

8. Carbon Offset Solutions for International Travel Emissions

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Abstract: This paper explores possible carbon offset solutions for the University of Richmond's (UR's) study-abroad travel emissions in pursuit of the University's goal to be carbon neutral by the year 2050. First, our group divided the world into five regions to which UR students travel: Oceania, Asia, Latin America, Europe, and Africa. For the most popular countries in each region, we suggest several carbon offset programs to address this portion of the University's carbon emissions. Then, we created a methodology for evaluating and comparing carbon offset programs around the world including six scoring categories: experience, education, incentive, price, impact, and effectiveness. We evaluated each offset option using a report card grading system on a scale from letter grade A to F. This paper concludes with recommendations for how UR's Office of International Education and Office of Sustainability should proceed with this project, and how our research should be included into the existing study abroad framework at UR.

Introduction

Climate change presents one of the most pressing issues in modern day scientific research. Greenhouse gases play a significant role in shifting global systems. Anthropogenic causes of global warming, including global air travel, have become a major topic of concern because of the life altering changes that could potentially result from a rise in global temperature. Rosenthal (2013) wrote in the *New York Times* that air travel is unknowingly many people's "most serious environmental sin". One person's round trip flight from New York to Europe generates a warming effect that is equivalent to three tons of carbon dioxide added to the atmosphere, so for people who travel by plane, their flights may account for over 75 percent of the emissions they generate in one year (Rosenthal 2013). Air travel currently accounts for about five percent of anthropogenic warming, but this percentage is projected to rise significantly in the future (Rosenthal 2013).

The University of Richmond (UR) has set a goal to be carbon neutral by 2050, recognizing the serious consequences of unchecked carbon emissions and the role they play in global climate change (Calise *et al.* 2008). In pursuit of this goal, President Ayers signed the American College and University President's Climate Commitment and pledged to reduce emissions along with over 600 other institutions. UR also has the goal to reduce carbon emissions 30% from 2008 levels by 2020. Figure 8.1, seen below, shows UR's greenhouse gas emissions profile for the past eight years. This image shows that one of the largest portions of the University's emissions are due to "Study Abroad Air Travel," shown by the turquoise bar. We believe international air travel is a key area of emissions the University of Richmond can address through carbon offset opportunities without significantly changing current UR processes.

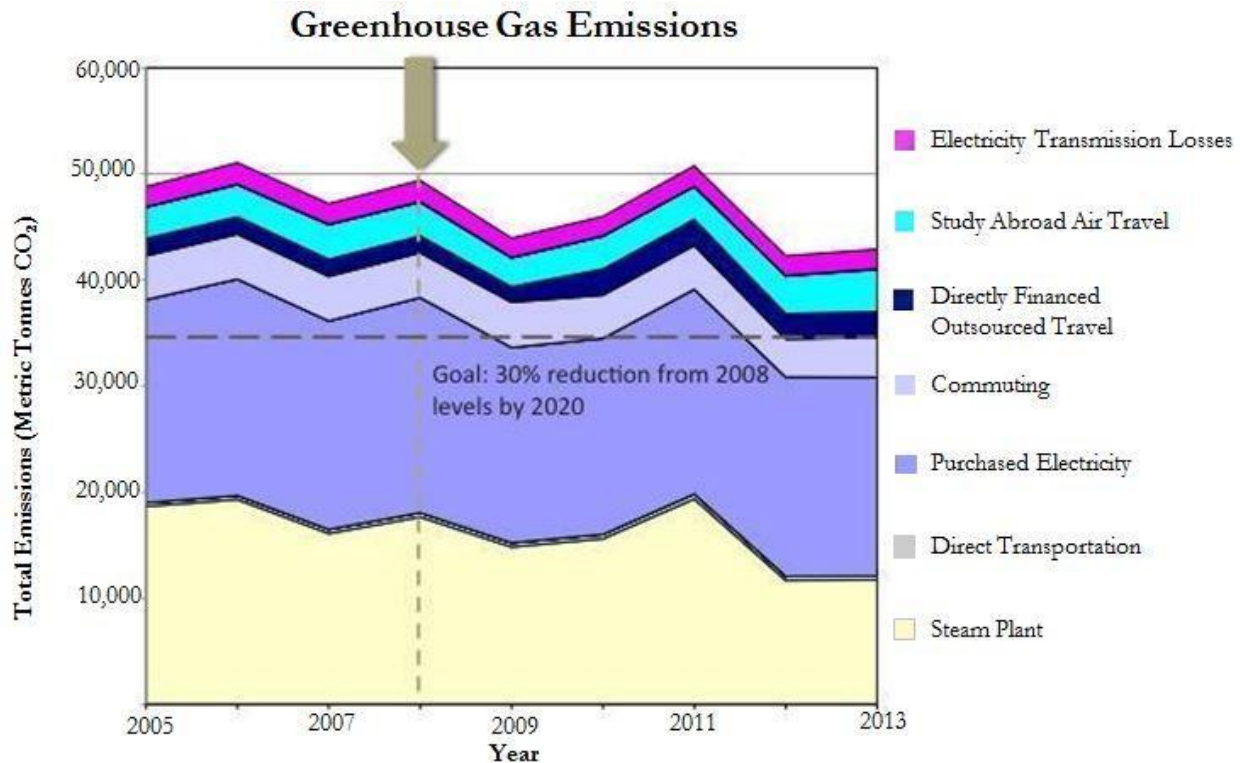


Figure 8.1. University of Richmond greenhouse gas emissions profile for 2013, showing that one of the largest portions of the University's emissions are due to Study Abroad Air Travel (turquoise bar).

Within a ten-year period (academic years 2002-2003 to 2012-2013), the University of Richmond semester long study abroad programs experienced a 96% increase in student participation. In 2007, *Newsweek* magazine recognized UR as the “Hottest School in America” for international studies (Mathews 2007). In academic year 2012, 710 UR students studied abroad in 42 countries. International travel not only exposes students to new cultures, but also increases awareness of environmental issues and climate change (Devine-Wright 2013). While studying abroad has numerous academic and cultural benefits, these programs add significant amounts of carbon dioxide to the atmosphere and thus have negative environmental consequences associated with climate change. Students collectively traveled 6,154,032 miles in academic year 2012, which is the equivalent of approximately 247 trips around the Earth’s equator. These six million plus miles resulted in 6,892,515.84 pounds of carbon dioxide added to the atmosphere, or the equivalent volume of 3,125 Statue of Liberties.

Given this negative impact and the University’s carbon neutral goals, we feel the University of Richmond and UR students should be aware of options to mitigate carbon emissions. One way to compensate for emissions released by air travel is to invest in carbon

capture offset programs. Although some assert carbon offset programs merely sustain environmentally unfriendly behaviors by reducing the guilt that people feel, others have found that carbon offsets are a beneficial option for people who cannot avoid their air travel (Lovell *et al.* 2009). Brouwer and colleagues (2008) found an increasing demand for climate change mitigation action for air travel, as well as an increased willingness to pay more for air travel in an effort to compensate for the environmental damage caused by flights. They found carbon offset programs work to discourage unnecessary, harmful travel practices while simultaneously and effectively generating funds for climate change mitigation and adaptation programs (Brouwer *et al.* 2008).

The following paper designs a methodology for evaluating and comparing carbon offset programs around the world. For the most popular countries to which University of Richmond students travel and study, our group has suggested several carbon offset programs to address this portion of UR's carbon emissions. We conclude with recommendations for the University of Richmond to continue this research and institutionalize carbon offset programs into the culture and practice of UR students studying abroad.

Methodology

In order to assess the quality of various carbon offset programs, we looked to a large body of academic research on carbon emissions and the effectiveness of different carbon offset projects. First, however, we tried to understand the study abroad programs currently in place at the University of Richmond. We examined study abroad data for academic year 2012, provided by the University of Richmond Sustainability Manager, Megan Zanella-Litke, showing the number of students studying abroad and total miles traveled to each country. Utilizing an algorithm for converting miles into carbon dioxide emissions, we designated the top countries where offsets would have the greatest impact in mitigating emissions per region (Blue Sky Model 2008). In this regard, these top countries by region were not always the most traveled to, but they do serve as base points to implement the first round of carbon offset partnerships for the greatest effect.

Second, we created a way to provide a structured method of selecting carbon offset programs across the globe. In order to assess the quality of the various carbon offset programs, we identified the following six criteria on which each program was evaluated: experience,

education, incentive, price, impact, and effectiveness. Using a standard gradient from A to F without modifications (+/-), we compared each program to the expectations of our research and then gave it a corresponding letter grade. The following section describes each criteria and examines the supporting literature in that area.

Experience

One of the most meaningful rewards for study abroad students is the special connection and relationship they form with the people and places they encounter abroad. This reciprocal exchange is often described by a geographic theory entitled distance-place attachment, and provides evidence for why these relationships should be considered in choosing carbon offset programs. Although both empirical and theoretical research has been conducted in the past, synthesizing ideas about place attachment and identity into future research plays a key role in evaluating the relationship between humans and climate change, particularly for an individual traveling around the world. For instance, Devine-Wright (2013) uses and further develops arguments posed by Feitelson (1991) twenty years ago, in which he introduced place attachments at local and global scales for understanding human responses to climate change. Feitelson (1991) concludes, “studies of individual’s attachment to place may provide important inputs for strategies to enhance the prospects for sharing the globe.” In this work, Devine-Wright (2013) recognizes climate change will not only alter the physical character of places, but also their related meanings, identities, and emotional bonds.

Research shows “visitors who resided in neighboring regions were more willing to donate [to energy development projects] than those who lived furthest from the destination,” and “more distant visitors may be less willing to pay because of higher costs, less attachment to the destination where the carbon-offsetting fees would be paid, and not recognizing the full extent of transportation emissions generated during their journeys” (Kelly *et. al.* 2007). A significant correlation also exists between sense of place and community, where both are key in examining how individuals view energy development and how such projects affect a place of shared concern (Boyd 2013). Engagement is viewed as more than simple awareness of an issue, also including care, motivation, willingness to act, and action itself (Scannell and Gifford 2013). Therefore, the level of involvement with the carbon offset program abroad affects the quality of impact the student has towards diminishing their carbon footprint from travel emissions.

Little is known about which factors predict climate change engagement, and what forms of communication are most successful. Nevertheless, trans-local area-based initiatives are emerging and encouraging mobile communities to “think globally, act locally.” For example, Devine-Wright (2013) suggests using initiatives such as Transition Towns Network and Manchester is my Planet to evaluate the tactics and impacts of socio-environmental interventions promoting climate change involvement and behavioral change. Scannell and Gifford (2013) cite specific evidence to support the three most significant predictors of climate change engagement: place attachment, receiving the local message, and gender. Increasing citizen engagement in climate change issues is now an important question among scientists, policymakers, businesses, and nongovernmental organizations because of the carbon intensive and unsustainable nature of individual lifestyle choices or behaviors (Scannell and Gifford 2013). Despite this and the direct relevance between place attachments and identity, especially with climate change adaptation, Devine-Wright (2013) notes a lack of consideration by policymakers for these studies. If we, as a global community, want to rid ourselves of the current climate crisis, everyone must positively engage with their environment and try to alter their harmful behaviors.

Education

Carbon offset programs should include education as another key component. Srinivasamohan and Lee (2010) argue “it may be quite difficult to get student representatives involved on site, in which case local offset programs, spearheaded by a large campus environmental organization, may be a better option,”. However, increased educational opportunities also benefit classes abroad in incorporating the carbon offset program and environmental studies, or a similar field. According to Srinivasamohan and Lee (2010), only 280 out of 686 ACUPCC schools submitted carbon plans as of 2010, and not all included emissions from study abroad. Out of those schools addressing offsetting study abroad emissions, many face complications such as cultural or political resistance by the city or country, lack of control over utilities or information, and the existence of university affiliations within a country (Srinivasamohan and Lee 2010). These are just some of the challenges the University of Richmond may encounter when implementing the chosen carbon offset programs. Nevertheless, Srinivasamohan and Lee (2010) still encourage students and other individuals to explore the potential for carbon offset programs in conjunction with study abroad.

Dvorak *et. al.* (2010) explores two case studies, one between New Zealand and the Cook

Islands, and another between Canada and the United States, both of which succeed in engaging two contradicting goals: a sustainable and international education. This study proposes multiple strategies for international educators and faculty in order to encourage students to learn more about the global climate change problem. One of the most valuable suggestions is to look further into the Forum on Education Abroad, which incorporates environmental and social responsibility into its “Standards of Good Practice for Education Abroad,” and possibly become a member of this non-profit association (Dvorak *et. al.* 2010). This association publishes multiple studies on the importance of a valuable education during a study abroad experience, including “A Guide to Outcomes Assessment in Education Abroad,” (Forum on Education Abroad 2010). Many similar studies demonstrate direct experience with a problem, such as climate change, is a crucial motivator for students to learn more about the problem and attempt to address it (Dvorak *et. al.* 2010). Tarrant *et. al.* (2012) examines the significance of a short-term study abroad experience, as this is the fastest growing area of international education and has potential for influencing global citizenship. Overall, results show participation in an educational travel program significantly increases environmental citizenship (Tarrant *et. al.* 2012). Therefore, the University should consider incorporating education when implementing carbon offset programs with the various study abroad destinations.

Incentive

Incentives represent an important part of changing behavior towards being more environmentally friendly, and thus should be incorporated into carbon offset programs in order to achieve maximum participation in the program. For example, De Young (1993) explains incentives are one way to change behavior for the long term, minimizing the need to repeatedly convince people of the need to act in a certain way or participate in an environmental program. He recommends ensuring there are positive incentives to encourage people to participate in environmentally beneficial programs to maximize program participation (De Young 1993). Paul Stern (2002) also argues that changing the “material incentive structure of behavior by providing monetary and other types of rewards” is one of the major factors that “determine environmentally significant behaviors and that can effectively alter them” (pg. #). Gardner and Stern (1996) found that most effective behavior change programs were those that included incentives, along with other behavior change strategies. For example, Stern warns one must be careful when using incentives, because sometimes incentives alone are not sufficient to change

behavior or motivate people to participate in an environmental program. He says, “financial incentives may favor behaviors that nevertheless do not occur unless information makes individuals aware that the incentive is available” (Stern 1999, pg. #). Stern (2002) found incentives, along with information dispersal, are necessary to change behavior.

Therefore, proper incentives should be available to encourage students to participate in the carbon offset program for study abroad. For example, Richmond should make it very clear to the students the direct benefits their participation will have. Middlebury College has also taken a unique approach to incentives by providing a free pint of Ben and Jerry’s ice cream to all students who participate in their study abroad carbon offset program (Carbon Offset Program 2014). Richmond could make similar efforts to provide material benefits to students who participate in their program.

Price

The price of a study abroad carbon offset program is one of the key factors that will influence student participation. Diekmann (2003) found participation in programs diminishes with increasing costs. He concludes, “environmental concern influences environmental behavior primarily in situations and under conditions connected with low costs and little inconvenience for individual actors” (Diekmann 2003, pg. #). Ensuring the study abroad carbon offset program is financially possible for students will be necessary. If the program costs are too high, many students will be unable to participate. Therefore, in order to maximize student participation, minimizing costs for students is essential.

The price of offsetting a study abroad flight greatly varies depending on the country to which the student is traveling. For example, offsetting the carbon for a flight from Richmond to Mexico costs approximately ten dollars, while offsetting a flight from Richmond to South Africa or Australia can cost more than 75 dollars according to TerraPass, a reputable American-run carbon offset program. Carbon prices constantly fluctuate, so UR and its students should understand that the prices to offset a flight may vary from year to year. Finding cost-appropriate programs for each country is necessary.

Impact

The impact of a study abroad carbon offset program includes all the social, economic and environmental changes produced by students’ participation. For example, carbon offset programs

implementing improved stoves that burn wood instead of coal are capable of significantly reducing fuel consumption while improving human health and indoor air quality (Smith 1999). Afforestation projects also significantly reduce logging pressures on native forest reserves while providing opportunities for future local livelihoods through ecotourism and environmental resource protection (Satyanarayana 2008). Currently, however, carbon offsetting only increases global wealth and power disparities (Satyanarayana 2008). Those organizations that support carbon trading also stand to benefit by continued access to pollution rights. Additionally, private businesses procure potentially lucrative financial commodities with compelling social or ecological narratives (Lovell *et. al.* 2009). Finally, carbon offset programs have the potential to not only mitigate the effects of climate change, but to contribute to the growth of surrounding communities. Therefore, we looked to recommend programs that had these additional benefits of alleviating poverty, creating ecosystems, and providing jobs.

Effectiveness

While carbon offset programs have limited potential to reduce greenhouse gas emissions, they remain a viable option for accounting for carbon emissions from study abroad flights and reducing the effects of such carbon additions. Different types of programs use varying methods to offset the carbon that is entering the atmosphere, each with its own benefits and drawbacks. For example, tree planting, the most popular type of carbon offset in the world, is also the least effective for mitigating climate change (Brand 2003). The evidence indicates offsets from renewable energy are best, followed by energy efficiency projects, with forestry ranked least effective. Part of the reason offset companies market forestry projects is because of the symbolism of trees. “We have been using trees as the imagery of environmental conservation forever, and trying to re-educate consumers to understand methane flaring is too hard” (Brand 2003, pg. #). In selecting the carbon offset programs, we looked for programs that would maximize effectiveness and take the most carbon out of the atmosphere. The money students contribute should be most effective in mitigating or removing carbon from the atmosphere.

Recommended Carbon Offset Programs

We designated the top countries in five world regions where offsets would have the greatest impact in mitigating emissions. During our research, we looked for study abroad programs that already incorporated carbon offsets into their materials, activities, and coursework.

From the limited perspective of admission websites, we were unsuccessful in finding a single program that offered carbon offsets. Therefore, in each region, we describe several carbon offset programs from third party operators. Included are our grades for each recommended option, based on our understanding of the programs' operations and on our report card criteria.

Oceania

Twenty-five students studied abroad in Australia in 2013, making it the fourth most popular country to which University of Richmond students traveled. A flight to Australia is also one of the longest, most carbon intensive study abroad flights from Richmond, VA. Therefore, UR must examine carbon offset options in Australia to reach carbon neutrality. The majority of students traveling to Australia use the Australian Pacific airline Qantas, so we recommend encouraging students to fly using Qantas' carbon neutral option. This program is certified and independently verified under the Australian Government's National Carbon Offset Standard Carbon Neutral Program, and works with providers such as Climate Friendly (Fly Carbon Neutral 2014). Climate Friendly is one of the founding members of the International Carbon Reduction and Offset Alliance, and is well-respected globally for its success with carbon offsets (Fly Carbon Neutral 2014). Alternatively, students may wish to work with Climate Friendly individually without going through their airline provider. Climate Friendly offers pre-made packages for purchase depending on the amount of carbon the individual wants to offset (Climate Friendly 2014). They also offer a list of projects, some of which are in Australia, and a project locator for individuals that wish to get involved in offsetting their carbon (Climate Friendly 2014).

Carbon Neutral is another reputable offset provider in Australia that offers individuals the opportunity to donate money spent planting native trees and working towards biodiversity conservation (Carbon Neutral 2014). Carbon Neutral plans planting projects every year for which they welcome assistance throughout Australia (Carbon Neutral 2014). In rating this program using our report card scheme, Carbon Neutral receives a B grade overall, with the following grade breakdowns for each criteria (Table 8.1). Due to the possibility of students taking part in their tree planting projects, this program receives an A in the experience category. There is the opportunity at most Australian universities to take classes focused on the environment, but none specifically incorporate this program into the curriculum. Therefore, this

program receives a C for the education category. The program does not provide an incentive for students to participate other than the good feeling students get from helping out, so we gave this program a D for the incentive category. In order to offset the price for one round trip flight from Richmond to Australia, Carbon Neutral recommends a donation of the equivalent of \$166.75 USD to plant enough trees to capture 5.5 tons of carbon dioxide. While this is expensive, flights to Australia are very carbon intensive. Therefore, we gave this program a C in the price category. Carbon Neutral’s programs appear highly effective with a large impact in mitigating climate change, so we gave this program an A in the effectiveness and impact categories. Their trees are legally protected for up to 100 years, and they sequester tons of carbon dioxide while also reducing soil erosion, improving biodiversity, and creating habitat for native animals.

Table 8.1. Grades for each criteria for Carbon Neutral (Australia); Overall Grade B

Country	Program	Experience	Education	Incentive	Price	Effectiveness	Impact
Australia	Carbon Neutral	A	C	D	C	A	A

Asia

China is not one of Richmond’s largest study abroad locations with only 9 students studying abroad there in 2013. However, China is an up-and-coming country and study abroad in China is expected to grow in the future. One report found over 14,887 Americans studied in China in 2011-2012, which was a 2% increase from the previous year (Foreign Students 2013). Therefore, considering carbon offset projects in China is important for the University of Richmond.

Native Energy is one offset provider to which students could contribute with several wind farms throughout China (Your Climate Solutions Expert 2014). These programs aim to generate renewable electricity while also increasing local incomes and job opportunities for the communities (Your Climate Solutions Expert 2014). These programs are validated under the Verified Carbon Standard, and demonstrate financial additionality according to the UNFCCC definitions (Your Climate Solutions Expert 2014).

Overall, Native Energy’s programs received a C grade, with the following grade breakdowns for each criteria (Table 8.2). There is no opportunity for students to give their time

or to get hands-on experience with these programs, nor is there an educational component to them. Therefore, Native Energy received an F grade for the experience and education categories. There is also no incentive other than students knowing they contributed to a beneficial cause, so this program got a D in the incentive category. Offsetting a round trip flight from Richmond to China with Native Energy costs \$294 USD. Although it is a very long, carbon intensive flight, this is expensive. Therefore, this program got a C in the price category. We gave this program A grades for the effectiveness and impact categories. This program decreases greenhouse gas emissions from fossil-fuel powered plants while supplying zero-emitting renewable energy, provides over 30 permanent job opportunities in the local communities, and contributes to the social and economic development of these regions of China.

Table 8.2. Grades for each criteria for Native Energy (China); Overall Grade C

Country	Program	Experience	Education	Incentive	Price	Effectiveness	Impact
China	Native Energy	F	F	D	C	A	A

Latin America

Argentina is the most popular study abroad location in Latin America that is individually visited by students, with nineteen having participated in academic year 2012. In addition to being the largest Spanish-speaking country in Latin America, Argentina also has a unique physical geography with four topographic regions: 1) subtropical woodlands and swamps in the north; 2) temperate region surrounding Buenos Aires in the east; 3) semi-arid and cold Patagonian Plateau in the far south; and 4) Andes Mountains in the west (“Geography of Argentina” 2014). This diverse landscape offers a wide range of locations for carbon offset programs. World Land Trust, an international conservation charity based in the United Kingdom, has developed the Misiones Rainforest Corridor project, which facilitates the creation of a wildlife corridor connecting three Guaraní communities in the north (Misiones Rainforest Corridor 2014). Students’ participation in this program helps protect 9,301 acres of land in a nature reserve through donations on the organization’s website (Misiones Rainforest Corridor 2014).

World Land Trust’s project in Argentina received an overall grade of B, with the following grade breakdowns for each criteria (Table 8.3). This project received an A for its price

component. Individuals are able to donate any amount of their choosing, making this program affordable and manageable for price. In all of the remaining categories, including experience, education, incentive, effectiveness, and impact, this program received a B. While World Land Trust's project does have the means to provide a meaningful experience and valuable education for students, it does not directly enforce any place-attachment or education component through participation. Students would have to seek this opportunity on their own. Additionally, this project would provide donors with a personalized Certificate of Appreciation if they give \$42 or more, giving students a mild incentive (Misiones Rainforest Corridor 2014). According to the project profile, 9,301 acres (3.764 hectares) of tropical broad-leaf forests should have been protected within the Yaboti Biosphere Reserve by April 2012, although no details of the project's completion are indicated (Misiones Rainforest Corridor 2014). In addition to a continuation of conservation and preservation, this project works to protect 45 mammal species, 293 bird species, 124 amphibian species, and 222 fish species (Misiones Rainforest Corridor 2014). These are only some examples of the project's environmental and cultural benefits, as well as its magnitude and importance, which is the reason why the project received a higher grade for both impact and effectiveness.

Mexico is another country for which UR should consider starting a carbon offset program partnership. The country's highly diverse geography, consisting of rugged mountains, deserts, and low coastal plains, allows for the development of a variety of carbon offset projects ("Geography of Mexico" 2014). We recommend MyClimate's sustainable, energy efficient, water-saving, purification project for low-income urban homes in Mexico (2014). This project aims to reduce 3,250,000 metric tons of carbon dioxide over a ten-year period, beginning in 2012. Based in Switzerland, MyClimate is "one of the world's leading providers of voluntary carbon offsetting measures," offering a "comprehensive range of sustainability consulting and uses climate education projects to sensitise people to climate change and climate protection," ("Portrait: About myclimate" 2014, pg. #). Using MyClimate's website, a student can individually offset their flight, vehicle, household, cruise, or event emissions by providing basic travel information (2014). The University of Richmond, as opposed to only an individual student, can also provide a collective donation or offset a specific amount of CO₂ emissions based on the number of students traveling there and for their length of stay. Although donations do not necessarily directly help a project in Mexico, students can contact project managers in

order to learn more about and assist with the project during their time abroad.

MyClimate's project in Mexico received an overall grade of B, with the following grade breakdowns for each criteria (Table 8.3). The lowest grade was an F for price because any donations that go towards MyClimate are not necessarily contributing to the completion of a project of the student's choice. This project also received a C for both experience and incentive. The distance-place attachment theory is not adequately addressed here, and students cannot receive a worthwhile experience, because this project spans across the entirety of Mexico. It also does not provide any type of incentive after donating to offset their carbon emissions. MyClimate receives A's in effectiveness, education, and impact because this project allows students to gain knowledge about various topics, and the project's aim and accomplishments are clearly defined. According to its profile, this project has already trained 500 female plumbers and received positive feedback from households with the new technology installations ("Portrait: About myclimate" 2014).

A second carbon offset program option in Mexico is the World Land Trust's Biodiversity of Sierra Gorda project, which aims to "permanently protect the biodiversity of Sierra Gorda by purchasing areas of threatened habitat still under private ownership and create wildlife reserves," ("Biodiversity of Sierra Gorda" 2014, #). By partnering with the Biodiversity of Sierra Gorda, World Land Trust enables the purchase of multiple reserves within this region, as well as the continuation of fundraising for similar wildlife habitat protection projects ("Biodiversity of Sierra Gorda" 2014). The Sierra Gorda Biosphere Reserve stretches across 946,000 acres of land and consists of over fifteen types of vegetation ("Biodiversity of Sierra Gorda" 2014). Student contributions result in the purchase of their own acre of land in this reserve.

If UR seeks additional carbon offset programs in other Latin American countries, our research suggests looking into projects in the next most popular study abroad locations on the continent: Chile or Peru. Chile contains a very similar geography to Argentina, offering a wide range of landscapes for the development of carbon offset programs. Patagonia Sur is a "preeminent sustainable development company that invests in, protects, and enhances scenically remarkable and ecologically valuable ecosystems in Chilean Patagonia," ("Who We Are & What We Do" 2014, #). Valle California Reforestation is one of Patagonia Sur's ongoing carbon projects. Individuals who wish to offset their carbon dioxide emissions may do so by donating to select a native tree species they wish to reforest. Students then receive an offset certificate.

According to Patagonia Sur’s “Carbon Offset FAQ & Glossary,” each native tree planted in the Palena Province of Chilean Patagonia is expected to sequester 0.49 tons of carbon dioxide over its lifetime (Patagonia Sur 2014). Another carbon offset project to consider is MyClimate’s energy efficiency, fan-installation, and brick-production project in Peru. This gold-standard, VER (Voluntary, or Verified, Emissions Reductions)-intended project aims to reduce 60,000-80,000 metric tons of carbon dioxide per year over a ten-year period, beginning in 2014 (“Energy Efficiency helps Brick Producers in Peru” 2014).

Table 8.3. Grades for each criteria for MyClimate (Mexico) and World Land Trust (Argentina); Overall Grade B, for each.

Country	Program	Experience	Education	Incentive	Price	Effectiveness	Impact
Mexico	MyClimate	C	A	C	F	B	A
Argentina	World Land Trust	B	B	B	A	B	B

Europe

Europe includes the countries to which most University of Richmond students travel during their study abroad experience, with Spain, Italy, and the United Kingdom at the top of that list. Although Spain and Italy are the most popular and emit the most carbon dioxide into the atmosphere, these countries offer the least opportunity for local carbon offset programs. The United Kingdom, on the other hand, appears to be a leading carbon offset company provider. However, most of the projects are located in Asia, Latin America, and Africa. Due to the difficulties in finding any reputable local carbon offset projects, the best options for students studying abroad throughout Europe may be paying an additional flat fee when purchasing a flight ticket, which would be added to the University’s revolving fund or to another carbon offset program of their choosing.

Spain was the most popular study abroad destination during the academic year 2012-2013, with a total of 118 UR students participating. One carbon offset project in Spain is ZeroCO₂.NO, a Norway-based, independent, not-for-profit foundation “working for zero emission solutions to the global climate challenge,” (“About Zero” 2014). They offer the

Compostilla Carbon Capture and Sequestration project in Northwestern Spain, which is a large-scale research and development pilot storage site with the goal of generating a risk assessment model related to deep geological carbon dioxide storage in aquifers (“About Zero” 2014). This site is monitored by two larger corporations, the Fundación Ciudad de la Energía (CUIDEN) and Endesa. CUIDEN is the “leading public developer of CO₂ capture, transport and geological storage technologies in Spain,” while Endesa is Spain’s leading electrical utility and one of Spain’s main gas suppliers (ZeroCO₂.NO “CUIDEN” 2014, pg. #; Endesa “Who we are” 2011). CUIDEN’s technology development center for carbon capture in Spain is testing injection and monitoring techniques for supercritical CO₂ in the underground structure at Hontomín (ZeroCO₂.NO “CUIDEN” 2014). Student contributions help advance public research initiatives while they learn about the EU’s European Energy Programme for Recovery (PEER) and how a carbonate saline aquifer functions.

Overall, Spain’s carbon offset program received a C grade, with the following grade breakdowns for each criteria (Table 8.4). ZeroCO₂.NO received an F for the education and price criteria because it lacks any possibility to create an academic component and does not offer a direct means for students to pay a fee. Because the projects are located in Northwestern Spain, and therefore not within a reasonable distance to the main study abroad cities of Barcelona and Madrid, the program was also given a low grade of C for Experience. Additionally, there are no direct incentives affiliated with this program. For effectiveness and impact, ZeroCO₂.NO received B grades because carbon capture and sequestration projects generally provide a lot of potential for mitigating carbon emissions.

The second most popular study abroad destination during the academic year 2012 was Italy, with 78 students participating. One project in Porto Tolle, Italy, is led by Enel and their partner company Aker Clean Carbon. Enel is Italy’s largest power company and a “leading integrated player in the power and gas markets of Europe and Latin America, operating in 40 countries across four continents, overseeing power generation, and distributing electricity and gas through a network spanning 1.9 million km to serve around 61 million customers,” (“About us” 2013, #). The project profile identifies the fate of carbon dioxide in the development of a 120 kilometer pipeline to offshore saline formation in the Adriatic Sea (“Porto Tolle Fact Sheet: Carbon Dioxide Capture and Storage Project” 2014). Although they are currently experiencing permit and legislation issues, the project’s permitting process is expected to be finalized within

2014 and the project's continuation is set for 2016.

Enel and Aker Clean Carbon's Porto Tolle carbon capture and sequestration project received an overall grade of a C, with the following grade breakdowns for each criteria (Table 8.3). This carbon offset program received an F for its education component because it lacks any indication for a student to learn about carbon capture and sequestration. Additionally, the project received a generous C grade for experience, incentive and price because it falls short on all three categories. The company profile does not provide adequate explanation as to how an interested individual may become involved, if possible, through giving donations or helping on-site. Moreover, the project is located very far from any major study abroad city in Italy, which disregards the importance of distance-place attachment. Finally, effectiveness and impact were given a B grade because, like the carbon offset project in Spain, this project will undoubtedly improve upon mitigating the region's carbon dioxide emissions through carbon capture and sequestration.

Another carbon offset project in Italy is LifeGate's Impatto Zero initiative. Unfortunately, the company website is written entirely in Italian and it was difficult for us to fully understand the company description, objectives, and long-term goals. However, this project works to reduce and offset carbon dioxide emissions by the protection of forests, the development of energy efficient projects, the production of renewable energy, and reforestation and afforestation efforts (LifeGate 2014). UR would benefit from further exploring this company as a possible carbon offset program.

The United Kingdom is the third most popular study abroad location overall, with 70 students having participated during the 2012-2013 academic year. Based on the large number of results revealed during a simple online search for carbon offset programs in the UK, this country is a leader in this field, especially compared to Spain and Italy. Out of all the carbon offset programs we found in the United Kingdom, one of the best is The Carbon Neutral Company, a "world-leading provider of solutions to businesses reducing their environmental impacts," (The Carbon Neutral Company "About us" 2014). Through a Carbon Sourcing team, this company offers businesses a wide variety of carbon offset purchasing options, including VERs, CERs, and Gold Standard verified carbon credits ("Carbon offsets-Project portfolios" 2014). Projects involve anything from energy efficiency, cookstoves, and hydropower, to reforestation, methane capture, and agricultural methane biogas ("Carbon offsets-Project portfolios" 2014). The only

shortcoming with this carbon offset program is the project locations, which are in North America, South America, Europe (Turkey), Asia, and Africa. Nevertheless, the University of Richmond should still consider this as a reputable opportunity with which students may participate.

Another United Kingdom-based carbon offset program is Carbon Footprint Ltd.’s Tree Planting project, which offsets carbon through the retirement of credits from a Verified Carbon Standard (VCS) clean energy project. This program is “committed to the environment, to quality, to learning, and leading in carbon offsetting,” (Carbon Footprint Ltd. “About us” 2014). They work with tree planting partners in order to offer individuals and organizations a chance to plant native British broad-leafed trees in any region of the UK (“UK Tree Planting” 2014). They also provide a carefully organized map on the website that distinguishes the twelve UK regions, and specific cities within each region (“UK Tree Planting Regions” 2014). Individuals or organizations simply click on “Start Planting” to specify an amount they would like to donate, and then are automatically incorporated into the “Tree Buddying” system. Through this system, donors are guaranteed their carbon offsetting is fully verified, meets international standards, meets BSI’s PAS 2060 specification on carbon neutrality, meets the Carbon Footprint Standard, and continues to take additional carbon dioxide out of the atmosphere during the tree’s lifetime, all of which is described in further detail on the project page (“UK Tree Planting” 2014).

Table 8.4. Grades for each criteria for ZeroCO₂.NO (Spain) and Enel and Aker Clean Carbon (Italy); Overall Grade C, for each.

Country	Program	Experience	Education	Incentive	Price	Effectiveness	Impact
Spain	ZeroCO ₂ .NO	C	F	C	F	B	B
Italy	Enel and Aker Clean Carbon	C	F	C	C	B	B

Africa

While few students study abroad in African nations, the carbon offset programs here have some of the best features and the highest quality services. African nations are among the most

vulnerable to climate change effects, and many of the programs not only offset students' travel carbon emissions but also create mitigation projects to combat future impacts. Below, we have included brief details of the best programs available as well as their strengths and weaknesses.

South Africa is the most popular country on the African continent to which Richmond students travel to study abroad. We recommend a local organization based out of Johannesburg entitled Credible Carbon, which is completely run from South Africa. Credible Carbon not only offsets carbon emissions, but also ensures all projects make a direct contribution to poverty alleviation (Credible Carbon 2014). Projects such as Welbedacht support the installation of solar water heaters, compact fluorescent lighting, a cooking option using LP Gas, solar cookers and/or gel fuel, and electricity generation for poverty housing in the region (Credible Carbon 2014). At the same time, they sequester 86 tons of carbon dioxide (Credible Carbon 2014). Critical Carbon receives an A in almost every category for their impressive work in South Africa (Table 8.5). The one critique is the lack of opportunity for student engagement with the projects. Students can work with the company, visit the sites, and speak to the people who are impacted. However, they do not have the skills to work the actual sequestration process. Yet, Critical Carbon does offer a lifetime partnership encouraging close and ongoing relationships between students and beneficiaries in the belief that these relationships can be more valuable than a financial contribution (Credible Carbon 2014). Therefore, in the Experience category, this program received a B grade, resulting in an overall grade of a strong A.

Another organization based out of South Africa is Food & Trees for Africa (FTFA), the first (and only) South African social enterprise that develops, promotes, and facilitates greening, climate change action, food security and sustainable natural resource use and management. Another locally managed team, FTFA has received multiple celebrity endorsements, sponsorships, and has been published in many magazines praising the community development work as well as the climate change actions coming out of the organization ("About Us" 2014). The opportunity to work directly with FTFA resulted in an A grade for Experience. However, their education, effectiveness, and price grades resulted in the overall grade of a B. They lack any information about climate on their website, only offer tree planting as an offset option (which is one of the least effective carbon offset means), and the price to work with them has placed it outside the majority of student budgets (the price has tripled since the celebrity endorsements).

Another program is available through a partner institution with the University of Richmond, the Minnesota Studies of International Development (MSID) - Senegal and their work on a reforestation project for mangroves. This project provides women in the area jobs as they are rebuilding a Marine Protected Area (that has become an illegal fishing area) increasing fish size, diversity, and populations. The education about carbon emissions and climate change impacts on the region is impressive, however, access to the program as a general student is difficult and not marketed. Our final grade for MSID - Senegal is a B.

We also researched programs in Gambia, Morocco, Kenya, Tanzania, Rwanda, Uganda, Botswana, and Zambia, encompassing all possible student study abroad or research locations in Africa. In Gambia, we recommend Gambia is Good, where the funds go to local farmers, 90% of which are women (Gambia is Good 2014). Gambia is Good also work to replace coal cookstoves with wooden options and restoring tree species in deforested regions (Gambia is Good 2014). Morocco carbon offset programs only offer private firms such as the Fondation pour la Protection de l'Environnement and CDG Capitol, who offset large company firms for funding of large scale solar and wind energy projects. Kenya, Tanzania, Rwanda, Botswana, Zambia, and Uganda all have projects with a third party international organization, CO₂Balance. Their carbon offset projects work with communities in developing countries to deploy a range of efficient technologies aimed at improving their quality of life, improving health and economic outcomes and reducing global emissions (Co2balance 2014). Improved efficiency cook stoves reduce the need for firewood and the volume of harmful smoke to which the families are exposed. Community borehole projects provide clean, safe drinking water for hundreds of families as well as reducing carbon emissions as water no longer has to be boiled to make it safe to drink (Co2balance 2014). While these last few programs offset carbon emissions, they lack in engagement with the community or project, provide little education about climate change in the region, and have limited efficiency sending only 80% of funds to these projects.

Table 8.5. Grades for each criteria for Credible Carbon (South Africa); Overall Grade A.

Country	Program	Experience	Education	Incentive	Price	Effectiveness	Impact
South Africa	Credible Carbon	B	A	A	A	A	A

Conclusions & Recommendations

We identified the seven programs with the greatest and most geographically strategic impact in offsetting carbon dioxide emissions from University of Richmond study abroad travel. We recommend offset programs in the locations where students are studying due to place-attachment theory. We recommended these programs specifically because they have the potential to create the most change, although they each have their own limitations. Academically, participation in these carbon offset programs will also allow students to critically analyze global-local links.

Ultimately, we have several recommendations for the University of Richmond's Office of International Education and Office of Sustainability, who should meet once a year to oversee the carbon offset programs and evaluate the issues. First, students should be educated about the carbon offset options available to them. This could be through the study abroad websites, or through the individual country study abroad orientations or interest sessions that take place on campus before students leave for their programs. The Office of International Education should also encourage students to engage with carbon offset programs during their study abroad, first with incentives and, in the future, as a requirement. Next, UR should implement a program where students can more easily engage with the recommended programs. This could take the form of a University-run website through which information could be found about the various programs and students could donate their money directly. UR should also oversee these new partnerships for all locations by reaching out to the leaders of the offset programs. In the future, UR should research and partner with carbon offset programs in other locations where fewer students study. Lastly, we encourage the University to design and implement a carbon offset program for international students studying abroad in the city of Richmond.

The University of Richmond differs from competing institutions by having a well-staffed and widely-connected Office of International Education, which has many more roles than study abroad and a far greater influence than most comparable offices. For each carbon offset program, we provided an in-depth analysis describing our justifications for why they should be incorporated into our international education programs. However, limitations to our research exist. For instance, we only found carbon offset programs for the most popular study abroad locations, each program has its own imperfections, and carbon offset programs merely reflect a mitigation strategy but do nothing to prevent initial carbon emissions.

If, or when, the University decides to implement our research into existing carbon offset programs, there are some suggestions for future research and fields of study. For example, if one of the chosen carbon abroad programs is no longer in service or received a low grade, we recommend continuing to oversee new partnerships or creating new programs that are better options. By implementing carbon offset programs, the University of Richmond will work towards mitigating a large portion of its greenhouse gas emissions, facilitating the goal of being carbon neutral by 2050.

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