

For instance, vegetable scraps, coffee grounds, tea bags, shredded paper, and plant trimmings can all be composted, but meat, dairy, and fat should not be (Vanderlinden, 2020).

5.2.6 Offering Incentives for Using Green Transportation Methods

While the CCCN claims that approximately 90% of their students use public transportation already, a portion of the green fund could go toward using a greener method of transportation. For example, monetary incentives could be given for those who walk or bike to school instead of using vehicles that run on fossil fuels. The CCCN could promote the use of electric cars or public transportation. Since so many students already use public transportation, the CCCN should consider looking into ways they could make their public transportation methods greener.

5.2.7 Offering a Green Discount to Students Who Continue Remote Classes After the Pandemic

During the COVID-19 Pandemic, many schools have converted to remote and hybrid learning styles. With this in mind, one possible way that the CCCN could decide to use their green fund is to offer a green discount for students who choose to continue learning remotely or in a hybrid fashion when the pandemic winds down. By keeping students and staff members of the CCCN remote even part of the time, the hope would be to reduce the amount of carbon emissions produced by electricity, transportation, water usage, and waste products. This is important as not only has the remote format benefited the CCCN, but both students and employees have cited lower personal environmental impacts.

5.2.8 Increasing the Number of Trees at Each Campus

A portion of the green fund should be allocated towards increasing the number of trees on campus. Each tree on the campus will help to absorb the CO_2 produced by the company, offsetting the carbon footprint. One method to ensure the continuous addition of trees to campuses will be to establish a policy in which the number of trees cut down for paper equals the number the company must replace. One tree, when cut down, makes approximately 17 reams of paper (Dartmouth, n.d.). Therefore, the CCCN should establish a policy stating that for every 17 reams of paper purchased, the company will in turn plant one tree. Another method is a tree planting fundraiser. CCCN would pledge to plant a tree per a certain dollar amount for the length of the fundraiser. Not only would this raise money that can be used for other green projects, but it would also contribute to carbon offsetting on campus.

5.2.9 Buying Green Materials

Another way the CCCN could use their green fund is by buying more green materials. There are many companies out there that focus on creating vegan, sustainable, plastic-free, recycled, reusable, and zero waste products (EWP Team, 2018). These green materials help reduce environmental damage in all stages of their life cycle.

Some examples the CCCN could benefit from are buying recycled paper, eco-friendly binders, cleaning products, etc. By using more eco-friendly and well-built products, the hope is that the CCCN will be able to reuse the same products for a long time without replacing them. As a result, less carbon emissions will be produced.

5.3 Course Format Recommendations

Similarities were noted between student responses and teacher responses, yielding virtual classes as the best option for the CCCN after the pandemic, followed by hybrid courses. Given the data collected through surveys, we found the methods in which adult CCCN students believe they learn best. 27% say in-person, 32% say hybrid, and 41% say virtual. Furthermore, when asked if they would like to continue taking virtual courses after the pandemic, and to what frequency, 48% of students responded *yes, always*, 43% responded *yes, sometimes*, and 9% responded *no, never.* When considering the teachers, we asked if they were in agreement that students are learning the same material and objectives remotely as before the pandemic. 28% strongly agreed, 67% agreed, and only 5% disagreed, with no teachers strongly disagreeing. Additionally, when asked how they would prefer to work, 51% preferred virtual, 41% selected hybrid, and only 8% preferred in-person. When asked if they would be willing to work a remote or hybrid format after the pandemic, the results were similar. 92% of the teachers responded they would be willing, and only 8% answered no. Together, the data signify that both students and teachers support virtual and hybrid course options over in-person courses.

Given the data, our team recommends that the CCCN offer both virtual and hybrid course options. The virtual and hybrid formats will help prevent the CCCN's carbon footprint from rising again after the pandemic, while the hybrid option will cater to students who need some face-to-face interaction to facilitate learning. It will also help teachers cater to a larger variety of learning styles. In order to ensure the best outcome in terms of carbon footprint reduction, we recommend the CCCN only open the campus on specific days. All in-person sessions of the hybrid courses should occur on the same days. This, in turn, will allow the building to be shut down some days, meaning that electricity, water and fuel usage will be kept at a minimum. This

will not only help with the organization's carbon footprint, but we believe hybrid courses will help cater to a larger variety of learning styles, while the virtual courses will cater to students who are either busier or who live farther away from the campuses.

5.4 Recommendations for Obtaining the ISO 14001 Certification

While a carbon footprint estimation is the first step towards the ISO 14001 certification, additional steps must be taken by the CCCN before they can receive the certification. First, the CCCN must create an environmental policy. The environmental policy is a document that lays out the plans for implementation and improvement of the environmental management system (EMS) that will be put into place. The EMS can be thought of as a database system that is "involved in the monitoring, tracking, summarizing, and reporting of environmental information to internal and external stakeholders" (Sroufe, 2003).

From there, the CCCN should hire a third-party company to help them obtain an accurate and certifiable calculation of their carbon footprint. While our team estimated the CCCN's carbon footprint to pinpoint sources of high emissions that the organization can improve, the certification requires an official calculation. There are several third-party companies which can do this including: Inteco, Carbon Trust, Earth University, SCS Global and Certvalue. However, the team determined either SCS Global or Certvalue would be the best, as they could help the CCCN through the entire ISO14001 certification process.

After calculating a rough estimate of the CCCN's carbon footprint, we assisted the CCCN in determining how to lower their environmental impact. In the future, SCS Global or Cert Value will help the CCCN to set objectives and goals to reach Costa Rica's carbon neutral requirements. They will help the CCCN implement their EMS system and will help them

monitor their progress. The third-party companies will also be able to do any audits needed for the certification.

5.5 Deliverables

As a part of this project there are six main deliverables. The first deliverable is the calculation of the carbon footprint for CCCN based on their carbon emission data. Appendix D includes a graph of calculations for the carbon emissions of each campus, pie charts showing where the highest emissions came from, and bar graphs comparing the calculations of the CCCN's carbon footprint both before and during the COVID-19 pandemic. The second deliverable is the Carbon Footprint Improvements Recommendations Report for the CCCN that was compiled based on the carbon footprint calculation, interviews, and surveys. Expanding on this report, we also created the Compost Bins Recommendations Report and the Green Materials Recommendations Report to further outline how the CCCN can implement compost bins and what materials can be replaced with green materials. Our fifth deliverable is the Green Fund Recommendations Report that outlines how to create a green fund and what it can be used for. This document also includes posters and social media posts that the CCCN will be able to use for campaigning. Finally, the sixth deliverable is the ISO 14001 Certification Recommendations Report that was compiled to give the CCCN a series of steps to follow in order to obtain their carbon neutral certification.

Conclusion

Our team has found evidence that the carbon footprint of the CCCN has decreased substantially since the beginning of the pandemic. We have further found that virtual classes remain an option for the CCCN, but that a hybrid course format should be offered once it is safe to do so. This will ensure the best learning opportunity for students, while decreasing the CCCN's carbon footprint. In order to continue decreasing their carbon footprint, the CCCN should also implement a green fund with the sole purpose of reducing carbon emissions. In this chapter we present the key factors which have led us to these conclusions.

6.1 Carbon Footprint Reduction

Our team found significant evidence that the switch to virtual courses greatly reduced the CCCN's carbon footprint. This decrease can be attributed to remote learning and teaching causing buildings to go unused. In 2017, the organization had a carbon footprint of 137 tons of CO_2, with electricity being the largest contributor, emitting 127 tons of CO_2. Water, gas, and diesel made up the remainder of the carbon emissions. A carbon footprint analysis of electricity and water from 2020 yielded a footprint of 46 tons of CO_2, with 45 tons of CO_2 being from electricity. The 2020 carbon emissions from electricity are only a third of what they were in 2017, indicating that remote learning has had a positive impact on the CCCN's carbon emission by reducing the overall CO_2 released into the atmosphere. Furthermore, the solar panels in San Pedro have proven to provide a great reduction in the carbon emissions created by electricity.

6.2 Evaluation of Course Format

Our team found that the majority of students and teachers would prefer either an entirely virtual course, or a hybrid option. We also found that the forced format of virtual classes due to the pandemic has significantly reduced the organization's carbon footprint. In order to cater to most students and teachers, while still reducing the CCCN's overall carbon footprint, our team recommends the continuation of virtual classes as well as the implementation of hybrid courses. To most effectively reduce the CCCN's carbon footprint, we recommend the buildings are only open on certain days, with all in-person sessions of the hybrid courses occurring on these days, as opposed to keeping the building open all week. This will allow for minimal usage of electricity, water and gas on the days when the buildings are closed.

6.3 Recommendations for Future Initiatives

Although the carbon footprint of the CCCN was reduced by the virtual format, our team has presented many recommendations for carbon emission reduction. In order to fund these projects, we propose that the CCCN create a green fund, or a fund of money specifically designated for reducing carbon emissions. Money for this fund should be raised through:

- Adding a $0.50 optional student donation or "green fee" to course registration
- Campaigning to different target groups
- Fundraising
- Grants

After conducting interviews and speaking with our sponsors, it was determined that the green fund could be used to:

- Implement a gray water recycling system

- Add timers to lights
- Improve recycling on campuses
- Increase the number of solar panels at the CCCN
- Create composting locations for employees
- Offer incentives to students and employees who walk, bike, or use public transportation
- Offer a green discount to students who continue remote classes after the pandemic
- Increase the number of trees at each campus
- Only buy green materials

These recommendations vary from small to large scale projects, which will allow the CCCN to implement them over time and based on funding. Solutions such as the timers on lights, composting, incentives, green discount, and planting trees are smaller projects which can be more easily achieved, while the others will require more foresight and a larger monetary contribution. Overall, these recommendations will help with the long-term process of receiving the ISO 14001 Carbon Neutral Certification, which requires a detailed plan for carbon footprint reduction.

6.4 Project Limitations

As travel between the United States and Costa Rica was prohibited due to the pandemic, our team completed this project remotely. While video conferencing and emailing were helpful in completing the project, there were aspects of this project which could have been facilitated by visiting the CCCN campuses. For instance, had we been on site, we could have observed problems firsthand, such as a lack of green spaces, flawed recycling procedures, and more. Instead, we have relied on accounts from our sponsors and from interviewees.

Another limitation of this project was the language barrier between our group and the student interviewees. With a limited Spanish knowledge, conducting interviews in Spanish was difficult. We were limited in clarifying survey responses or pursuing follow up questions.

Furthermore, one area of research that this study has not covered is the opinions of CCCN employees who are not teachers. This population of employees may have different views about working remotely vs. in person, therefore it may be helpful to conduct a study on this group before making final decisions. Additionally, due to age restraints, we were only able to focus on adult students. Children, who are in essential developmental phases, may have different needs which may or may not be met by the proposed course styles.

In terms of the CCCN's carbon footprint, we were not able to collect any offset data with the exception of some qualitative data on student and employee utility usage and the CCCN's solar panels. Therefore, the carbon footprints we calculated were only based on emissions and did not take into account any offsets. If the CCCN were to collect more data on their offset methods, they would be able to calculate a more accurate carbon footprint.

Another limitation in calculating the CCCN's carbon footprint for the year 2020 was that we were only able to collect electricity and water usage data. While the data allowed us to estimate the emissions due to water usage and electricity, an exact carbon footprint cannot be calculated from the data. Instead, these estimates were compared to the water and electricity emissions from before the pandemic to see if there was a notable difference.

In terms of overall carbon footprint reduction, this study asked students and employees if they have noticed a change in their personal carbon footprints since the pandemic began. The limitation with these responses is that they were not backed with physical data based on their personal emissions. In fact, most survey respondents reported that overall, their bills had

increased. However, with no evidence of this increase, we are left with some uncertainty. Therefore, it would be useful to collect data from employees and students to calculate their carbon footprints and determine if the overall environmental impact has decreased due to remote learning during the pandemic, or if the CCCN's facilities are the only places that have reaped the benefits.

6.5 Long-Term Outlook

With the successful implementation of our recommendations, the CCCN will be able to continue lowering its carbon footprint and receive the ISO 14001 certification. Throughout this process, the CCCN wishes to present transparency in their progress towards environmental sustainability. Ideally, this leadership will inspire other companies to follow suit. If this project has the impact that our sponsors hope, then the world will benefit from reduced carbon emissions.

Along with the reduction of carbon footprints, this project highlights a significant change in education due to the pandemic. Although the CCCN's carbon footprint was the focus of the study, the findings of our project indicate that an option of virtual learning may be here to stay, even past the pandemic. It suggests that the world is rapidly changing, including the face of education. Further research could be done on the impact of the pandemic on education. *How have students adjusted to new learning formats? Has student performance changed when switching from traditional courses to remote learning? What course options work the best for specific groups of students?* These are only a few of the questions which the idea of continued virtual learning poses.

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Appendix

Appendix A: Adult Student Survey Questions

Appendix A.1: Adult Student Survey Questions: English

1. What is your ideal learning environment?
    a. In-Person
    b. Hybrid
    c. Remote
2. After the need to be remote due to the pandemic is over, would you be like to continue learning from home, and with what frequency?
    a. Yes, All of the time
    b. Yes, Some of the time
    c. No, Never
3. How has the quality and quantity of your education changed since the pandemic began?
    a. Has Improved Significantly
    b. Has Improved Slightly
    c. Has Remained the Same
    d. Has Gotten Worse
4. How do you feel about the following statements:
   "The CCCN is passionate about reducing its carbon footprint and lowering its environmental impact."
    a. Strongly Agree
    b. Agree
    c. Disagree
    d. Strongly Disagree

   "I am passionate about reducing my personal carbon footprint and lowering my environmental impact."
    a. Strongly Agree
    b. Agree
    c. Disagree
    d. Strongly Disagree
5. How could the CCCN become more environmentally friendly?
6. Describe how the quality and quantity of your education changed since the pandemic began.
7. Do you feel that in-person learning or remote learning is more effective? Explain.

Appendix A.2: Adult Student Survey Questions: Spanish

1. ¿Cuál es su ambiente ideal para aprender?
    a. En persona
    b. Híbrido
    c. Virtualizado
2. ¿Le gustaría seguir recibiendo lecciones virtuales una vez que haya concluido la pandemia?
    a. Sí, todo del tiempo
    b. Sí, algunas veces
    c. No, nunca
3. ¿Cómo ha cambiado la calidad de su curso desde el inicio de la pandemia?
    a. Ha mejorado significativamente
    b. Ha mejorado un poco
    c. Se mantiene igual
    d. Ha desmejorado
4. Favor indicar qué tan de acuerdo está con las siguientes frases:
   "E*l CCCN es una institución apasionada por reducir su huella de carbono e impacto ecológico"*
    a. Completamente de acuerdo
    b. De acuerdo
    c. En desacuerdo
    d. Completamente en desacuerdo

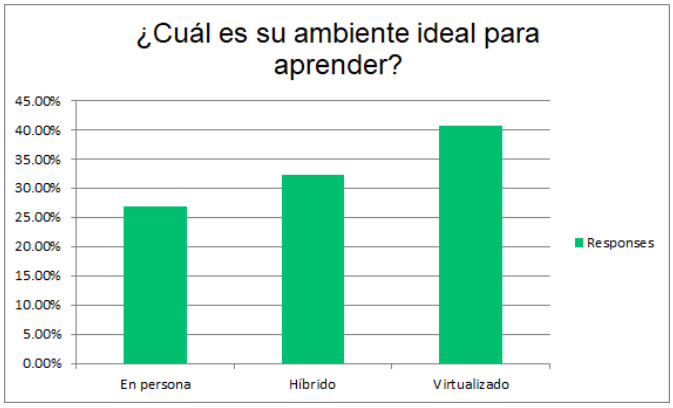
   "Estoy apasionado/a por reducir mi huella de carbono e impacto ecológico?"
    e. Completamente de acuerdo
    f. De acuerdo
    g. En desacuerdo
    h. Completamente en desacuerdo
5. ¿Cómo podría el CCCN ser más amigable con el ambiente?
6. Describa cómo el inicio de la pandemia ha cambiado la calidad de los cursos
7. ¿Cúal método (presencial o virtual) le resulta mejor? Explique.

Appendix A.3: Adult Student Survey Questions: Results

➢ Question 1 Results:

¿Cuál es su ambiente ideal para aprender?

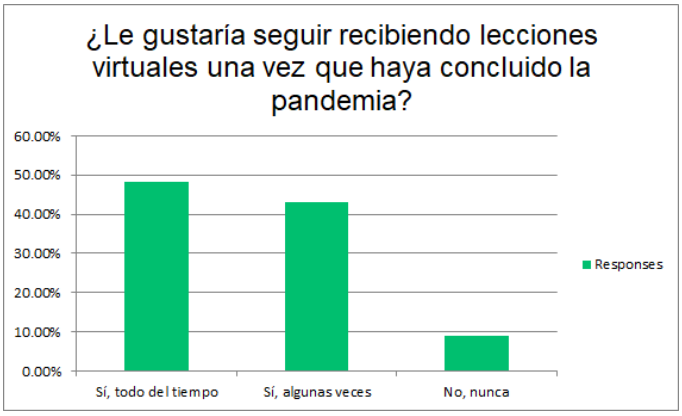
Answer Choices	Responses	
En persona	26.91%	109
Híbrido	32.35%	131
Virtualizado	40.74%	165
	Answered	**405**
	Skipped	**0**



➢ Question 2 Results:

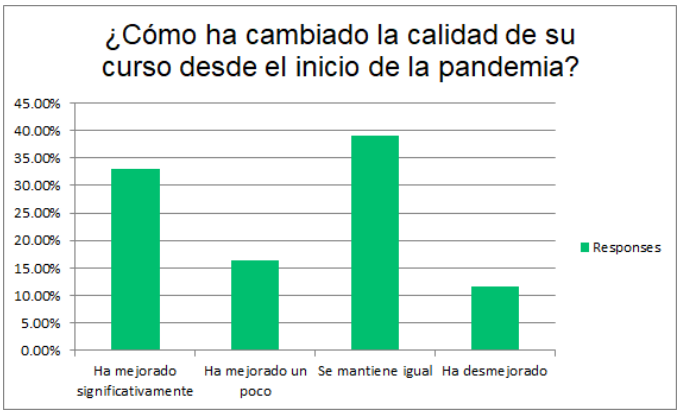
¿Le gustaría seguir recibiendo lecciones virtuales una vez que haya concluido la pandemia?

Answer Choices	Responses	
Sí, todo del tiempo	48.20%	174
Sí, algunas veces	42.94%	155
No, nunca	8.86%	32
	Answered	**361**
	Skipped	**44**



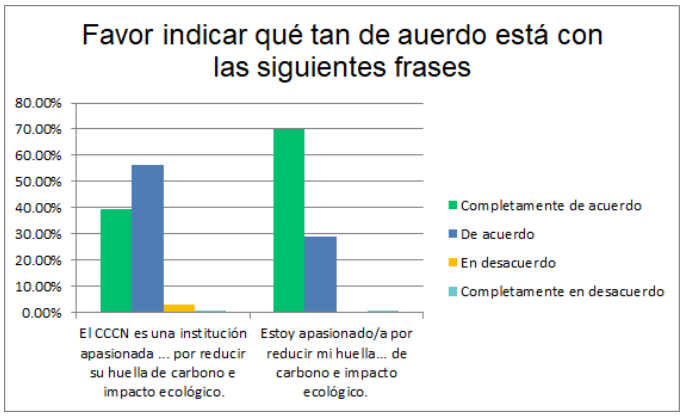
➢ Question 3 Results:

¿Cómo ha cambiado la calidad de su curso desde el inicio de la pandemia?		
Answer Choices	Responses	
Ha mejorado significativamente	32.96%	119
Ha mejorado un poco	16.34%	59
Se mantiene igual	39.06%	141
Ha desmejorado	11.63%	42
	Answered	**361**
	Skipped	**44**



➢ Question 4 Results:

Favor indicar qué tan de auerdo está con las siguientes frases									
	Completamente de acuerdo		De acuerdo		En desacuerdo		Completamente en desacuerdo		Total
El CCCN es una institución apasionada ...	39.53%	134	56.34%	191	3.24%	11	0.88%	3	339
Estoy apasionado/a por reducir mi huella...	70.21%	238	28.91%	98	0.00%	0	0.88%	3	339
								Answered	**339**
								Skipped	**66**



Appendix B: Teachers Survey Questions

Appendix B.1: Teachers Survey Questions: English

1. How much has your method of teaching changed since the pandemic began?
    a. It has changed a lot
    b. It has stayed the same
    c. It has changed a little
    d. It has not changed at all
2. Compared to in-person learning, students are learning the same material and objectives remotely.
    a. Strongly agree
    b. Agree
    c. Disagree
    d. Strongly disagree
3. Would you rather teach remotely, hybrid, or in-person?
    a. Remote
    b. Hybrid
    c. In-Person
4. Would you be willing to continue working in a virtual format after the pandemic?
    a. Yes
    b. No
5. Do you support the continued use of remote learning in place of in-person learning after the pandemic?
    a. Yes
    b. No
6. In a typical year (not Covid), how often do you drive to the CCCN campus?
    a. 1 to 2 days a week
    b. 3 to 4 days a week
    c. 5 to 6 days a week
7. How have your bills been impacted when working from home compared to going to work?
    a. They have decreased significantly
    b. They have decreased slightly
    c. They have stayed the same
    d. They have increased
8. How do you feel about the following statements:
   “The CCCN is passionate about reducing its carbon footprint and lowering its environmental impact.”
    a. Strongly agree

b. Agree
c. Disagree
d. Strongly disagree

"I am passionate about reducing my personal carbon footprint and lowering my environmental impact."

e. Strongly agree
f. Agree
g. Disagree
h. Strongly disagree

9. How has the transition to remote teaching impacted you?
10. What type of car do you use? (if you do not have a car, write "no car")
11. How much fuel do you consume in comparison to in-person classes? Explain your response.
12. Do you have any ideas to make the CCCN more environmentally friendly?

Appendix B.2: Teachers Survey Questions: Spanish

1. ¿Cuánto ha cambiado su estilo de trabajo desde el inicio de la pandemia?
    a. Mucho
    b. Se mantiene igual
    c. Un poco
    d. Nada en absoluto
2. ¿Comparado con las clases presenciales, considera que los estudiantes están logrando los objetivos en formatos virtualizados?
    a. Totalmente de acuerdo
    b. De acuerdo
    c. En desacuerdo
    d. Totalmente en desacuerdo
3. ¿Cómo prefiere trabajar?
    a. De manera remota
    b. De forma híbrida (una combinación de forma remota y presencial)
    c. Presencialmente
4. ¿Estaría de acuerdo en trabajar en un formato remoto o híbrido después de la pandemia?
    a. Sí
    b. No
5. ¿Estaría de acuerdo en continuar un aprendizaje en forma virtual después de la pandemia?
    a. Sí
    b. No
6. Antes de la pandemia con qué frecuencia se trasladaba a su centro de estudio del CCCN?
    a. 1 a 2 días a la semana
    b. 3 a 4 días a la semana
    c. 5 o 6 días a la semana
7. ¿Cómo han cambiado sus gastos con el teletrabajo?
    a. Han disminuido significativamente
    b. Han disminuido un poco
    c. No han cambiado
    e. Han aumentado
8. ¿Qué tan de acuerdo está usted con las siguientes frases?
   “El Centro Cultural Costarricense Norteamericano está comprometido con reducir su huella de carbono y disminuir su impacto ecológico.”
    a. Completamente de acuerdo
    b. De acuerdo
    c. En desacuerdo
    d. Completamente en desacuerdo

"Estoy comprometido(a) personalmente con reducir su huella de carbono y disminuir su impacto ecológico."

a. Completamente de acuerdo
b. De acuerdo
c. En desacuerdo
d. Completamente en desacuerdo

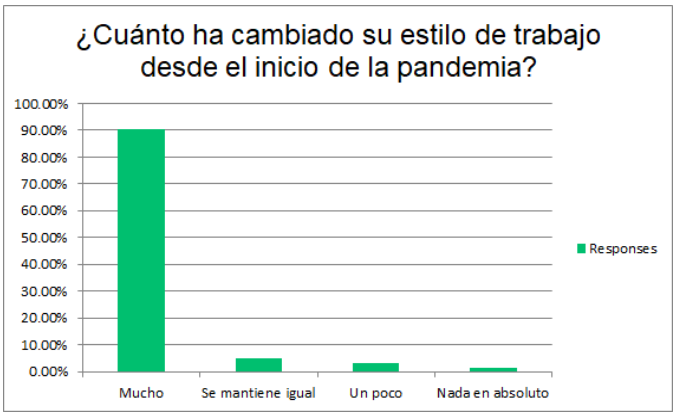
9. ¿Cómo le ha impactado la transición al aprendizaje virtualizado?
10. ¿Qué tipo de auto conduces? (si no tiene auto, por favor indicarlo)
11. ¿Ha reducido o aumentado su consumo de combustible en comparación con el formato presencia (antes de la pandemia)? Explique su respuesta.
12. ¿Qué le recomendaría al CCCN para reducir su huella de carbono?

Appendix B.3: Teachers Survey Questions: Results

- Question 1 Results:

¿Cuánto ha cambiado su estilo de trabajo desde el inicio de la pandemia?

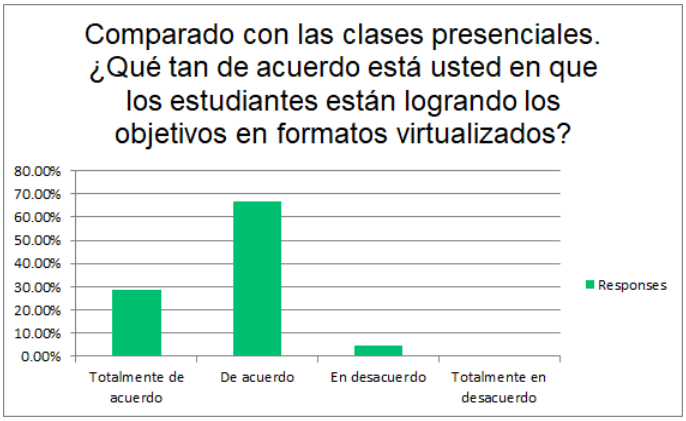
Answer Choices	Responses	
Mucho	90.48%	57
Se mantiene igual	4.76%	3
Un poco	3.17%	2
Nada en absoluto	1.59%	1
	Answered	**63**
	Skipped	**0**



- Question 2 Results:

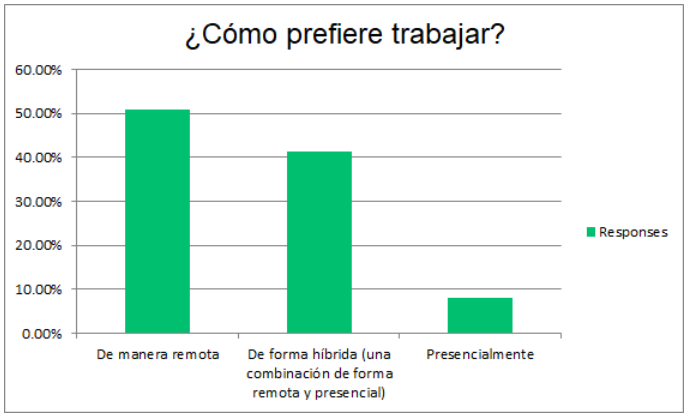
Comparado con las clases presenciales. ¿Qué tan de acuerdo está usted en que los estudiantes están logrando los objetivos en formatos virtualizados?

Answer Choices	Responses	
Totalmente de acuerdo	28.57%	18
De acuerdo	66.67%	42
En desacuerdo	4.76%	3
Totalmente en desacuerdo	0.00%	0
	Answered	**63**
	Skipped	**0**



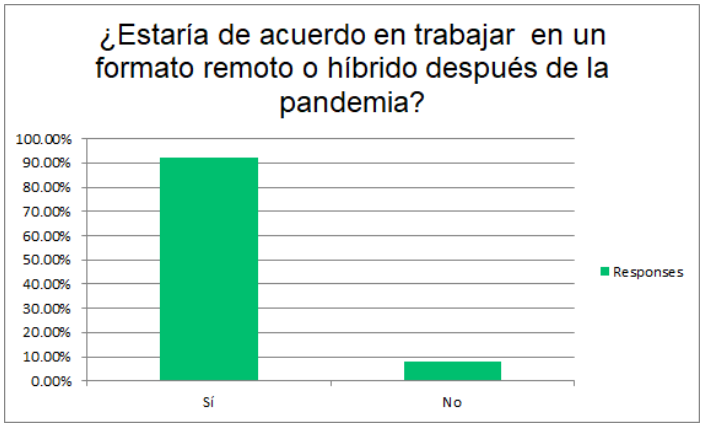
➢ Question 3 Results:

¿Cómo prefiere trabajar?		
Answer Choices	Responses	
De manera remota	50.79%	32
De forma híbrida (una combinación de forma remota y presencial)	41.27%	26
Presencialmente	7.94%	5
	Answered	**63**
	Skipped	**0**



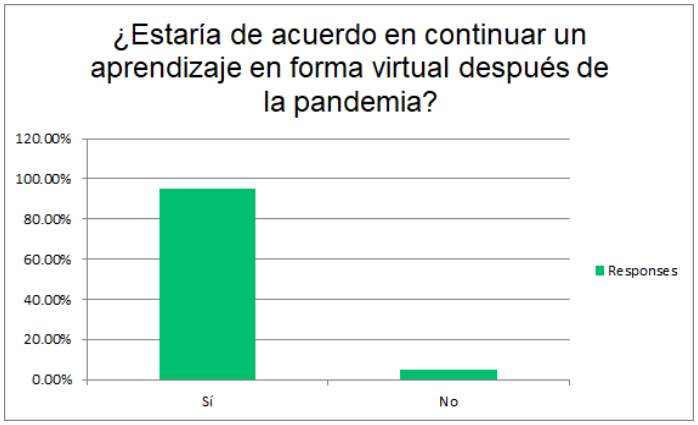
➢ Question 4 Results:

¿Estaría de acuerdo en trabajar en un formato remoto o híbrido después de la pandemia?		
Answer Choices	Responses	
Sí	92.06%	58
No	7.94%	5
	Answered	**63**
	Skipped	**0**



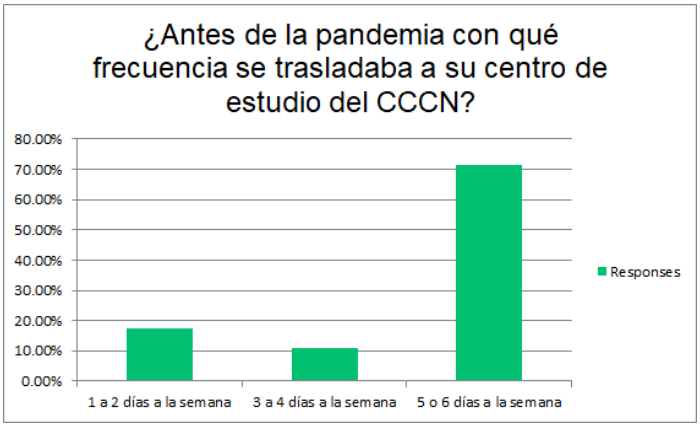
➢ Question 5 Results:

¿Estaría de acuerdo en continuar un aprendizaje en forma virtual después de la pandemia?		
Answer Choices	Responses	
Sí	95.24%	60
No	4.76%	3
	Answered	**63**
	Skipped	**0**



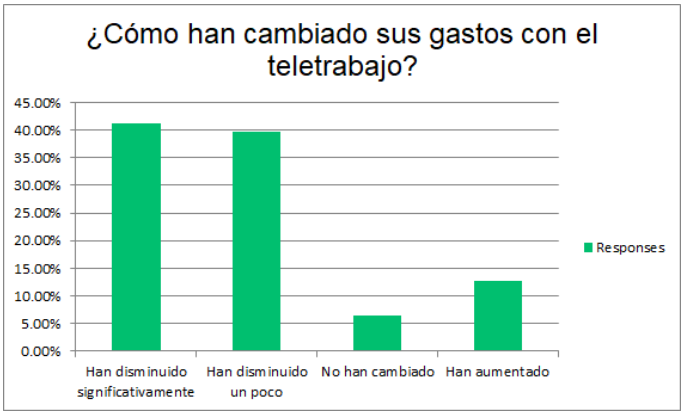
➢ Question 6 Results:

¿Antes de la pandemia con qué frecuencia se trasladaba a su centro de estudio del CCCN?		
Answer Choices	Responses	
1 a 2 días a la semana	17.46%	11
3 a 4 días a la semana	11.11%	7
5 o 6 días a la semana	71.43%	45
	Answered	**63**
	Skipped	**0**



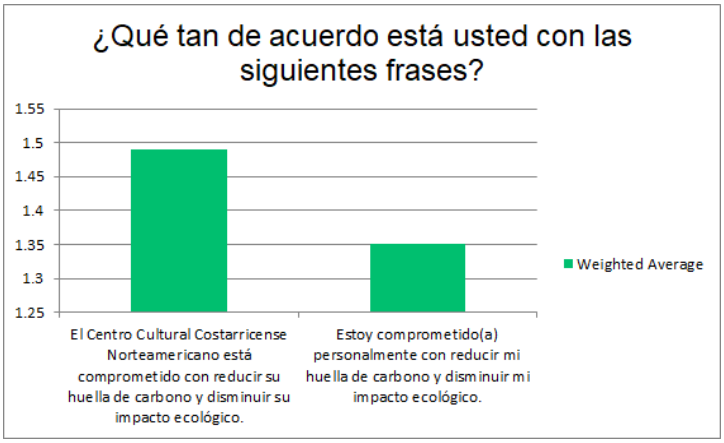
➢ Question 7 Results:

¿Cómo han cambiado sus gastos con el teletrabajo?		
Answer Choices	Responses	
Han disminuido significativamente	41.27%	26
Han disminuido un poco	39.68%	25
No han cambiado	6.35%	4
Han aumentado	12.70%	8
	Answered	**63**
	Skipped	**0**



➢ Question 8 Results:

¿Qué tan de acuerdo está usted con las siguientes frases?									
	Completamente de acuerdo		De acuerdo		En desacuerdo		Completamente en desacuerdo	Total	Weighted Average
El Centro Cultural Costarricense Norteamericano está	53.97%	34	42.86%	27	3.17%	2	0.00% 0	63	1.49
Estoy comprometido(a) personalmente con reducir mi	66.67%	42	31.75%	20	1.59%	1	0.00% 0	63	1.35
								Answered	**63**
								Skipped	**0**



Appendix C: Interviews

Appendix C.1: Adult Student Interview Questions: English

Hello my name is Emily. My name is Lexi. My name is Jon. And my name is Katie and we are a group of WPI Students doing a project to help the CCCN decrease their carbon footprint. As a reminder, this interview will be anonymous and your identity will not be tied to any answers that you give. Your answers will only be used to help analyze whether students believe the CCCN should continue remote or hybrid learning.

1. We can conduct this interview in English or Spanish, which language would you prefer?
2. Can we record this interview so we can review the responses at a later date?
3. How long have you been a student at CCCN?
4. Have you had any difficulty learning from home, and if so what challenges have you faced?
5. Do you hold remote classes and traditional classes to the same value? Why or why not?
6. After the pandemic removes the need for remote courses, what is the ideal class format which you would like to see?
7. What can individuals do to help the CCCN improve their environmental impact?
8. If there were a fund of money to be used on making your campus more green, where would you like to see it go?
9. Would you be willing to pay a small voluntary green fee to help the CCCN establish a green fund which will help lower the company's environmental impact?
10. Do you see a difference in your carbon footprint when learning remotely compared to in-person?

Appendix C.2: Adult Student Interview Questions: Spanish

Hola. Me llamo Emily. Me llamo Lexi. Me llamo Jon. Y me llamo Katie. Somos un equipo de estudiantes de WPI. Estamos haciendo un proyecto para ayudar el centro cultural a reducir su huella económica. Como recordatorio, la entrevista es anónima, y tus respuestas no serían conectadas a su nombre, solo utilizadas por el objetivo de analizar si los estudiantes crean si el centro debe continuar con clases virtuales.

1. Podemos hacerte la entrevista en español o inglés. ¿Qué idioma prefiere?
2. ¿Nos permite grabar la entrevista y así poder posteriormente revisar las respuestas?
3. ¿Durante cuánto tiempo has sido una estudiante en el CCCN?
4. ¿Ha tenido algunas dificultades aprendiendo desde su casa? De ser así, ¿cuáles han sido los mayores retos?
5. ¿Recibe la misma calidad en las clases tanto presenciales como virtuales? Justifique por favor su respuesta.
6. Una vez que pueda regresar a clases presenciales, ¿cuál formato preferiría, virtual o presencial? ¿Porqué?
7. ¿Ha experimentado algún cambio significativo en el uso o método de transporte?
8. ¿Cuáles actividades pueden realizarse en el CCCN para mejorar el impacto ambiental por parte de los usuarios?
9. ¿Si existiera un fondo específico para mejorar el impacto ambiental de los usuarios, en qué te gustaría que se invirtiera ese dinero?
10. ¿Estarías dispuesto a contribuir económicamente para ayudar al CCCN a establecer un fondo voluntario y mejorar el impacto ambiental?
11. ¿Ves alguna diferencia en tu huella ecológica recibiendo clases virtuales en comparación con las clases presenciales ?

Appendix C.3: Transcribed Interviews: Adult Students

Appendix C.3.1: Transcribed Interviews: Adult Student Interview 1

Q1. Podemos hacerte la entrevista en español o inglés. ¿Qué idioma prefiere?

A1. Español, pero si no sabes la palabra en español, puedes decirlo en inglés.

A1 [English Translation] Spanish, but if you do not know a word in Spanish, you can say it in English.

Q2. ¿Nos permite grabar la entrevista y así poder posteriormente revisar las respuestas?

A2. Okay, no hay problema.

A2 [English Translation] Okay, that is not a problem.

Q3. ¿Durante cuánto tiempo has sido una estudiante en el CCCN?

A3. Este es mi primer bimestre. Dos meses.

A3. [English Translation] This is my first semester. Two weeks.

Q4. ¿Ha tenido algunas dificultades aprendiendo desde su casa? De ser así, ¿Cuáles han sido los mayores retos?

A4. No, en realmente ha sido super sencillo para mí en lo personal. No me gustan mucho las clases virtuales. Y tenía cierta resistencia por llevar las clases virtuales. Pero realmente en este momento la dinámica, el profesor, y el ser tan interactivos me ha botado muchos ratos, ya. Verdad. Me he sentido muy tranquila entonces. Y ha sido provechos.

A4 [English Translation] No, in reality it has been super simple for me personally. I do not really like virtual classes. And I had some resistance to doing virtual classes. But really, in this moment the dynamics, the teacher, and being so interactive has thrown me a lot of challenges. Right. I felt very calm then. And it has its benefits.

Q5. ¿Recibe la misma calidad en las clases tanto presenciales como virtuales? Justifique por favor su respuesta.

A5. Nunca ha ido a presencialmente. Siempre ha sido, bueno, como ha sido en mi primer bimestre, ha sido virtual. Me imagino que posiblemente la diferencia va a ser la relación de tú a tú con mis compañeras, verdad. Pero también el profesor ha sido como muy accesible y ya ha disminuido que estaba virtual y te ha gran relantones y nos ponen grupos y no le relacionas…(Audio cut out) accesible y sencilla en fue llevar a la clase.

A5 [English Translation]: I never went to in-person classes. I have always been, well, this has been my first semester, and it has been virtual. I imagine that the difference is going to be the relationship on the same level as my classmates, right. But also the teacher has been very accessible and has been very accessible and it has diminished that it was virtual and you make great relationships and they put us in groups… (Audio cut out) accessible and simple as it was to attend clase.

Q6. Una vez que pueda regresar a clases presenciales, ¿cuál formato preferiría, virtual o presencial? ¿Porqué?

A6. Yo preferiría presencial, a mi me gusta ir a las clases. Me gusta tomar apuntes. Poder relacionarme. Entonces, no soy tan de la era total y completamente virtual, sino que sí pero un poquito de presencial. Así que si fue una opción ir a presencial, yo iría a presencial.

A6 [English Translation] I would prefer in-person, as I like to go to clases. I like to take notes. I am able to relate. So, if I am not completely and totally virtual, but rather it was a bit in-person. So that if it was an option to go in-person, I would go in-person.

Q7. ¿Ha experimentado algún cambio significativo en el uso o método de transporte?

A7. Sí, por supuesto. Even nos tránsito es más accesible, porque hay menos trabajando. De hecho era las situaciones en que de la pandemia creo que a nuestro país en cierta medida le ha ayudado muchísimo a nivel de transporte. Se reducen nos tiempo de traslado.

A7. [English Translation] Yes, of course. Even our transit is more accessible, because less people are working. In fact it was the situations due to the pandemic which I believe that our country, in a way, has benefited a lot on the topic of transport. It reduces our time in transit.

Q8. ¿Cuáles actividades pueden realizarse en el CCCN para mejorar el impacto ambiental por parte de los usuarios?

A8. Sí, como no conozco la metodología anterior y como eran las clases entonces tal vez no puedo opinar mucho sobre el tema, verdad. Pero si nos basamos, bueno. Yo trabajo en una universidad con también conozco poco la dinámica de la parte de educación, verdad. Si nos vamos en el consumo o el uso de papel verdad los materiales que se utilizan el poder colaborar ahí no solamente haciendo este tipo de actividades sino también de manera inteligente energía limpia se reutiliza el agua, verdad. Creo que eso a mi en lo personal me preocupa mucho el agua. Creo que es super importante y muchas veces al vivir en un país donde tenemos el privilegio de vivir en Costa Rica donde no tenemos tantas limitaciones de

recursos como en otros países y creemos que eso no nos va a llegar a pasar, verdad. Entonces no hacemos un buen manejo de las aguas y crea que si tuviésemos unas plantas de tratamiento de recolección de agua, nos podría ayudar y reducir muchísimo el impacto que tenemos

A8. [English Translation] Yes, since I do not know the methods before and how classes were, maybe I can not comment much on the subject, right. But if we build on it, well. I work in a university but also I know little of the education side, right. If we look at the consumption of or use paper, right, the materials that are used for communication are not only making these types of activities but also of the method of smart clean energy and reusing water. Water use worries me personally. I believe it is super important and many times, living in a country where we have the privilege to live in Costa Rica, where we do not have so many resource limitations like in other countries and we believe that this is not going to come to pass, right. So we do not do a good job with water collection and believe that if we had water collection treatment plants, it would help us and greatly reduce the impact we have.

Q9. ¿Si existiera un fondo específico para mejorar el impacto ambiental de los usuarios, en qué te gustaría que se invirtiera ese dinero?

A9. En lo principal creo que es la única manera de evitar conductas educando. Entonces te debería de invertir una parte de tu presupuesto en educar de manera consciente. Que sepamos cuál es nuestra huella y que al final de cuentas desde nuestras casas o de nuestros trabajos podemos hacer una diferencia, lo que me envió a mí reciclar en mi casa, verdad. Me voy a mi trabajo, me compré un fresco. Comí un montón de cosas en mi trabajo. Estoy siendo tan consciente o enfocada en lo que debo de hacer. Entonces de educar de generar y trabajar por energía limpias y creo que en eso enfocaría yo, porque al final de cuentas ahorita nosotros podemos ser un ente de cambio, pero los que realmente van a ver ese cambio iban a traer responsabilidad completa son los más pequeños. Entonces el empezar desde ahí es lo que realmente nos puede ayudar a generar lo que tanto Necesitamos.

A9. [English Translation] In principle, I believe that the only way to avoid these behaviors is by educating people. Then, part of the budget should be invested into educating people to be more conscious. We know what our footprint is, and at the end of the day we can make a difference from home, which lead me to recycle at home. I went to work, I bought a drink. I ate a mountain of things at work. I am being so conscious and focused on what I should do. So generally educate and work towards clean energy, and I believe that I would focus on that, because at the end of the day we can be an entity of change, but those who are really going to

see this change and bring responsibility are the little ones. So starting from there is what can really help us do what we need.

Q10. ¿Estarías dispuesto a contribuir económicamente para ayudar al CCCN a establecer un fondo voluntario y mejorar el impacto ambiental?

A10. Sí.

A10. [English Translation] Yes.

Q11. ¿Ves alguna diferencia en tu huella ecológica recibiendo clases virtuales en comparación con las clases presenciales?

A11. Sí. Porque reduzco lo que utilices. Y no tal vez mi casa tal vez no voy a tener que hacer hidrocarburos y el consumo de plásticos, en cosas de los materiales, en el método, en una computadora. Tal vez cuando fue a clases presenciales, no voy a tomar notas escritas. Ese tipo de cosas creo que también obviamente iba a ser Diferente.

A11. [English Translation] Yes. Because it reduces what you use. And perhaps not in my house, maybe I will not make hydrocarbons and consume plastics, en materials things, in transport, in a computer. Perhaps when there were in-person classes, I am not going to take written notes. This type of thing I believe would obviously be different.

Appendix C.3.2: Transcribed Interviews: Adult Student Interview 2

Q1. Podemos hacerte la entrevista en español o inglés. ¿Qué idioma prefiere?

A1. Español

A1 [English Translation] Spanish.

Q2. ¿Nos permite grabar la entrevista y así poder posteriormente revisar las respuestas?

A2. Ya, Ya. Sure.

A2. [English Translation] Yes, yes. Sure.

Q3. ¿Durante cuánto tiempo has sido una estudiante en el CCCN?

A3. Muy poco. Tengo un mes. No dos meses. Two months.

A3. [English Translation] Very little. I have one month. No two months. Two months.

Q4. ¿Ha tenido algunas dificultades aprendiendo desde su casa? De ser así, ¿Cuáles han sido los mayores retos?

A4. No absolutely not. No tengo ninguna. Ninguna.

A4. [English Translation] No absolutely not. I have none. None.

Q5. ¿Recibe la misma calidad en las clases tanto presenciales como virtuales? Justifique por favor su respuesta.

A5. Sí, me encantan las clases virtuales. Creo que vienen a facilitar a uno como estudiante que también este no solo unos estudiantes y no trabaja de viajar del trabajo a la casa y llegar a tiempo a conectarse. Da mucha facilidad, practicidad también. Entonces prefiero mil veces las clases virtuales. Mejor las clases virtuales porque la física es pasarse lugar luego salir tarde… Salir tarde y llegar a la casa tarde y al día siguiente levantarse temprano para ir a trabajar. Entonces virtuales 100%.

A5. [English Translation] Yes, I love virtual classes. I believe that they facilitate it for students, as it does not work as well to travel from work to home and to arrive on time. It gives a lot of ease and practicality. I prefer it a thousand times over virtual classes. Virtual classes are better because it's better than getting to the place and leaving late… to leave late and get to the house late and the following day to get up early and go to work. So 100% virtual.

Q6. Una vez que pueda regresar a clases presenciales, ¿cuál formato preferiría, virtual o presencial? ¿Porqué?

A6. Virtual. Virtual 100% porque es más fácil. Se hace más práctico. Trasladarme poner atención. No tengo que estar pensando en que tengo que llegar a hacer

comida, planchar para el día siguiente. Entonces virtuales 100%.

A6. [English Translation] Virtual. Virtual 100% because it is easier. It is more practical. It makes me pay attention. I do not have to be focused on how I have to get food, or iron for the next day. So virtual 100%.

Q7. ¿Ha experimentado algún cambio significativo en el uso o método de transporte?

A7. Lo uso train. Entonces no, no hizo como un cambio. Es muy fácil porque hay mucho tráfico. Viajo más rápido. Llegar más rápido a lugares a los que tengo que ir.

A8. [English Translation] I use the train. So no, there has not been a change. It is very easy because there is a lot of traffic. I travel faster. I arrive faster to the places I have to go.

Q8. ¿Cuáles actividades pueden realizarse en el CCCN para mejorar el impacto ambiental por parte de los usuarios?

A8. El reciclaje. No sé si hacen el reciclaje. Que más? Bueno, el tema de apagar las luces cuando nos están ocupando, desconectar los equipos cuando nos estamos ocupando.

A8. [English Translation] Recycling. I do not know if they [el centro cultural] recycle. What else? Also, the issue of turning off lights when they are not in use, and disconnecting equipment when we are busy.

Q9. ¿Si existiera un fondo específico para mejorar el impacto ambiental de los usuarios, en qué te gustaría que se invirtiera ese dinero?

A9. El reciclaje, creo que mejorar muchísimo. Por ejemplo con las latas. Hay que levarlas y depositarlas en el reciclar, y luego en el basurero. Es algo que no sé si el centro cultural lo hace, pero es una práctica que no sé si es correcta y se realizan gigantes. Entonces creo que capacitar sobre cómo depositar los desechos al basurero de manera que se pueda reciclar.

A9. [English Translation]Recycling, I believe it could improve a lot. For example with cans. You have to take them and deposit them in the recycling, then later in the bin. It is something that I do not know if el centro cultural does, but it is a practice that is generally not correct and could be conducted better. So I believe that you train about depositing waste in the correct bin so they can be recycled.

Q10. ¿Estarías dispuesto a contribuir económicamente para ayudar al CCCN a establecer un fondo voluntario y mejorar el impacto ambiental?

A10. Depende, ¿de cuanto sea? How much? Maybe 10 dollars?

Q10B. How about one dollar or less?

A10B. Yes, definitely yes

A10. [English Translation] It depends, how much would it be? How much? Maybe 10 dollars?... Yes, definitely less.

Q11. ¿Ves alguna diferencia en tu huella ecológica recibiendo clases virtuales en comparación con las clases presenciales?

A11. Sí totalmente, totalmente que sí. En la línea en que estamos conversando, sí, por supuesto que sería un impacto positivo.

A11. [English Translation] Yes, totally, totally yes. In our line of speaking, of course it would have a positive impact.

Appendix C.3.3: Transcribed Interviews: Adult Student Interview 3

Q1. Podemos hacerte la entrevista en español o inglés. ¿Qué idioma prefiere?

A1. In Spanish.

A1. [English Translation] In Spanish.

Q2. ¿Nos permite grabar la entrevista y así poder posteriormente revisar las respuestas?

A2. Sí.

A2. [English Translation] Yes.

Q3. ¿Durante cuánto tiempo has sido una estudiante en el CCCN?

A3. Este es el primer bimestre.

A3. [English Translation] This is my first semester.

Q4. ¿Ha tenido algunas dificultades aprendiendo desde su casa? De ser así, ¿Cuáles han sido los mayores retos?

A4. Claro, verdad. No. Me encanta eso en realidad.

A4. [English Translation] Sure, right. No. I love this method.

Q5. ¿Recibe la misma calidad en las clases tanto presenciales como virtuales? Justifique por favor su respuesta.

A5. Sí. Para mí, la misma calidad, digamos que más bien siento que es más detallada porque tengo como el chanceo, o la oportunidad de estar uno por uno en la cámara en cambio en clase, tal vez al lado. Aquí todos tienen que hablar uno por uno.

A5. [English Translation] Yes. For me, they are the same quality. Let's say that it is good because I feel that it is more detailed because I have the chance, or the opportunity to be one on one on camera, instead of in class, perhaps to the side. This way everyone has to speak to one another.

Q6. Una vez que pueda regresar a clases presenciales, ¿cuál formato preferiría, virtual o presencial? ¿Porqué?

A6. Yo prefiero el virtual. Porque digamos, yo pierdo como mucho tiempo en el tráfico mientras me estoy trasladando de un lugar a otro entonces. Prefiero estar en mi casa porque yo trabajo desde mi casa, entonces nada mas me conecto a la computadora y me quedo trabajando y luego terminó y ya estoy en mi casa.

A6. [English Translation] I prefer virtual, because let's say, I lost a lot of time in traffic getting from place to place then. I prefer to be in my house because I work from home, so I just stay on my computer when I'm done work. Later, when I am finished, I am already at home.

Q7. ¿Ha experimentado algún cambio significativo en el uso o método de transporte?

A7. Es que no usó transporte. Esa es la diferencia, eso es un cambio gigante. Porque antes, de ser así, tengamos que salir de la oficina, este ir a clases. Tuve que ir a lugares diferentes. Ahorita trabajo en mi casa y en mi casa estudiando. Entonces no pierde tiempo.

A7. [English Translation] It's that I don't use transportation. That's the difference. This is a huge change. Because before, in that case, we had to go to the office and to go to clases. I had to go to different places. Not my job is from my house and I learn from home. So now I do not lose time.

Q8. ¿Cuáles actividades pueden realizarse en el CCCN para mejorar el impacto ambiental por parte de los usuarios?

A8. Okay. Vamos a ver, yo creo que primero le presentación de los libros digitales me parece una genial idea porque después ya no estamos con el tema de papel y como ahorita no estamos yendo a clases presenciales. Yo creo que es un poquito complicado decir. Tal vez un analiza un impacto tangible de una reducción en contaminación. Tal vez diría que el tema del manejo de desechos como tal y yo creo que eso es algo que cualquier organización puede aprovechar para hacer una reducción. El tema de la no impresión de hojas de libros fáciles y también práctica y acción del tema de la reducción de electricidad parece muy bueno pero en ninguna organización se utiliza.

A8. [English Translation] Okay. Let’s see, I believe that having virtual textbooks seems like a good idea, as it will move us further from paper waste, along with virtual classes. I think it is a bit complicated to say. Perhaps aniliza a tangible impact in the reduction of pollution. Maybe I would say along the issue of waste management. That’s something that any organization can do to make an impact. Not printing on paper because it is easy, and putting into action using less electricity seems like a good idea, but no organization seems to use it.

Q9. ¿Si existiera un fondo específico para mejorar el impacto ambiental de los usuarios, en qué te gustaría que se invirtiera ese dinero?

A9. Como le digo yo creo que lo más importante es el manejo de los hechos comerciales, y yo invirtiera en eso. Y tal vez hace una reducción, por ejemplo, de agua controlada. Entonces tal vez compres comerciales para que las luces se apagan solas, cuando los salones estén vacíos o para que el agua dure cierto tiempo menos abierto. No sé si ya está abierta siempre. No sé si invierta como en esas cosas.

A9. [English Translation] As I say, I believe that the most important thing is management of commercial products, I would invest in that. And perhaps make a reduction, for example, in controlled water usage. Then perhaps buy products to turn lights off automatically, and when rooms are empty, so those and water only run a certain amount of time. I do not know if those things are in place already. I do not know if el centro cultural should invest in these things.

Q10. ¿Estarías dispuesto a contribuir económicamente para ayudar al CCCN a establecer un fondo voluntario y mejorar el impacto ambiental?

A10. Sí, sí.

A10. [English Translation] Yes. Yes.

Q11. ¿Ves alguna diferencia en tu huella ecológica recibiendo clases virtuales en comparación con las clases presenciales?

A11. Claro que sí, y vamos a ver. Yo creo que es un tema con la madre biológica, como tal. Pero sí, o sea, está implecho que yo no desplazarme al centro. Está implecho que el hecho de que yo no tenga que estar en el centro. Así que el centro hace una reducción de gas, de combustible, una reducción de agua, y una reducción de tal vez y transportes independientes que se utilizan. Entonces ya hay como una huella, una reducción de gases, una reducción del agua. Tal vez porque si no estamos como todos concentrados en solo punto este, y creo… si hay como una reducción en cuanto a estar virtual y presencial, tal vez no es notable, yo no pondría tanto dinero. Pero este si se pone un promedio de todos los estudiantes en cómo se transportan, como bien día a día, te veo una orden para ver una reducción del impacto. No sé la misión de gas. Por ejemplo, huella de carbono, etc.

A11. [English Translation] Yes, of course, and let's see. I believe that perhaps it's about mother earth. But yes, I mean, it's implied that I do not commute to el centro. It's implied that I do not have to be at el centro. So the center could reduce gas, fuel, water and perhaps independent transports. Then when they have a trace, reduce gases and water more. At the same time, if not everyone concentrates on this point, I believe… that there are already reductions from in-person classes to virtual, which perhaps are not as noticeable, and would not require such a money investment. But instead if we put a promise for all the students in how we travel, as well as every day, you will see a positive impact. I do not exactly know the mission of gas. For example, carbon footprint, etc.

Appendix C.3.4: Transcribed Interviews: Adult Student Interview 4

Q1. Podemos hacerte la entrevista en español o inglés. ¿Qué idioma prefiere?

A1. Español.

A1. [English Translation] Spanish.

Q2. ¿Nos permite grabar la entrevista y así poder posteriormente revisar las respuestas?

A2. Yes.

A2. [English Translation] Yes.

Q3. ¿Durante cuánto tiempo has sido una estudiante en el CCCN?

A3. Two months.

A3. [English Translation] Two months.

Q4. ¿Ha tenido algunas dificultades aprendiendo desde su casa? De ser así, ¿Cuáles han sido los mayores retos?

A4. There are not any problems with that.

A4. [English Translation] There are not any problems with that.

Q5. ¿Recibe la misma calidad en las clases tanto presenciales como virtuales? Justifique por favor su respuesta.

A5. I don't know, because I only have classes de virtually no presencial. I think virtually is very easy for the people that live largo del centro cultural. In my case I live two hours from el centro cultural. For me, it is impossible to go twice a week a San Jose for the classes. For that, this year I matriculate in centro cultural porque era virtual.

A5. [English Translation] I don’t know, because I only have classes virtually, not in-person. I think that virtually, it is very easy for the people who live far from el centro cultural. In my case, I live two hours from el centro cultural. For me, it is impossible to go twice a week to San Jose for the classes. For that, this year I matriculated to el centro because it was virtual.

Q6. Una vez que pueda regresar a clases presenciales, ¿cuál formato preferiría, virtual o presencial? ¿Porqué?

A6. Virtual. Si sería en presencial, no maltricularía más. In my case, only virtually is the way for me.

A6. [English Translation] Virtual. If it was in-person, I would not be able to attend anymore. In my case, virtual is the way for me.

Q7. ¿Ha experimentado algún cambio significativo en el uso o método de transporte?

A7. No, because I have a car. Y tengo home work. Two days I go to the office and 3 days I'm at home work. The transportation is the same because I have a car.

A7. [English Translation] No, because I have a car. And I work from home. Two days I go to the office and three days I am at home working. The transportation is the same because I have a car.

Q8. ¿Cuáles actividades pueden realizarse en el CCCN para mejorar el impacto ambiental por parte de los usuarios?

A8. Sí, but I think they are very good. They have clases virtuales because the people stay in their homes. No tienen que usar el carro para ir a clases.

A8. [English Translation] Yes, but I think they are very good. They have virtual classes because the people stay at home. They do not have to use a car to get to classes.

Q9. ¿Si existiera un fondo específico para mejorar el impacto ambiental de los usuarios, en qué te gustaría que se invirtiera ese dinero?

A9. Bueno, en mantener las clases virtuales. And reforestar, I think.

A9. [English Translation]Yes, for maintaining virtual classes. And reforestation, I think.

Q10. ¿Estarías dispuesto a contribuir económicamente para ayudar al CCCN a establecer un fondo voluntario y mejorar el impacto ambiental?

A10. Sí, sí estaría dispuesto.

A10. [English Translation] Yes, I would be willing.

Q11. ¿Ves alguna diferencia en tu huella ecológica recibiendo clases virtuales en comparación con las clases presenciales? (o después del comienzo de la pandemia)

A11. Yes, because I make compost and in my family we use less de car because hay reducción vehicular. The government say the people in this country don't, no pueden, go out every day in the car. And then we use less de car.

A11. [English Translation] Yes, because I compost and in my family we use the car less because there is a reduction of vehicle use. The government says the people in this country can't, don't, go out every day. And then we use less of the car.

Appendix C.3.5: Transcribed Interviews: Adult Student Interview 5

Q1. We can conduct this interview in English or Spanish, which language would you prefer?

A1. I will practice my english.

Q2. Can we record this interview so we can review the responses at a later date?

A2. Yes.

Q3. How long have you been a student at CCCN?

A3. Uh, well, this is my first period so I can say just one day. One or two days! Because I just started yesterday. I'm really, I'm new. I'm new.

Q4. Have you had any difficulty learning from home, and if so what challenges have you faced?

A4. Well, to be honest, I prefer to learn here at home. Because, It's easy for me because, you know, my schedule at work is complicated sometimes and when I have to leave my responsibilities at work. So, I have the time to take some coffee and connect and learn on my own way, you know? I prefer working this way when it's all online.

Q5. Do you hold remote classes and traditional classes to the same value? Why or why not?

A5. Well it depends. Depends, you know? Eh… depends on the course, or it depends on... for example for english that works for me. But for example some time ago I attended a course related to project management, so sometimes it was difficult for me to interact with my partners, you know? Because we had to find and identify some information for reports, or investigate, or some discussions; because there is some part that we have to, you know, interact or communicate some things and it's difficult when you have debates online. But for example for english, for me, it works very well.

Q6. After the pandemic removes the need for remote courses, what is the ideal class format which you would like to see?

A6. Mix of two, yes, I think that will work for me, well at the time. Now prefer… well, also I can say I prefer more remote. But it depends as I said, I prefer remote, but depending on the course, sometimes we have to go in-person.

Q7. Since Covid began, have you noticed any change in the amount you travel? Please explain.

A7. Oh yes for sure! I spend more, most of my time here at home. So I, only on weekends, I can say on weekends, I have time to go, you know, to the supermarket or even to go to the park, or to the beach also. But now during the week I don't need to go to any place to be honest.

Q8. What can individuals do to help the CCCN improve their environmental impact?

A8. Well let me think… that for example, when I was at university for example, when I had to attend the university with my friends there… also the part that maybe I can say I miss a little bit is the debates or discussions that we had because we learn you know with this kind of discussions we interact with people but sometimes when this is remote we don't have this kind of interaction that we have to stop the people and say 'no no don't take it that way.' That is the part that I would say I miss a little bit yeah.

[team rephrases the question]

No maybe… maybe the food courts or the restaurants in these places. Or maybe for example here I saw in the building of this cultural institute, they have a nice, you know, like a park near to this place. And, well now we can't go there so maybe this is the part if I have to attend there I will really… I think I would like that park but for the moment it's only today, so…

Q9. If there were a fund of money to be used on making your campus more green, where would you like to see it go?

A9. Oh lets see… well they have huh… maybe well it's because… in the dry season they can apply this but maybe they can have some available places on the outside of the building. They have some space right, so maybe outside of the building in the dry season, right, some tables that the people can share or eat outside because usually we are always inside of the building and only walls we see. So maybe these things because here we have, you know, it's also because the government, right, we have the different trash cans with identification that we have to separate the things. And also we try, you know, we dont bring a lot of things we usually work everything online here we have a lot of conscience about the environment so maybe these kinds of things can help a little bit.

Q10. Would you be willing to pay a small voluntary green fee to help the CCCN establish a green fund which will help lower the company's environmental impact?

A10. Yes sure, yeah, yes if that is small yeah. Depends if it's small for me! Yeah sure also we have some activities outside for example we go to the beaches and we clean the beaches because sometimes we have some people that… they don't take

care of the bottles and these kinds of things, but we usually have some groups that prepare some days and they go to the beach and they clean.

Q11. Do you see a difference in your carbon footprint when learning remotely compared to in-person?

A11. Hmm… I would say yes because I reduce the, you know, the gasoline, the transportation, I avoid those kinds of things. And maybe the energy that I use every day is a little higher, but I think if I can take into consideration more things I usually do outside, then yes I… working at home and doing my stuff here at home then yeah.

Appendix C.4: Teacher Interview Questions: English

Hello my name is Emily. My name is Lexi. My name is Jon. My name is Katie and we are a group of WPI Students doing a project to help the CCCN decrease their carbon footprint.

As a reminder, this interview will be anonymous and your identity will not be tied to any answers that you give. Your answers will only be used to help analyze whether teachers believe the CCCN should continue remote or hybrid teaching.

1. We can conduct this interview in English or Spanish, which language would you prefer?
2. Can we record this interview so we can review the responses at a later date?
3. What are some of the challenges that teaching from home has presented?
4. In your role as an educator, have you noticed a difference in the effectiveness of virtual classes with respect to student performance?
5. Do you believe that students learn better in traditional class formats or the current format? Why?
6. After the pandemic, what do you believe is the ideal class format of class? What format would you like to see?
7. If it were determined that remote learning greatly reduced the company's carbon footprint, would you be willing to continue teaching remote?
8. Before Covid, what method of transportation did you use to get to the CCCN?
9. Since Covid began, have you noticed any change in the amount you travel? Please explain.
10. Do you know of any ways in which the CCCN is trying to reduce its carbon footprint?
11. Do you know of any environmental problems at the CCCN?
12. If there were a fund of money for the Get Green project, where would you like to see it go?
13. Do you see a difference in your carbon footprint when working remotely and in-person?
14. Would you be willing to take some of your time to volunteer for a committee dedicated to reducing the company's carbon footprint?

Appendix C.5: Teacher Interview Questions: Spanish

Hola. Me llamo Emily. Me llamo Lexi. Me llamo Jon. Y me llamo Katie. Somos un equipo de estudiantes de WPI. Estamos haciendo un proyecto para ayudar el centro cultural a reducir su huella económica. Como recordatorio, la entrevista es anónima, y tus respuestas no serían conectadas a su nombre, solo utilizadas por el objetivo de analizar si los profesores crean si el centro debe continuar con clases virtuales.

1. Podemos hacerle la entrevista en español o inglés. ¿Qué idioma prefiere?
2. ¿Nos permite grabar la entrevista para poder después revisar las respuestas?
3. ¿Cuáles son algunos de los retos que han enfrentado al enseñar de manera virtual?
4. Desde su perspectiva, ¿ha notado alguna diferencia en la efectividad de los programas virtualizados con respecto al desempeño estudiantil?
5. ¿Cree que los estudiantes aprenden mejor en una clase presencial o en un formato virtualizado? ¿Por qué?
6. Después de la pandemia, ¿cuál cree que sea el formato ideal para impartir lecciones?
7. Si fuera determinado que el aprendizaje virtualizado reduce considerablemente la huella de carbono del CCCN, ¿estarías dispuesto a continuar teletrabajando?
8. Antes de la pandemia, ¿qué método de transporte usabas para llegar al CCCN?
9. Después de la pandemia, usted ha experimentado cambios en cuanto al uso de medios de transporte? Por favor comentar.
10. ¿Conoce sobre las iniciativas que el CCCN está implementando para reducir su huella de carbono?
11. ¿Sabe si el CCCN tiene problemas ambientales?
12. Si se destinan recursos para el proyecto Get Green, ¿en qué le gustaría que se invirtieran?
13. ¿Percibe alguna diferencia en tu huella de carbono cuando trabaja desde su casa?
14. ¿Estaría dispuesto a participar en un comité dedicado a reducir la huella de carbono del CCCN?

Appendix C.6: Transcribed Interviews: Teachers

Appendix C.6.1: Transcribed Interviews: Teacher Interview 1

Q1. We can conduct this interview in English or Spanish, which language would you prefer?

A1. I would be happy to do the interview in English to make it easier for you.

Q2. Can we record this interview so we can review the responses at a later date?

A2. Yes, you can.

Q3. What are some of the challenges that teaching from home has presented?

A3. Um, Okay. Number 1 - I would say adapting my space and my family to it. Number one - the space - I think that's the most difficult but that's also the most concrete. Right? Once you find the right lighting, the right corner, and everything- That's it - you stay put. But with a family, then that's something else. They have their own routines, their own needs of sound or quiet and we need to match our needs in a new way that takes more time and effort.

Q3B. Have you noticed any of those challenges with the students at all, or has it just been at your home?

A3B. The students have similar challenges, definitely. Um - On the students part I feel that there's also a need for a culture of virtual learning. Virtual teaching has its own culture and virtual learning has its own culture that I think was not given to them but was more like imposed on them and many students have reacted to it. I don't know how to explain this because I teach mostly adults, but I would say they went back to their last stage as students and they reacted like that - and mostly rebelled against it. It was a process.

Q4. In your role as an educator, have you noticed a difference in the effectiveness of virtual classes with respect to student performance?

A4. Um- I noticed it mostly at the beginning when both the teacher and the student were in the process of switching into the needs of the virtual environment. I think right now, we the teachers are better prepared to connect with our students and start the process and help them make it efficient and effective.

Q5. Do you believe that students learn better in traditional class formats or the current format? Why?

A5. Um- I think that will always be a matter of what kind of student you are dealing with. People are individuals. They are different. They learn differently. It has always been like that and it will forever be like that. I am a teacher, but as a

student I know I do better with distant learning - which nowadays is virtual learning - for the simple reason that I concentrate more or I have more power over the conditions that help me concentrate and actually absorb information in a useful way to actually learn. But not everyone works like that. A lot of people need the input from the physical interaction with others. And I have to respect that and accept that's never going to disappear.

Q6. After the pandemic, what do you believe is the ideal class format? What format would you like to see?

A6. Um- I think I would like a hybrid version. As a teacher, it is more satisfying when you know you are addressing all your students needs. So the hybrid version would give me the chance to balance that in my groups. Right? And so everybody feels that they are being addressed and they would accept when they are in the section of the process that is not ideal for them or preferred by them but they would know that their chance or their time would come. I would like that. Apart from that, if I just have to think about myself virtual teaching has been better in many ways. You know, no commuting, no worrying about certain times I have to do things because I have to move back and forth. I have finished class at 11:30 in the morning and my next class is at 2:00. After I have lunch where do I go to actually rest - properly or not. That disappeared.

Q7. If it were determined that remote learning greatly reduced the company's carbon footprint, would you be willing to continue teaching remote?

A7. Yes, definitely. Yes, yes. I would support it and I would help to find new and better ways to adapt.

Q8. Before Covid, what method of transportation did you use to get to the CCCN?

A8. Um- It would be a combination of walking and - well I use uber all the time. I have mobility problems, so buses are difficult for me, so that's why I use uber. Before my mobility problems, at this stage where I am right now, I used buses.

Q9. Since Covid began, have you noticed any change in the amount you travel? Please explain.

A9. Yes definitely, I travel less and I walk less also. So, I use the delivery services as much as I can to avoid the risk of getting it [Covid-19] again.

Q10. Do you know of any ways in which the CCCN is trying to reduce its carbon footprint?

A10. Yes, years ago we started the process of eliminating printed documents for internal use as much as possible, so all the internal communication goes online. The trainings started using more and more digital material and access to it. So we started - I would say - Four years ago it was very noticeable where we were now using, during our training sessions, QR codes to access surveys or things like that. So the quality and the amount of interaction with the documents was there just reducing our footprint I would say.

Q10B: Did the students have their own Ipads or computers? What did they use instead of paper?

A10B: That part did not change as much. Students came to our classes with physical books and notebooks and all that. Very few students used laptops or tablets in class. I would say one every other group and our groups are 14 students so it was not the most common. The culture here is not like that.

Q11. Do you know of any environmental problems at the CCCN?

A11. The straight answer would be no, but due to the location I would say there are problems of noise, such as sonic contamination, around us that sometimes affect us where sometimes it is so loud that it goes into the classrooms. And pollution in areas is really where it is hot.

Q11B. Do you see any ways the employees or students may contribute to any environmental problems?

A11B. I don't think so. I don’t know how objective I am about it, but I don't think so. I think the employees once we got there, those who drove kept their cars parked and that was not part of the problem. And most of us didn't drive, even having a car, because we knew we were just going to have a car sitting in the parking lot doing nothing - so people preferred using other means of transport. Um- And the noise- No we definitely did not contribute to the noise of the area.

Q12. If there were a fund of money for the Get Green project, where would you like to see it go?

A12. Ooh um - I don’t think I am informed enough to give you an answer on that. I don't think I know what are the options or what has been overseen or forgotten so I cannot answer that.

Q13. Do you see a difference in your carbon footprint when working remotely and in-person?

A13. Yes, I was always the teacher who created materials - flashcards, games, physical things to use in class - and of course I had to stop doing that. In a way, it was a challenge for me but I think that definitely changed things. People started just using virtual enabled things which helped reduce it.

Q14. Would you be willing to take some of your time to volunteer for a committee dedicated to reducing the company's carbon footprint?

A14. Okay, I would have said yes a few days ago, but honestly right now I teach 6 hours a day, for 2 classes. But for every class I am using about 2 hours of preparations. So that is already 4 extra hours of my day so 10 hours a day I am there working. And I don't think I have the energy. I have the interest but I don't think I have the energy.

Appendix C.6.2: Transcribed Interviews: Teacher Interview 2

Q1. We can conduct this interview in English or Spanish, which language would you prefer?

A1. English

Q2. Can we record this interview so we can review the responses at a later date?

A2. Yes

Q3. What are some of the challenges that teaching from home has presented?

A3. In terms of teaching, maybe- the first challenge I encountered was the materials - Let's say the adaptation of the materials that I had for my face to face interaction with students and just transforming that into virtual content perhaps. Another challenge that I found was communication with students as well. It gets to be a little bit different because right now we communicate a lot via email and not as much in a face to face interaction conversation, which I miss. Yeah, pretty much. Those were the two major challenges.

Q4. In your role as an educator, have you noticed a difference in the effectiveness of virtual classes with respect to student performance?

A4. I notice there is like - I don't know. I feel like students who are shy tend to be kind of protected by the computer - The screen lets say. Right now Centro is trying to let students know that it is mandatory to activate your camera and just to have it on because it is necessary for your pronunciation, for better communication. But I believe it is still difficult, like communication gets to be difficult and English learning is communication pretty much. And that's one of the things I noticed. My students sometimes get to have difficulties with - not like difficulty- but its like something that hinders - at a certain point - the learning process or their learning in general terms.

Q5. Do you believe that students learn better in traditional class formats or the current format? Why?

A5. Yeah, I believe it is not the same when you - or maybe students are not used to it. Once they get used to it I think it will be pretty much the same. But right now some of them are still getting used to it, and it is better for them to communicate in a face to face conversation. I don't know, but it gets to be a little bit more realistic. Most of the situations that we practice, for example, last time I was practicing phone conversations - and the context was appropriate. But there are some other times in which we practice, for example directions. Like you don't ask for directions via a conference call or just like virtual classes. So it is not the

same, And it gets to be different. And the experience is not the same, and they do not feel the pressure- or forced to speak because they are in front of another person. They feel protected as I was telling you before.

Q6. After the pandemic, what do you believe is the ideal class format of class? What format would you like to see?

A6. When I was reading about your project, I thought of this hybrid idea as a good one. It will be nice because we - Of course it is gonna be different anyway and I believe that taking advantage of this opportunity, this chance of having all the teachers prepare to teach virtually is something we should take advantage of. And I think it would be nice to have a combination of both.

Q7. If it were determined that remote learning greatly reduced the company's carbon footprint, would you be willing to continue teaching remote?

A7. Yes, that would be good, but I still need that face to face interaction.

Q8. Before Covid, what method of transportation did you use to get to the CCCN?

A8. I used to travel by bus and I walked because the bus stop was kind of far away from Centro, but I had to walk a little bit. But It was great because when I walked it was kind of like - relaxing before class time. And I miss that time a lot. If I come back or we have to teach again at Centro I would probably use a car because I have a car right now.

Q9. Since Covid began, have you noticed any change in the amount you travel? Please explain.

A9. In terms of frequency, or?

Q9B. Yeah, like do you go to the store as often or you know, anywhere?

A9B. I used to go out every day before Covid-19, but right now it's a little bit less. Like we just go out to buy groceries or I don't know, like when we went to go to the beach or when we went to go to a green area because I have kids and they need to go out. So just in those cases.

Q10. Do you know of any ways in which the CCCN is trying to reduce its carbon footprint?

A10. I know we use solar panels in the institution. The institution recycles a lot and has recycle bins pretty much all over the place and so basically it's available for students, teachers, and any other person that works for el Centro Cultural. Centro is doing a good job in that sense but I think that we could do better.

Q11. Do you know of any environmental problems at the CCCN?

A11. Maybe water waste, that could be a major problem that we don't save water. We don't have any type of tool or any special taps to help you save water. We don't have those, I don't think we have those in el Centro. I haven't seen that. Or sometimes, well I don't know how the pipes are - like the condition of the pipes, but I do believe we could do something to save water a little bit more. Or the toilets as well- just the water we get in the toilet, there is no special toilets to save water. So that would be great.

Q12. If there were a fund of money for the Get Green project, where would you like to see it go?

A12. Perhaps yeah, it would be related to water. Yeah, Maybe to buy certain things that will help us save water because there are a lot of students and a lot of people at the institution, so I think that would be great.

Q13. Do you see a difference in your carbon footprint when working remotely and in-person?

A13. Sure. A lot. I don't go out as much as I used to. I used to go out and - I mean, I don't have to spend money on gasoline or transportation. Also I don't have to buy my food outside, I buy it and I cook at home. I think that we are more aware of the things that we consume in a way because you get to notice how many things you buy in a month because you are in the house. That doesn't happen when you go out everyday because you are not fully aware of that.

Q14. Would you be willing to take some of your time to volunteer for a committee dedicated to reducing the CCCN's carbon footprint?

A14. Yeah, why not? It would be nice.

Appendix C.6.3: Transcribed Interviews: Teacher Interview 3

Q1. We can conduct this interview in English or Spanish, which language would you prefer?

A1. English

Q2. Can we record this interview so we can review the responses at a later date?

A2. Sure

Q3. What are some of the challenges that teaching from home has presented?

A3. Quite a few. Leaving some things aside like the internet connection, the hardest thing is interacting with people face to face, we kinda miss that. It's been a year, you get used to it, but it's still one of the biggest challenges. Staying in front of the computer for 8+ hours or more, it represents a challenge also for your body. At first, it was really, really hard for me, I have to be honest, because I used to be moving and going from this place to the other. It's been a challenge physically and Of course mentally because of that factor, I mean interacting with people. Adapting to new technologies and using other resources that we used, yea, but not to this extent. Because now we depend on technology 100%. So, all of that, for example paper and markers and all of those things that we used to use in the classroom, there are now in the locker room. Now it is technology, pretty much and I think that is something that we have to learn to adapt, to learn to use more frequently.

Q4. In your role as an educator, have you noticed a difference in the effectiveness of virtual classes with respect to student performance?

A4. I would say yeah, definitely. Even though, yea, you're not there with them you can actually try to give them more useful and effective tools. Now, being there with them we are trying to observe what they are doing and at the same time, changing the strategies and methodologies, I think that I have felt with the last 4 or 5 groups that it is as effective or more effective than a face to face class. I don't know if its because they have to take it more seriously, but everytime you teach a new class or new unit, and also if I take a look at the evaluations or oral assessments, I think they actually perform a lot better. I cannot really pinpoint the exact reason but I'm pretty sure they are more committed and they now have a lot more time to study. I can tell you that I have noticed that.

Q5. Do you believe that students learn better in traditional class formats or the current format? Why?

A5. They have a lot more distractions from home. I don't know if they also changed

some rules. At the beginning, I'm pretty sure, they had zoom and other tabs open, facebook, instagram, or whatever things they use. I think that this helps them a lot in terms of learning or trying to or the language acquisition process. Probably because they have to be there in front of the computer. In a classroom, they have the opportunity to interact but they are probably doing other things too. While doing an exercise they might start talking about other things, but since they are here in front of the computer and everybody can see them, they don't have that chance to do that. I think they also have to really focus on what's going on too, because also their connections start giving them trouble, they are going to get lost. I think that's helped a lot in terms of paying attention. Helped with paying attention and focusing on what they have to do, whatever task we're doing.

Q6. After the pandemic, what do you believe is the ideal class format of class? What format would you like to see?

A6. Currently I am taking a 100% virtual masters degree option. I think I would like to see that more often or at least a hybrid program. This has helped us realize that going to class today or those technologies that were kinda overlooked, now we see the whole potential and everything they can do. Of course, all the tools we find on the web, Kahoot, Nearpod, teachers actually use them a lot more often than they were in a classroom. We used to do that a lot. But now it's a whole different level.

Hybrid program or hybrid way to do things, I think it's really useful. I really miss my classroom, but I think that this will change the whole thing for the next couple of years. I think that there is, every 10 years you see something very different. I remember when I was in college ten years ago, I would have never imagined using the things that we used today and every ten years there is going to be something different. I don't think that face to face classes or lessons are going to be back 100%. I think that this is something that is definitely going to stay, teaching from home or… we used to have that, but it was only a handful of universities. Now you see high schools and primary schools doing all this. I think this is going to be the thing for the next 10-20 years.

Q7. If it were determined that remote learning greatly reduced the company's carbon footprint, would you be willing to continue teaching remote?

A7. Yes 100% definitely. Something I am really really grateful for is that our country has a lot of water. I really hate looking at people wasting water and all of those resources. Jesus Christ, we use a lot of paper. Even though we recycle a lot, you could see at the end of the day, a huge amount of paper, plastic and other kinds of waste. If it helps the planet, I will definitely teach remotely or try to be at home as much as I can. Something that I am definitely with.

Q8. Before Covid, what method of transportation did you use to get to the CCCN?

A8. Public transportation. I live just 30 minutes away and I didn't use to drive. Pretty much the bus.

Q9. Since Covid began, have you noticed any change in the amount you travel? Please explain.

A9. Substantially. Yea. I havent - I have to be honest, I rarely - go downtown now. Probably one day a week and that is it.

Q10. Do you know of any ways in which the CCCN is trying to reduce its carbon footprint?

A10. Aside from the program we used to have, recycling different kinds of materials, I don't know of anything we have now. I think that's the only thing we used to have. Paper, plastic, glass and I think cardboard. I think that's the only thing.

Q11. Do you know of any environmental problems at the CCCN?

A11. Not really. Environmental problems? Not at the moment.

Q12. If there were a fund of money for the Get Green project, where would you like to see it go?

A12. Probably trees. Planting more trees. That's something I want to see happen more often. In my community, for example, some institutions do that and if we could help, I would be more than glad to be part of that too. I feel a deep connection with the environment and trees. Trees are really important, and something in our country especially that should be encouraged a lot more.

Q13. Do you see a difference in your carbon footprint when working remotely and in-person?

A13. Totally. As I mentioned before, the only thing I use is my computer and that's it. I stopped using post-it notes, paper. I rarely use paper. That's basically it. I rarely use paper now. I have to be honest, our site was located in a mall, and I used to go there and there was a copy center there. I used to take a lot of copies and used a lot of paper in my class to support my students and practice. Now I use lots of other resources, technological resources, which reduces my carbon footprint. Probably, the only thing, how much energy I consume in my house, probably the lights, but these are LED, so I think it's a little better. I think that's the only thing.

Q14. Would you be willing to take some of your time to volunteer for a committee

dedicated to reducing the CCCN's carbon footprint?

A14. Yeah, I would.

Q14B. Is that something you are interested in or that you would be willing to volunteer for?

A14B. I am interested in it because it is something that worries me. Global warming and climate change, it's something that we have to start doing something. I know this is a cliche or cheesy but we actually have to do something about that. Not as much as the United States, but we have, when it rains in some parts of the country, it floods. Communities are really affected by that. I think that it's a wake up call that we should and have to start doing something and if I can be a part of that, I'm totally in.

Appendix C.6.4: Transcribed Interviews: Teacher Interview 4

Q1. We can conduct this interview in English or Spanish, which language would you prefer?

A1. Whichever you prefer

Q2. Can we record this interview so we can review the responses at a later date?

A2. Yeah, no problem.

Q3. What are some of the challenges that teaching from home has presented?

A3. Oh my god, that's a very interesting question. Even though we have had some training on virtual learning and teaching before the pandemic start, it caught everyone off guard. Everything we had, the materials and our mindset, was focused on face to face classes. Then when the pandemic started, we were forced to change everything from paper to virtual materials, so it was very hard, and time consuming. Students were not prepared for this shift. In the beginning, it was difficult for students to feel that they were learning. There were some misconceptions with virtual learning, because students believed it was not that meaningful. As the months went by, they realized it was effective and a good way to learn. That was one of the biggest challenges, convincing students it was worth taking virtual classes. As I said before, everything was planned for face-to-face classes. All of a sudden, we were forced to change everything and virtualize everything. Everything was super hard and super time consuming. And I guess the interactions like changed a lot, as people in a classroom can walk around and interview people. So trying to replicate that same thing in a virtual class was difficult in the beginning. And thank God we have zoom. It allows us to create breakout rooms, it gives students an opportunity to talk to different partners. I know there are other programs that don't allow for break out rooms so it is a luxury.

Q4. In your role as an educator, have you noticed a difference in the effectiveness of virtual classes with respect to student performance?

A4. At the beginning, I was a little bit worried about how effective clases were. I was not familiar with virtual teaching. But now, we have a level of expertise and based on what I have noticed and experienced in my class, now I believe that everything we do in a face to face class, can be done in a virtual class. I think that the activities are really effective, we can see that in the assessments that we carry out in the lessons. I now can tell you that I can see that effectiveness. In the beginning, it was new to me so I couldn't see it, but now I see it because now

students are more trained to perform in a virtual environment, but in the beginning they were not.

Q5. Do you believe that students learn better in traditional class formats or the current format? Why?

A5. Oh my God… I do believe that it also depends on the learning style of each student, right. Because there are many students who are kinesthetic learners who learn by doing and by manipulating things so dealing with that specific learning style in a virtual class is really hard, especially for kids and teenagers. Even their attention span is super short. They can only stay focused for 10 minutes. You have to be planning a lot of activities for them to feel engaged in the class. I honestly consider that both formats are equally effective, but that's my point of view as a teacher, but maybe a student may think differently based on their learning style. It is easy to deal with visual and auditory learning styles. But for those students who are kinesthetic learners, it is really really hard. So we have to be looking for ways to appeal to them. They are deprived from activities that we do in face to face classes that give them a chance to actually do and manipulate things.

Q6. After the pandemic, what do you believe is the ideal class format of class? What format would you like to see?

A6. I think that this pandemic has opened a lot of doors and even windows because students realized that virtual classes aren't fruitful, aren't effective. I have heard a lot of students who are willing to take virtual classes forever, right, but maybe because their learning styles match with what they experience in the virtual classes. Many students who say, no I really want to go back to the classroom, I miss the space and the interaction with their partners. After the pandemic, the ideal way of learning and teaching will depend on the student's perspective and point of view. They can choose these two options, which is better for them, they can feel empowered to choose one. They are going to have a voice. In the past, they were forced to attend classes. They have options, this gives them some sort of autonomy, or even empowerment on how they want to learn.

Q6B. You mentioned the two extremes, but how would you feel about a hybrid option?

A6B. Since I haven't had the chance to teach in this format, I don't know what to expect, I think it would be kind of weird. I honestly love virtual classes. I want to continue teaching online like forever, if that's possible. I think hybrid format can give all the students the chance to actually learn based on their learning style, kinesthetic learners will actually have the chance to have that kind of exposure to those kinds of activities. Virtual classes can give auditory and visual learners a chance to learn in their own way. So a hybrid format can be meaningful in that sense, where we can tackle all the different learning styles at one time. I think

that's going to be awesome.

Q7. If it were determined that remote learning greatly reduced the company's carbon footprint, would you be willing to continue teaching remote?

A7. Yea, I would love to continue teaching online for the rest of my life if thats possible. During this, almost a year, I have saved a lot of time, energy and even money due to the pandemic. I would love to keep working that way. Even our exams are now done online, in the past, we used a lot of paper, that was not really good. It has helped us save a lot of trees. That is something that I believe has made a huge impact, not only in Costa Rica but around the world.

Q8. Before Covid, what method of transportation did you use to get to the CCCN?

A8. Well, I used to travel by car and commute by car. That is why I told you I have saved a lot of money and time. Traffic jams are sometimes really tiring. I now have time for exercise. I finish work at 5 so I can start running at 5:10, but in the past I haven't had time to do that.

Q9. Since Covid began, have you noticed any change in the amount you travel? Please explain.

A9. Yea, actually, I almost never use my car. If I use it, it's because I have to run errands and that's it. I use it like maybe twice a week so it's changed a lot, a lot. I love working from home because I have time for myself and for my family. It's something that I didn't have a year ago.

Q10. Do you know of any ways in which the CCCN is trying to reduce its carbon footprint?

A10. Yes, in some sites el centro installed solar panels. That is a huge change. I know that there is a huge investment behind this policy, but it is something that is gonna pay off in the long-term. So yes, solar panels. That's the one I know. And again, we have some recycling bins inside the buildings. We have even been teaching kids and teenagers to recycle bottles and paper.

Q11. Do you know of any environmental problems at the CCCN?

A11. Well, I think in the past, to be honest, we used a lot of paper, A LOT of paper. You have no idea how much paper we used. I think that we can do something about it, we are doing that because of covid. After the pandemic, the exams can continue to be done online, that's going to help a lot and that's the only one I know.

Q12. If there were a fund of money for the Get Green project, where would you like to see it go?

A12. That's a very interesting question. I have never thought about it. I believe seeing as we are teachers, I guess we can invest that money and time in educating kids and teenagers to change their mind regarding recycling and the environment. I think that's the most important thing that we can do as an institution. We can take advantage of the fact that we are teachers and we teach those kids and teenagers..

Q13. Do you see a difference in your carbon footprint when working remotely and inperson?

A13. Oh yes, again, I'm not commuting every day, so my fuel consumption has decreased a lot. What else? Paper. Energy. Because at centro we have a lot of smart boards which consume a lot of energy. Even the fact that students are not there, so paper consumption has decreased. I believe this is going to be interesting. To be honest, I haven't bought shoes in a year. Sometimes I work barefoot and I know fashion pollutes a lot which is interesting and I have noticed.

Q14. Would you be willing to take some of your time to volunteer for a committee dedicated to reducing the company's carbon footprint?

A14. That would be awesome, yeah.

Appendix C.6.5: Transcribed Interviews: Teacher Interview 5

Q1. We can conduct this interview in English or Spanish, which language would you prefer?

A1. English is fine.

Q2. Can we record this interview so we can review the responses at a later date?

A2. Yes, no worries you can do it.

Q3. What are some of the challenges that teaching from home has presented?

A3. Well, in my personal opinion some of my challenges that I have had during this time is the organization of time. Because like, dividing my - lets say - chores at home and the activities I have to perform at centro cultural, I mean that organization is really hard for me. So I think that the most - lets say - complicated part of this working at home is having like a space for working and having your personal space, like the relaxing time. So having like that- lets say - division I would say is really hard for me. Yeah like the challenge I experienced during this time.

Q4. In your role as an educator, have you noticed a difference in the effectiveness of virtual classes with respect to student performance?

A4. I would prefer having like - lets say- face to face classes, Right? But at the same time I have realized that different people from - lets say- places that are far from the great metropolitan area here in Costa Rica are having the opportunity to get access to the service. So I have noticed that people, for example, from the coast - they need to take 4-5 busses to go to the nearest - lets say- institution that Centro has here in Costa Rica. Now they have the opportunity just to connect and practice the language. And I have noticed that these people even with all their limitations are improving little by little because its not the same pace that we usually have in the face to face classes, but they are improving. Now with the same - Lets say - results because when you learn the presencial way you have more control. Okay, so you can control and get feedback, immediate feedback, even if the students were working in groups so you were like a muted person in that session and you could listen to all the people performing and you could address if someone was doing a mistake. But her online, we cannot do that. We cannot divide ourselves like in 3, to go group by group or room by room checking if the students are preforming well or not. So i think that the results are good but they are not like the ones we expected or the ones we had in the face to face class.

Q5. Do you believe that students learn better in traditional class formats or the current format? Why?

A5. In-person. Yes, absolutely. Basically because of the control we had. Right? And you force the students to participate. Especially when you are teaching basic or beginners level - let's say - in beginner level or A1 level- oh my god it's really hard to get them to participate in English because they tend to use Spanish, even to explain questions like "teacher I have a question can I use spanish" and I say "no try to use English." So when I send them to work in groups they participate in spanish. When I - lets say - access the group they switch like "ah yes now the teacher is here, let's do this in English." You see? I mean we have less control over the students than we had before - let's say- in the face to face session.

Q6. After the pandemic, what do you believe is the ideal class format of class? What format would you like to see?

A6. I would really like the hybrid idea because of the reason I explained before. The students who live really far have the opportunity to have access to the service. Right? So we can have this hybrid teaching learning experience. So students who are, for example, from the Great Metropolitan area - they could have the opportunity to go- to attend classes. Right? But also we can continue offering the service for those who don't have like the opportunity to go to an institution, a physical institution. So they could continue learning and getting the opportunity to get involved with the language.

Q7. If it were determined that remote learning greatly reduced the company's carbon footprint, would you be willing to continue teaching remote?

A7. Yeah, I would like. I would like. In the case of my carbon footprint, I have noticed that I have reduced for example, the use of my car. I was the person who carried a lot of things to her job like in my case I was bringing a lot of toys when I was teaching kids, so that implied that I needed to use a lot of plastic bags or I had to buy different materials like paper and plastic or those things we use to decorate the class. Now with the remote learning it would be - well its much easier because I just decorate a powerpoint presentation and I apply different activities and I don't have to spend a lot of money, for example, decorating the class or I don't have to spend my money on my car.

Q8. Before Covid, what method of transportation did you use to get to the CCCN?

A8. Just my car. Yeah, just my car.

Q9. Since Covid began, have you noticed any change in the amount you travel? Please explain.

A9. Of course. I mean before the covid I traveled like 6 days per week using my car. Now I am at home and I don't travel, so imagine the big change that is for me. Yeah, and sometimes I have to go there just to bring books but like - well this year I haven't gone to Centro Institutions. Imagine, and we are in March.

Q10. Do you know of any ways in which the CCCN is trying to reduce its carbon footprint?

A10. Yeah, before Covid 19, in my site we started to implement like different methods, like recycling. We put like different trash cans with posted categories like paper, plastic, metal, and those things. We were using solar panels so the electricity consumption was really reduced in that time. And also we started to - let's say - reuse paper. Like, if we print something and then we don't need that paper, well we continue using that paper on the other side. So, those are the actions that we did before the pandemic started. Now, here everyone is working at home, so I think that everyone has like a special and specific way to - you know - help the environment. Like in my case at home, I live in a rural area so I don't have that problem like getting a lot of trash because everything that we use is reused in other ways.

Q11. Do you know of any environmental problems at the CCCN?

A11. Environmental problems or issues, hmm. That's an interesting question because to be honest I haven't noticed anything. I mean there in some pivotal site that is like the center of the institution, I mean people there have like really good organizations and students were aware of the different - lets say - actions of the impact. So in the different classes we used to teach our students in the face to face, like different methods to take care of the environment. Now online we continue teaching that, let's say the implementation is different. Because before we had the opportunity, to teach the students how to classify the trash. But now here, you know, in the online environment we can continue doing that but we cannot implement that with the kids because each person or in this case each student is in their home, so I think issues - I haven't noticed that because I haven't had the opportunity to go there. But before we had the opportunity to teach and implement, so the students could have like an active participation of the topic they were learning in the case of a preserved environment.

Q12. If there were a fund of money for the Get Green project, where would you like to see it go?

A12. I would say that probably since we are like a non confirmed government

institution - lets say, some of the funds we get are from the enrollment processes, you know, the acquisition of different books. But regarding this area, getting greener lets say, I would say that probably we could have like some campaigns, something like that, like to collect money in order to - you know- get some funds to improve the conditions that centro has currently. I don't know if that makes sense for you?

Q13. Do you see a difference in your carbon footprint when working remotely and in-person?

A13. Well it's really hard because as I told you, I haven't visited my company - lets say- during these three months. But yeah, I have noticed some differences, for example we have reduced the consumption of paper. Right? That's something that teachers use a lot like to have some prints, to have some materials. Also we have reduced the consumption of electricity. We compared before the use of projectors, the use of computers implied a high cost for the institution. Now everyone is working at home. Of course, my consumption at home has increased a little bit, but it's something that is normal when you are working at home. But of course the cost in the institution has been reduced of the electricity, paper, even water consumption because we are working remotely so we have reduced in a significant way the use of these resources.

Q13B. Just to clarify, on a personal level, has your carbon footprint decreased?

A13B. Yeah, Of course, of course, I mean here at home I don't have to be worried about the consumption of paper. Ahh the electricity, well here in Costa Rica we can say electricity is cheap so I don't have to pay a lot of money with the bill. Same with the water. As I told you I live in a rural area so I dont have problems with water. I just open the sink and water is running there and the cost is not high. And the community where I live is so aware of the environmental problems, the beautiful place we have, so we tend to reduce, for example, the consumption of plastic. In my community every month, let's say the company that is in charge of distributing water, collects plastic bottles, cans, or juices that we usually buy. So this company or this group is in charge of collecting different products. At the same time, well I am in that group so every Sunday in the mornings we go and we walk around the community and we pick up all the trash that all of our people left behind during the week. So those are the ways that I am helping my community and I am reducing my carbon footprint.

Q14. Would you be willing to take some of your time to volunteer for a committee dedicated to reducing the company's carbon footprint?

A14. I would like to. The problem is that I do not have time. I would like. I would like. I really like working with those people who are like willing to help the

environment. And As I told you, Every Sunday I take some minutes and I walk with my friends from the water committee, collecting garbage. Right? So I would like to do something similar at Centro, but what's the problem? That we don't have time as teachers and as administrative staff or personnel. So, El Centro demands a lot of time. Evaluating, checking exams, getting the performance of different students and sending reports. So that implies a lot of time. Plus if a person is studying, for example taking a master's degree or taking another course. That implies more time for you like working, studying. So when are you going to be able to help centro with this kind of campaigns. So I think that probably if centro wants to do this, set like a specific date. Right? Like okay guys we are going to be in charge of doing this, but this specific date is only for doing this. Right? So not like first you have to check the exams, then you have to do the lesson plans, you have to send them to check with the coach, and then you have to do the activity for reducing the carbon footprint. I think that is not the way. If centro wants to implement something like this, they should be aware that we need a space, like a specific day. Like okay guys we are going to do this activity only for today and we are going to repeat this every month, for example. So you know that every month you are going to have different students to do the activity and you can forget the other tasks you have to do at Centro.

Appendix D: Carbon Footprint Calculations

Appendix D.1: Data Tables and Distributions

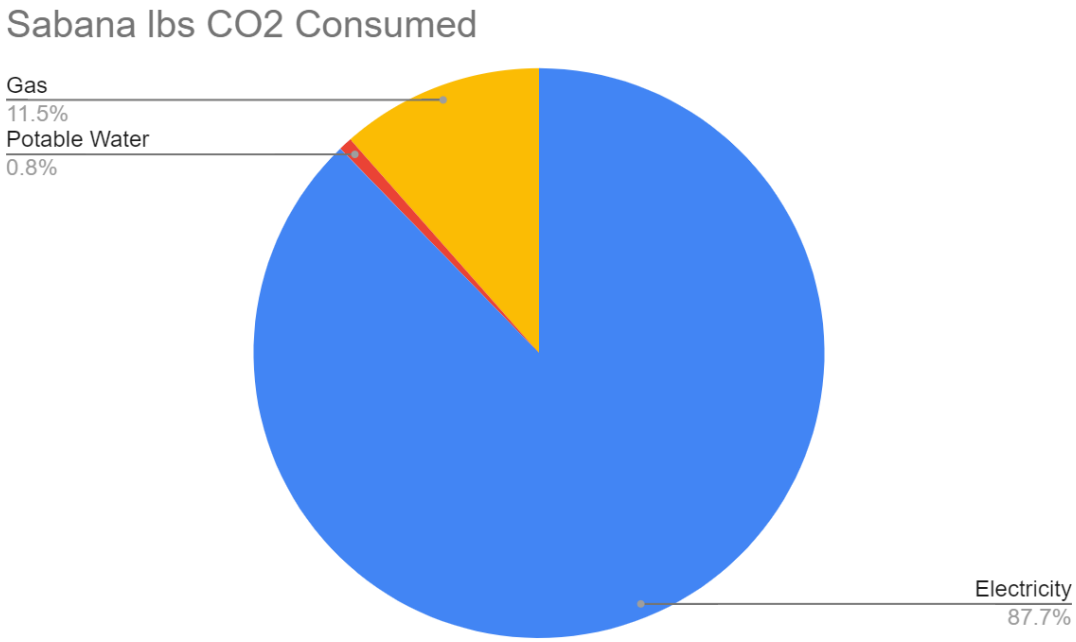
2017 Carbon Footprint Distributions

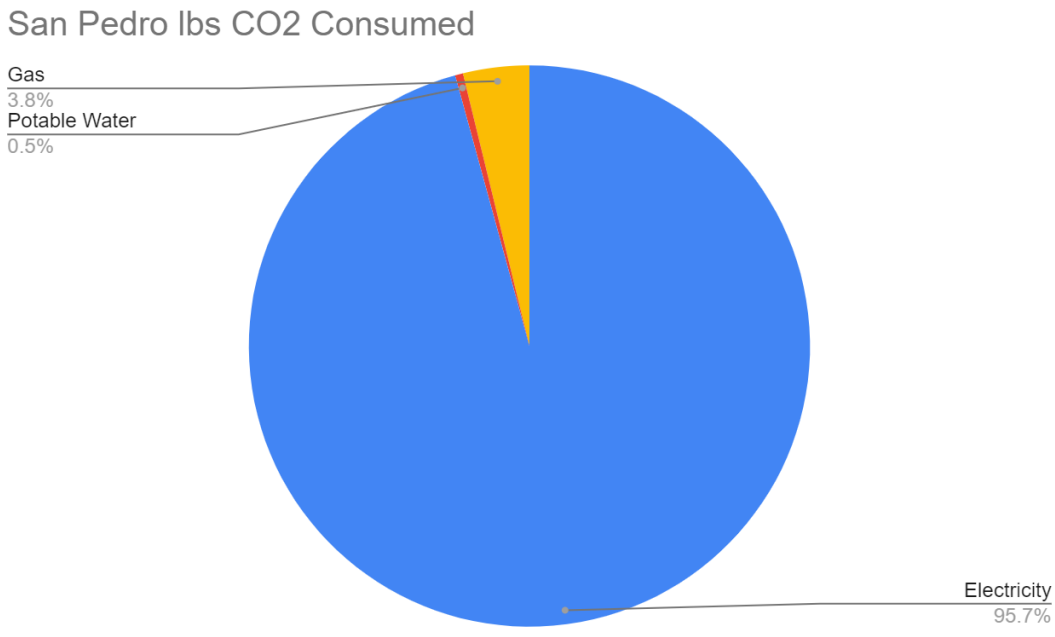
Utility	Location	Amount Consumed (see utility units)	Emission Factor	lbs CO2 Consumed	tons CO2 Consumed
Electricity (KWH)	San Pedro	200080.000	0.998	199759.872	99.880
Electricity (KWH)	Sabana	55080.000	0.998	54991.872	27.496
Potable Water (m^3)	San Pedro	3115.000	0.302	940.823	0.470
Potable Water (m^3)	Sabana	1564.000	0.302	472.375	0.236
Gas (lbs)	San Pedro	2650.000	3.003	7958.207	3.979
Gas (lbs)	Sabana	2400.000	3.003	7207.433	3.604
Diesel (liters)	San Pedro + Sabana	370.000	5.946	2200.128	1.100
			Totals	273530.711	136.765

2020 Carbon Footprint Distributions

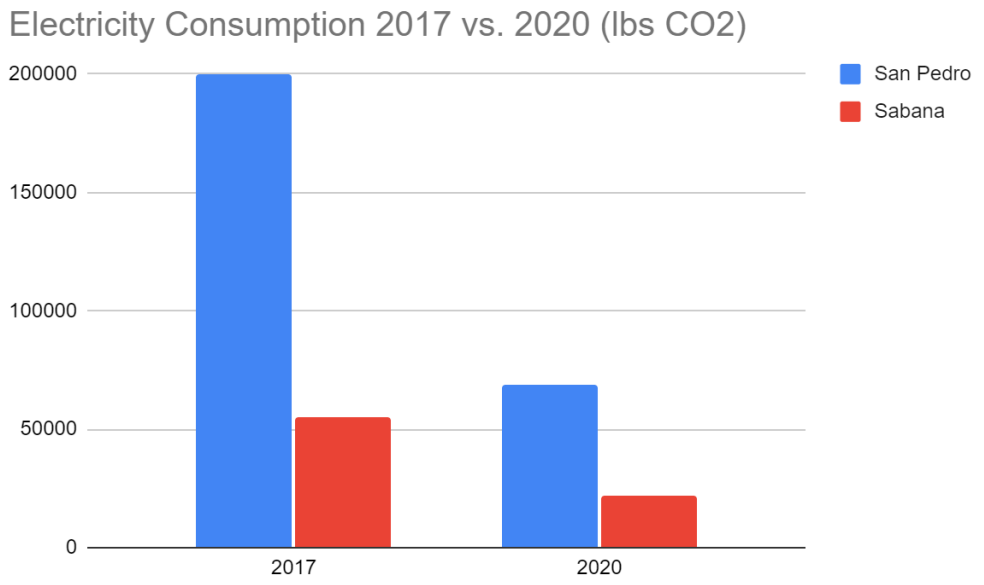
Utility	Location	Amount Consumed (see utility units)	Emission Factor	lbs CO2 Consumed	tons CO2 Consumed
Electricity (KWH)	San Pedro	68640.000	0.998	68530.176	34.265
Electricity (KWH)	Sabana	22260.000	0.998	22224.384	11.112
Potable Water (m^3)	San Pedro	580.000	0.302	175.177	0.088
Potable Water (m^3)	Sabana	578.000	0.302	174.573	0.087
			Totals	91104.311	45.552

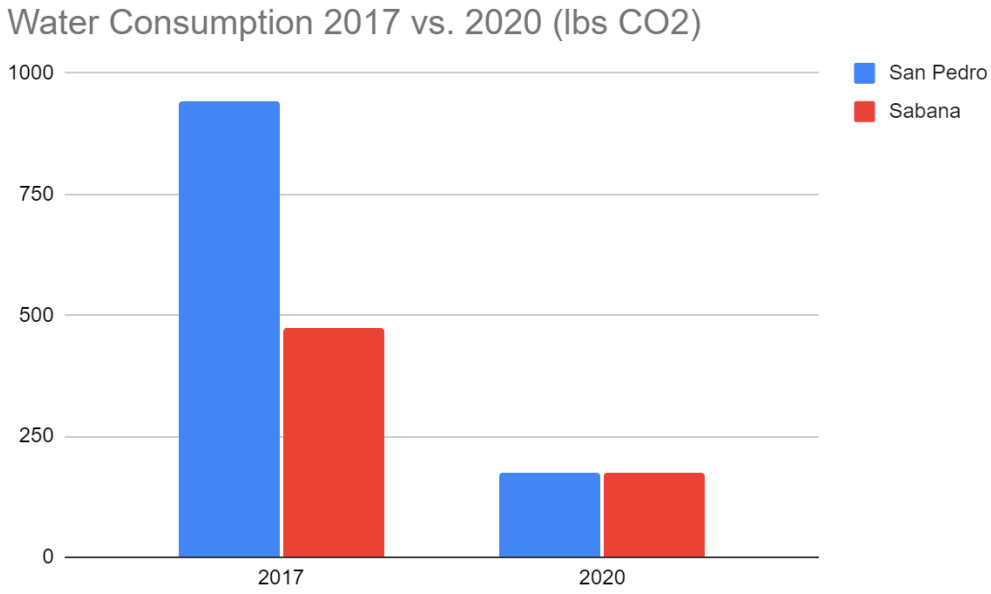
2017 Distributions - Pie Charts



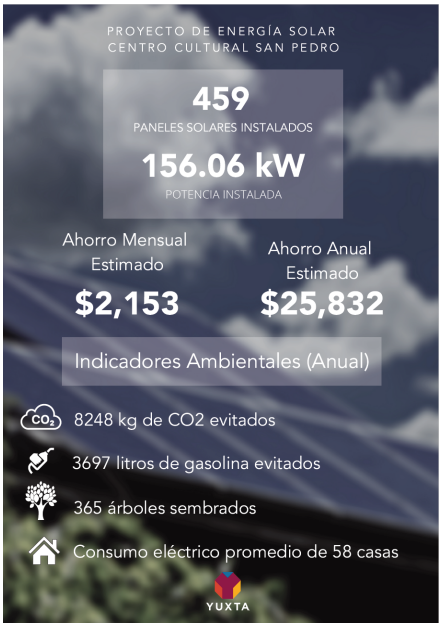


Appendix D.2: Before Versus During Pandemic Comparisons





Appendix D.3: Supplemental Carbon Footprint Information



Appendix E: Carbon Footprint Improvements Recommendations Report

Carbon Footprint Improvements Recommendations Report for the Centro Cultural Costarricense-Norteamericano (CCCN)

March 18, 2021

This Document submitted by: Alexandria Baker, Katelyn Barron, Emily Philbrook and Jonathan Valsamis is a summary of recommendations that the Centro Cultural Costarricense-Norteamericano should follow in order to further improve their carbon footprint.

Increasing the Number of Solar Panels

In both 2017 and 2020, electricity was the highest contributor of the CCCN's carbon emissions. In order to combat some of these emissions the CCCN had previously implemented solar panels. Currently there are 459 solar panels located at the San Pedro campus. It is estimated that each year, these solar panels will offset the electric carbon emissions by 8248 kg or 9.1 tons CO_2. Since these solar panels have such a large impact, our team recommends that more solar panels should be installed.

As of now, San Pedro is the only campus that has solar panels installed. Once the CCCN is able to build their green fund, we recommend that they use a portion of this money to begin installing solar panels at their other campuses. This will allow the offset of an even larger portion of the CCCN's electricity emissions. Our hope for the CCCN is that they can move to 100% solar power within the next few years. By moving to only solar power and implementing other methods to reduce electricity usage, the CCCN should see a major decrease in their electricity and overall emissions.

Water Reduction

A concern many of the students had with the CCCN's environmental practices was the lack of water saving appliances, like the sinks and toilets. For reference, the average modern toilet uses 2-3 gallons per flush (gpf), while many older toilets use as many as 6 gpf (Drinking-Water, 2019). Eco-friendly water saving toilets can limit water usage to about 1.28 gallons per flush or less (How to cut your water use in half - consumer reports, 2015). The average sink has a flow rate of 2-3 gallons per minute (gpm), while water saving sinks can flow at 1.5 gpm with newer technology, like aerators, that lower the amount of water used (Drinking-Water, 2019). Products labeled as WaterSense meet EPA specific criteria to ensure they limit their water flow to an eco-friendly level (Bathroom Faucets, 2020). There are many options on the market for these products, so the following lists out options within different price ranges and levels of water reduction.

- https://us.alteredcompany.com/collections/nozzles
    - Altered Company has a variety of water saving nozzle attachments that can be attached to existing faucets in order to save water without the cost of buying entirely new faucets. They claim 85-98% water savings compared to regular flow taps.
        - $159 USD for a 5 pack of nozzles, $44.90 USD each
    - This company also creates water saving faucets that have 96% water saving compared to regular flow taps. These are far more pricey, but are produced exactly for company like settings
        - $470 USD each
- https://www.americanstandard-us.com/bathroom/bathroom-sink-faucets/colony-pro-single-handle-centerset-bathroom-faucet-05-gpm-25200
    - American Standard is a well known and trusted brand, this faucet in particular is rated at 0.5 gpm maximum flow rate which is significantly lower than average
        - $135.15 USD
- https://www.americanstandard-us.com/bathroom/commercial-toilets/madera-128-gpf-ada-everclean-toilet-with-selectronic-battery-flush-valve-system-21954

    - American Standard also makes reliable toilets. This toilet is rated at 1.28 gpf which is considered eco-friendly, and it is created for a commercial setting. There are many other eco-friendly commercial toilets listed on their website as well.
        - $831 USD
- https://www.us.kohler.com/us/wellcomme-ultra-floor-mounted-top-spud-flushometer-bowl/productDetail/commercial-toilets/1276418.htm?skuId=1276327&brandId=431966
    - Kohler is also a well known and trusted brand. This toilet bowl supports 1.0-1.6 gpf, however the flushometer component is sold separately on their website which tends to be around $800 USD. There are many other eco-friendly commercial toilets listed on their website as well.
        - $162.20

Greywater Recovery System

What is a Greywater Recovery System?:

Greywater is gently used water from your bathroom sinks, showers, tubs and washing machines. This is water that has not been in contact with any feces such as toilet water. It may, however, contain traces of dirt, food, grease, hair and certain household cleaning products (Allen at al., 2018).

A greywater recovery system is tasked with taking greywater and filtering it to then be used for toilet flushing and irrigation. The simplest way of accomplishing this to pump the water directing from the source to the location of intended use. Greywater can also be filtered to prevent particles from entering the system and clogging it(Allen at al., 2018).

Since greywater is water that is being reused, there are a number of guidelines that must be followed to ensure safe use.

- Untreated greywater should not be stored for more than 24 hours. This will result in the nutrients in the water breaking down which creates foul odors(Allen at al., 2018).
- Contact with greywater should be avoided as pathogens that are potentially in the water can cause harm to humans (Renew, 2015).
- The water is not potable and should also not be used as a replacement for clean, safe water.

Benefits of a Greywater Recovery System:

A greywater recovery system is a great addition in the CCCN's plan to minimize their environmental impact. The system allows for the company to reduce their water waste along with benefitting surrounding flora and lowering water and energy bills.

According to the Water Wise Group, the average homeowner with a greywater system saves up to 40,000 gallons of water per year. Installing a similar system at the CCCN will allow for the company to save amounts beyond that value.

The greywater can also be used in an irrigation system at the CCCN. This system would lead directly through the flora surrounding the building and would use only recycled water. This nutrient-filled water helps your plants thrive while reducing the use of sprinklers. Also, during

dry periods, heat waves and droughts, water that was originally disposed of will now be used to keep gardens moist and healthy.

Different Types of Greywater Systems:

There are different types of greywater recovery systems available depending on its intended use. For many homes, a simple system that pipes water directly to the toilet or irrigation is substantial as the total water-use is low. However, for the CCCN, the total water use is much higher than a single family. This results in the need for a much larger system that filters the water, allowing for it to be stored. A number of different systems are available and are highlighted below:

Hydraloop

According to Cosgrove and Hydraloop:

- A single unit is about 4,000 USD. This is relatively pricey, but for a low maintenance filter, it may be worth the price.
- Removes dirt, soap and other pollution from greywater without the use of a filter or chemicals. This ensures that the water system does not become clogged or unhealthy chemicals pollute the water.
- The machine cleans itself every few weeks to ensure that it works to the fullest potential.
- The system can be controlled through a phone app and smart system. This allows for the user to direct the water to specific areas(Cosgrove, 2020).

Aqua2Use

According to Rainharvest Systems and the Water Wise Group:

- Two types of units:
    - One uses gravity to move the water and is priced at 429 USD
    - The other has internal pumps and motors to move the water. It is priced at 729 USD(Water Wise Group, 2021).
- Ideal for single family homes. This may lead to problems if the water-use exceeds the capacity and rate of the system.
- Fully automatic
- It uses filters which may need to be cleaned and can get clogged (Rainharvest Systems, 2021).

Recover

According to Bio-Microbics and ProudGreenHome:

- Pricing is unknown
- Specifically for toilet water use
- Smart System
    - Auto toilet size detection
    - Maintenance reminders

    - Self-cleaning filter
    - Leak detection
    - Triggers away mode if not used within 48 hours (ProudGreenHome, 2021)
- The greywater is run through filters and chlorine is added to decontaminate.
- Clean water is stored in an internal tank
- Automatic draining system prevents overflow
- The water is purged if not used within 48 hours. The system then brings in enough clean water to flush the toilets once (BioMicrobics Inc, 2020).

There are a number of other systems available. These were specifically chosen because they seem like the most viable options to start with until the CCCN is fully committed to a more complex system.

Hybrid Class Format

While a hybrid class format is what fits many of the students' and teachers' needs best, there are ways to go about it that also keep energy and water consumption down. When hybrid classes are in session, having designated days of the week where the building is closed and in a "shut down" state would help lower utility usage. An example of this state would be turning off any energy, water, and fuel sources that are able to be turned off while in shut down. This could also be done over the winter holiday break if it is not done already. We recommend having 2-3 days of the week in "shut down," and 2-3 days functioning as normal.

A remote option would also be feasible since 48% of the 403 students surveyed stated that they would like to continue as remote if possible. This 48% will be fully virtual should they choose to be.

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Appendix E.1: Green Materials Recommendations Report

Green Materials Recommendations Report for the Centro Cultural Costarricense-Norteamericano (CCCN)

March 18, 2021

This Document submitted by: Alexandria Baker, Katelyn Barron, Emily Philbrook and Jonathan Valsamis is a summary of recommendations of different green materials that the Centro Cultural Costarricense-Norteamericano can use in place of current products to further reduce their carbon footprint.

What are green materials?

Green materials are composed of local and renewable resources that consider the impact of the product over its entire life cycle (Dick, 2019). Many products and materials focus on one or two stages of the life cycle. Green materials take into account all 4 stages: introduction, growth, maturity and decline (Das et al., 2019). There are many companies out there that focus on creating vegan, sustainable, plastic-free, recycled, reusable, and zero waste products (EWP Team, 2018). These materials are an important part of creating an environmentally friendly company.

Green products have two basic goals: to reduce waste and maximize resource efficiency. They are certified to have been created using environmentally friendly ingredients and procedures. Green products possess a number of characteristics that make them green. These range from eco-friendly packaging to minimal resource use to a reduced or zero carbon footprint. (Das et al., 2019)

Why switch to green materials?

Green materials have many benefits.

- Positive public image: The CCCN already has a great public image in terms of being environmentally friendly. By introducing more green products to the organization, it will further solidify its green image;
- Cost-effective: Green products are made to last longer than regular products. This reduces the number of times the company must purchase a specific product. Also, these products consume less energy, this reduces the bills of the company (Das et al., 2019);
- Health: Green products are made with safe materials that reduce human exposure to harmful components. Going green has also been linked to an improvement in mental health. This can reduce anxiety and stress, and improve morale of employees (Weiss, 2021); and
- Reduced or zero carbon footprint: The most important benefit of them all. In the quest to achieve carbon neutrality in the CCCN, green products are an essential step. These products are manufactured, used and disposed of with a minimal carbon footprint.

What can the CCCN do to implement green materials?

Paper:

In our interviews with several students and teachers, we learned that the CCCN uses a tremendous amount of paper. One teacher stated that he uses paper for everything in his classroom and would waste a large amount of it. This paper is used in masses and contributes heavily to the CCCN's carbon footprint. Although this isn't reflected in our calculated carbon footprint, it still contributes greatly to the company's total carbon footprint.

With the switch to online classes, this paper use has decreased to a minimal amount. However, this is not a permanent solution. Once classes return to campus, paper will be an issue

again. We propose that the CCCN switches to environmentally-friendly paper products. This paper will be a greener version of regular paper that boasts a smaller carbon footprint and overall environmental impact. There are two types of green paper available, those being recycled paper and FSC certified paper(Cook, 2017).

Recycled Paper:

Recycled paper is created from post-consumer waste rather than wood pulp from trees. This waste consists of old paper products, packaging, notebooks and other paper materials. By using recycled material to create the paper, it has lasting positive environmental impacts. Paper no longer needs to be harvested from trees which creates more carbon sinks, reduces habitat loss and deforestation. According to Green Matters, recycling one ton of paper reduces greenhouse gas emissions by one ton and saves 7,000 gallons of water (Cook, 2017).

Some benefits are:

- Reduces deforestation
- Reduces habitat loss
- Reduces carbon emissions
- Reduces water use
- Reduces energy use
- Creates a positive image in the eyes of the public and employees (Cook, 2017).

FSC Certified Paper:

Forest Stewardship Council (FSC) certified paper is paper that is still produced from trees. However, the FSC certifies that the paper was produced in accordance with guidelines that work to preserve the world's forests. The FSC works to track and improve timber production to ensure forests are managed in a sustainable manner. The council takes into consideration habitat loss, deforestation, and displacement of indigenous people. Although FSC certified paper is not as environmentally friendly as recycled paper, it is still a good step in the right direction (Cook, 2017).

Some benefits are:

- Reduced deforestation
- Reduced habitat loss
- No displacement of indigenous people
- Preservation of forests
- Sustainable
- Environmentally friendly while still preserving the characteristics of traditional paper(Cook, 2017).

Cleaning Supplies:

Another way that the CCCN can implement green products is through green cleaning supplies. Normal products have harmful chemicals that are damaging to humans and the environment. Green cleaning alternatives use less of these chemicals and are mindful of their

environmental impact. These products come in many shapes and forms, and are all environmentally friendly in different ways. Some products are biodegradable, others are made from organic materials or produced through sustainable farming practices. Their productions may also meet a certain environmental and labor standard (Aguirre, 2020). Green cleaning consists of many different products, but they all have one vision in mind: minimize environmental impact.

Compared to traditional cleaning supplies, green cleaning supplies have been proven to tackle messes and germs just as effectively (Watson, 2017). This ensures that performance is not sacrificed at the cost of being eco-friendly.

Many common cleaning products are not green, this includes: windex, comet, pine-sol, glade and pledge (Aguirre, 2020). We propose that the CCCN remove all cleaning products from their campuses and replace them with green products to further improve the organization's carbon footprint.

Commonly Used Product	Green Alternative
Windex	Method, Green Works, Biokleen
Comet	Bon Ami
Pine-sol	Method, Green Works
Glade	Method
Pledge	Method

Most commonly used cleaning products can be replaced by either Method or Clorox Green Works. Both of these companies work with the EPA to create environmentally friendly cleaning supplies. These companies are mindful of their impact and both promise their products are:

- Biodegradable
- Free of animal testing
- Monitored by the EPA
- Made from environmentally friendly ingredients (Alimurung, 2009; Clorox, 2016).

Why switch to green cleaning supplies?

Although a minor part of the CCCN's total environmental impact, cleaning supplies are exposed to the hundreds of people that pass through the halls of the multiple campuses. They play an important role in campus upkeep and are used regularly to ensure that the campus is safe during the pandemic. Cleaning supplies are more important than even before. However, the environmental impact of these products is not usually taken into consideration. By making the switch to green cleaning products, the CCCN would further solidify itself as a leader in environmental change in Costa Rica. It also has a many other benefits:

- Healthier environment - They reduce your exposure to harmful chemicals (Cultivating Capital, 2020). Green products still contain some of these chemicals, but they are in reduced quantities.
- Less expensive - Many name brand cleaning products are more expensive than green cleaning alternatives(Cultivating Capital, 2020). When comparing windex to method, it can be seen that windex is more expensive per fluid ounce.
- Less environmental impact - Green cleaning alternatives are made from naturally derived and safe ingredients that have minimal environmental impact.
- Lower carbon footprint - Green materials have a reduced carbon footprint through their entire life cycle (Das et al., 2019).

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Appendix E.2: Compost Bins Recommendations Report

Compost Bins Recommendations Report for the Centro Cultural Costarricense-Norteamericano (CCCN)

March 18, 2021

This Document submitted by: Alexandria Baker, Katelyn Barron, Emily Philbrook and Jonathan Valsamis is a summary of recommendations that the Centro Cultural Costarricense-Norteamericano may follow in order to implement compost bins.

What are Compost Bins?

Compost bins are an addition to the set of recycling and trash bins located around the school. These bins would specifically be dedicated for composting certain food and yard items to reduce waste (EPA, 2021). This keeps these items out of landfills and reuses them as nutrients for plants inside or surrounding each campus. At WPI, there is a compost bin located at the exit of our food court. Since mostly employees eat on campus, bins can be located in high trafficked areas by employees. This can be break rooms, lounges or other locations where teachers usually eat.

What Can be Composted?

Composting the right items is important. By throwing incorrect items into the compost bin, it can cause immediate and long term problems. This can range from creating a foul odor in the bin to damaging plants that the compost is used for. According to the Environmental Protection Agency (EPA), the following items can be composted:

- Fruits & vegetables
- Eggshells
- Coffee grounds and filters
- Teabags
- Nutshells
- Shredded newspaper
- Cardboard
- Paper
- Yard trimmings
- Grass clippings
- Houseplants
- Leaves
- Sawdust
- Wood chips
- Hair
- Cotton & wool rags (EPA, 2021)

These items fall into 3 different categories: browns, greens and water. Having a balance of all 3 categories is important as each provides important nutrients to your compost. The brown materials provide carbon, the green materials provide nitrogen and the water provides moisture to help break down the organic matter (EPA, 2021).

There are also some items that cannot be composted. These items include:

- Black walnut tree leaves or twigs
- Dairy products
- Meat scraps
- Pesticide-treated yard trimmings
- Disease-ridden plants (EPA, 2021)

How to Compost?

Once the materials are collected in indoor compost bins, they will need to be transferred to an outdoor bin. This is a specific type of bin that allows you to turn the compost pile. Turning the pile is very important as it aerates your supply and allows for the microbes to break down the compost(H. Rhoades, 2021). This happens for a few different reasons, the first being that the compost becomes too compact which leaves no room for air. Turning helps break up the pile and create space for oxygen. Another reason is overheating. When compost sits for too long, certain areas heat up which kills microbes(H. Rhoades, 2021). Turning breaks up hot spots and redistributes them into the center to allow the pile to keep the ideal temperature which ranges from 32 to 60 C(J. Rhoades, 2020).

A compost tumbler should be turned every three to four days, but this can vary depending on several factors. If the decomposition process is slow, there is a pest infestation or a foul odor is coming from the pile, the tumbler may need to be turned more frequently. Once the compost begins to mature, it will need to be turned less frequently(H. Rhoades, 2021).

If the CCCN is open to it, worms are also a great addition to compost bins. They help speed up the process of converting compost to nutrients by consuming their own weight each day(Piccoli, 2020). However, like all other living things, they require more maintenance. These specially made compost bins cannot reach temperatures as high as regular compost bins. Worms can tolerate as high as 35 C. Also these worms can be both overfed and starved (Piccoli, 2020). For the introduction of compost bins to CCCN's campuses, we recommend to start with traditional compost bins. In the future, worm compost bins may be an option.

Unlike many of our other recommendations, the type of compost bins used is less important about the process. Most compost bins on the market are viable options. The bin just needs to be able to hold a lot of material and be ventilated to allow for the compost to breathe. A tumbler also needs to be purchased. The type of tumbler comes down to personal preference as most tumblers are viable options.

Why Add Compost Bins to CCCN's Campuses?

The world has a food waste problem. Millions of pounds of food waste are thrown away each year that are dumped into landfills where they break down and release methane which contributes to global warming (Piccoli, 2020). By eliminating a portion of food waste from these landfills, the CCCN would help lower their contributions to global warming and overall carbon footprint.

Benefits:

- Reduces methane emissions
- Reuses food and yard waste for plant fertilizer
- Reduces the use of chemical fertilizer
- Saves money
- Provides carbon sequestration (EPA, 2020)

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Appendix F: Green Fund Recommendations Report

Green Fund Recommendations Report for the Centro Cultural Costarricense-Norteamericano (CCCN)

March 18, 2021

This Document submitted by: Alexandria Baker, Katelyn Barron, Emily Philbrook and Jonathan Valsamis is a summary of recommendations that the Centro Cultural Costarricense-Norteamericano should follow in order to create a green fund.

What is a Green Fund?

A green fund is a pool of money designated for future environmental sustainability projects aimed at preventing further climate change and other environmental implications (Yu, 2018). The money in the green fund is separate from normal finances and is collected independently. This is beneficial for many reasons. First, it does not divert money that has been set aside for other projects/departments. It allows those raising money for the fund to know that their money will be dedicated to change rather than other expenses. Finally, even if this money isn't used immediately, the fund would allow for new projects to be fueled in the future. Overall, it is favorable to develop a green fund for the CCCN.

How to create a Green Fund:

In order to create an effective Green Fund, the CCCN should focus on three things: raising money, where to allocate their money, and being transparent. Each of these parts are important and complex, and require that they be planned out to maximize their efficiency and effectiveness.

Raising Money:

In order to start a green fund, the CCCN must collect money and dedicate it to a singular purpose. This money can be collected through a number of means:

<u>Green Fees and Donations:</u>

In the past other schools like the University of California, Berkeley have grown their green funds by collecting green fees and donations (Difalco et al., 2018).

Since the CCCN is a nonprofit organization, asking for donations will be better than asking for green fees. The CCCN could grow their green fund by asking for donations from students and CCCN employees every month/semester/year. This amount could simply be a few dollars and would ensure that the green fund always has funds available. These funds could go directly to the green fund or the donors could choose a particular Green Fund project to which their fee would be directed. . This would give more of an incentive to contribute as people could donate to the project that they wish to see implemented on campus.

<u>Campaigning:</u>

The University of California, Berkeley has also grown their green funds through campaigning (Difalco et al., 2018). Campaigning can be directed toward a number of different audiences to educate them on the importance of a green fund and environmental action. Campaigns would be designed targeting specific groups. These groups would be: young students; adult students; employees; and administration. Based on our own experiences, we have determined the most appropriate manner of campaigning to each group.

Young Students:

To campaign to young students we feel that short videos, graphic posters and fundraisers are the best methods. These would engage the students for a short period of time while informing them of useful information pertaining to environmental facts and issues (Marketing Schools, 2020). Fundraisers that reward students for collecting donations from family members for small prizes is very effective and gives students an incentive to "Go Green." For example, the class that collects the most amount of donations could be rewarded with pizza or some other treat.

Adult Students:

To campaign to adult students we feel that TED talks, graphic posters and longer, informational videos are the best methods. We feel that it is reasonable to assume that older students tend to understand the importance of environmental actions more than younger students, so providing them with more information about the environment would give them a bigger incentive to take action (Lister, 2020).

Employees:

To campaign to employees, we feel that work incentives and graphic posters are the best methods. By giving employees reasons to go green that would benefit them in the workplace, they would be more open to taking environmental action. These benefits could be an environmental bonus if they meet certain requirements at home or in the workplace. Also, the positive impact of a green campus could be actively promoted to convince them to take action. Posters around the campuses could also drive the message of change. Informational videos can also be a good method, but would require that time be taken out of their work day to show the videos.

Administration:

To appeal to administrators or administrative personnel we feel that TED talks and longer, informational videos are the best methods. During meetings regarding the green fund and proposed environmental changes on the campus, videos can be shown that highlight the benefits of environmental change. These can be in regard to saving money and general productivity on a green campus.

Campaigning Strategies:

Fundraisers:

In order to raise money for the green fund, green fundraisers would encourage members of the CCCN community to "Go Green" and raise money for the fund to fuel future green projects. These fundraisers can be held multiple times throughout the year as special events to challenge students, employees and administrators to make green changes in their life.

Idea 1:
Tree planting

Challenge students to raise money for the green fund by pledging to plant 10 trees for every 250 dollars raised (the numbers can change). The students can bring home a pamphlet that explains the fundraiser and contact family and friends to make small donations. These donations can go directly to the purchase of the trees while the rest is put into the green fund (Ibrisevic, 2019). Many organizations offer tree seedlings at reduced prices. For example, https://tropicadvisorscostarica.com/plant-a-tree/ offers tree seedlings for $4 per seedling.

Idea 2:
In-class reward

Challenge students to raise money for the green fund by collecting donations from family and friends. The students can take home a pamphlet that explains the fundraiser and use it to collect the money. The class with the most amount of donations after a certain time period wins free pizza in class. This reward doesn't have to be pizza, but it must give students an incentive to try to collect donations.

Idea 3:
Electronic Device Collection

Challenge students to bring in old electronic devices that are no longer being used. Many electronic devices are disposed of incorrectly which can result in harmful chemicals polluting the environment. These electronics can range from phones and tablets, to computers. Once collected, they can be sent to a company that buys old electronic devices and recycles them appropriately. A reward can be set in place for the students/class that brings in the most devices to be recycled (Ibrisevic, 2019).

TED Talks:

TED talks are a great way to convey accurate information to an audience. Such educational videos can be found on youtube and contain a wide variety of information. For example: https://www.youtube.com/watch?v=7Lc_dlVrg5M&ab_channel=TED considers climate change and a country's achievement of carbon neutrality.

Graphic Posters:

Posters can be placed around the school to inform students, employees and administration about carbon neutrality and climate change. These posters can range from "Recycle!" posters to others that explain why carbon neutrality is important. Short, informational, graphic posters will catch the attention of students and keep their concentration long enough to provide valuable information.

Work Incentives/Eco-friendly Employees:

Encouraging employees to "Go Green" can be a bit more challenging than students who can be "bribed" with rewards. There are a number of effective techniques that might be employed to influence employees to become more eco-friendly.

- Create a "green team"

    - A group of employees who are already environmentally conscious. This group can hold meetings that encourage and help other employees/students change their lifestyle habits to reflect a greener life.
- Transportation Benefits
    - For those who do become more green and can prove that they have modified and improved their lifestyle. The CCCN can pay for their transportation to work every Friday or some other scheduled day while they continue to live a green life.
- Leading by example
    - By improving the CCCN with green changes and living green lives at work, employees can be encouraged to change their own lifestyles at home.

Apply for Grants:

The University of California, Berkeley has also grown their green funds through applying for grants (Difalco et al., 2018). A number of grants are available through both the US government and many organizations. Such grants would require an application process and therefore would not be an immediate source of funds. They would, however, be beneficial in the long run once an application is accepted.

https://www.iaf.gov/apply-for-grant/#_grant-criteria
- Inter-American Foundation (IAF)
- No deadline to apply, proposals may be submitted anytime
- Cannot be under $25,000 or over $400,000
- Initial review will take 5 months

https://cr.usembassy.gov/embassy/sanjose/apply-u-s-government-funded-grant/
- US Embassy in Costa Rica
- Grant should be focused on improving the connections between the general public and government (not the best option but as CCCN is a binational organization with ties to the US Embassy it could work)

https://www.gcpf.lu/impact-investment-criteria.html
- Global Climate Partnership Fund
- Supplies financing for energy projects for small and medium-sized businesses
    - Must provide projected energy savings or CO2 reduction of at least 20%
- Typical deals are large ($5 mill - $15 mill), but also offers small scale project funding

https://www.epa.gov/grants/specific-epa-grant-programs
- Multiple different grant opportunities that are highly competitive
- Due dates for grants vary
- Below are 2 that I found that may be applicable
- Air Grants and Funding: includes competitive grant funding announcements for projects and programs relating to air quality, transportation, climate change, indoor air and other related topics.

- Environmental Education Grants: projects to help the public make informed decisions that affect environmental quality.

https://sgp.undp.org/about-us-157/how-to-apply.html
- Free to apply
- SGP grants are made to community-based organizations in recognition of the key role they play as a resource and constituency for environment and development concerns. The maximum grant amount per project is US$50,000, but averages around US$25,000.

https://www.advance-africa.com/Grants-for-NGOs-in-Costa-Rica.html
- Extensive List of Grants for NGOs in Costa Rica

Co-sponsors:

The University of California, Berkeley also grew their green funds through finding cosponsors (Difalco et al., 2018). Co-sponsors can be an excellent source of funding. These can be existing sponsors and/or new sponsors dedicated specifically to the green fund. A proposal for each project/funding's need would be presented to ensure that there is transparency about how the funds are being used.

Currently, the CCCN does not have any co-sponsors. However, in the past, the CCCN has worked with YUXTA energy to install solar panels. These solar panels were a large success and have helped to reduce the CCCN's carbon footprint. The company can pair with YUXTA energy in the future for further solar panel projects for the other campuses.

Allocation of Funds:

Funds from the green fund can be separated into categories based on their intended use. Specified amounts of money can be earmarked solely for each category. This would ensure that a wide range of changes are being made, rather than putting all the money into one program.

Some examples of different programs:

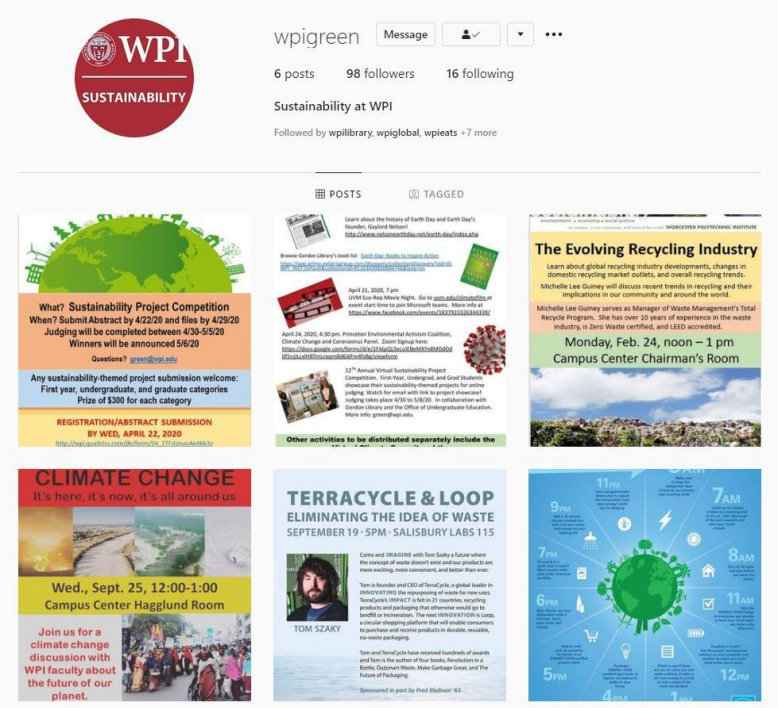
- Carbon footprint reduction program
    - A carbon footprint plan will be outlined once the carbon footprint is calculated and the necessary solutions are determined.
- Recycling campaign/program
    - The recycling program is outlined in another proposal that was made.
    - This program would revamp the recycling program currently on the campuses by creating brand new posters and labels that help students understand the necessity of recycling and going green.
- Green fundraisers
    - Green fundraisers can be held to encourage members of the CCCN community to "Go Green", raise money for the green fund and collect items that can be refurbished or that might otherwise be disposed of improperly, to help improve the environment.

- Campus upkeep
    - A portion of the funds would go to ensuring the campus is as clean as it can be. These funds can be used for garbage clean-up, planting more trees and plants, and any changes/fixes that help keep the campus green.
- Renewable Energy
    - Some of the funds can be allocated to the continuation of the solar panel project. More panels can be placed on every campus until they become 100% reliant on these panels for energy
- Gray Water Recycling System
    - Currently, the CCCN does not have a method of saving excess water. Through the green fund, a system can be created to filter the water that can then be used for toilet flushing and irrigation.
- Switch to green materials/products
- Tree planting program

Transparency

Transparency is an important part of a successful green fund. The allocation of the funds must be known to all those who are donating and putting time into the green fund. This can be done in a number of different ways:

- Instagram page dedicated to “Going Green.”
- Per Semester/Month open meeting that discusses the green changes happening on campus.
- Specific tab on the CCCN website dedicated to the green fund.
- Clear announcements to the public whenever the green fund would be used for a project



Example of a “Go Green” instagram page

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Appendix G: ISO 14001 Recommendations Report

ISO 14001 Certification Recommendations Report for the Centro Cultural Costarricense-Norteamericano (CCCN)

March 18, 2021

This Document submitted by: Alexandria Baker, Katelyn Barron, Emily Philbrook and Jonathan Valsamis is a summary of recommendations that the Centro Cultural Costarricense-Norteamericano should follow in order to obtain their ISO 14001 Carbon Neutral Certification.

What is ISO 14001?

ISO 14001 is a standard for environmental management systems. ISO 14001 has many benefits, including but not limited to: improving resource efficiency; reducing waste; and managing environmental obligations with consistency. Getting ISO 14001 certified is essential for the CCCN, as it is widely considered to be the most important environmental certification (ASQ, 2020). While the certification is broad, it ensures the organization is run so it is environmentally and economically sustainable (NQA, n.d.).

What is Required to Achieve the ISO 14001 Certification?

First, an environmental policy must be established. The environmental policy is a document that lays out the plans for implementation and improvement of the environmental management system. The EMS can be thought of as a database system that is "involved in the monitoring, tracking, summarizing, and reporting environmental information to internal and external stakeholders" (Sroufe, 2003). The environmental policy must be understood by all who work toward maintaining the ISO 14001 standard (International Organization for Standardization, 2004).

Next, the organization must determine their potential and legitimate environmental impacts. These environmental impacts could include the organization's: "emissions to air, releases to water, releases to land, use of raw materials and natural resources, use of energy, [and etc]" (International Organization for Standardization, 2004) . Once these environmental impacts are determined, the organization must look into national, state, and local governmental and environmental requirements with respect to these regulations (International Organization for Standardization, 2004). From there the organization can set objectives and goals to reach these requirements.

After a plan is set, the EMS implementation process can commence. First, a person will be appointed to be the EMS representative. This person will have "defined responsibility and authority for implementing the environmental management system" (International Organization for Standardization, 2004). Once the EMS is implemented all people involved in improving it must be trained in accordance with the ISO 14001 international standard. The reason for the mandated training is that everyone involved has the potential to cause significant environmental impacts. In order to avoid mistakes that could lead to setbacks in the certification process and pollution that could harm the environment, this training is meant to ensure competence in all workers (International Organization for Standardization, 2004). In addition to training, the organization will have to implement a procedure for receiving, documenting and responding to relevant communications from interested parties. They will also have to document all EMS data including procedures to ensure that they are following their environmental policy. Finally, a set of emergency preparedness and response procedures should be put into place (International Organization for Standardization, 2004). This will allow for the quick response to environmental emergencies to prevent environmental damage.

After implementation of the EMS, it is important to keep monitoring the progress of the environmental management system. To do this, environmental factors will be measured frequently, and all data will be documented. This will allow the organization to assess their ability to achieve objectives and targets, and to improve their environmental performance over

time (International Organization for Standardization, 2004). Monitoring environmental impacts further allows for the evaluation of compliance and will allow corrective action and preventive action when noncompliance is found. Furthermore, internal audits will need to be completed in intervals as another method of monitoring progress and a management review will be done when the organization is ready to obtain their certification.

What Steps Can the CCCN Take to Achieve the ISO 14001 Certification?

Now that the CCCN has their carbon footprint estimate they can begin following these steps to obtain their carbon neutral certification:

1) Take the steps recommended to reduce the CCCN's environmental impact;
2) Create an environmental policy;
3) Hire a third-party company to help obtain an accurate and certifiable carbon footprint calculation;
    a) There are several third-party companies which can do this including: Inteco, Carbon Trust, Earth University, SCS Global and Certvalue;
    b) The team determined either SCS Global or Certvalue would be the best, as they could help the CCCN through the entire ISO14001 certification process;
4) From there, the selected third-party company will help the CCCN:
    a) Implement their EMS system;
    b) Set objectives and goals to reach Costa Rica's carbon neutral requirements;
    c) Monitor their progress; and
    d) Do any audits needed for the certification.

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