



Carbon Offset Solutions for International Travel Emissions

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Introduction

Within a ten-year period (FY 2002-3 to FY 2012-2013), the University of Richmond study abroad program has experienced a 96% increase in student participation. In 2007, *Newsweek* magazine recognized the University as the "Hottest School in America" for international studies. In 2013, 710 University students studied abroad. While studying abroad has numerous academic benefits, international transportation contributes carbon dioxide to the atmosphere and thus increases the negative environmental consequences of anthropogenic climate change. In FY 2013, UR students traveled 6,154,032 miles, emitting ~6,892,515 pounds of carbon dioxide to the atmosphere.

Given this negative impact and UR's carbon neutral goals, we feel UR 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 people feel, others have found carbon offsets a beneficial option for people who will be traveling by plane (Lovell *et al.* 2009).

This project introduces several international carbon offset programs that might help offset UR's international travel carbon emissions. Specifically, we examine options for programs around the countries most popular with University of Richmond students.



Figure 1. In 2007, *Newsweek* magazine selects the University of Richmond as one of the top 25 schools for study abroad.

Greenhouse Gas Emissions

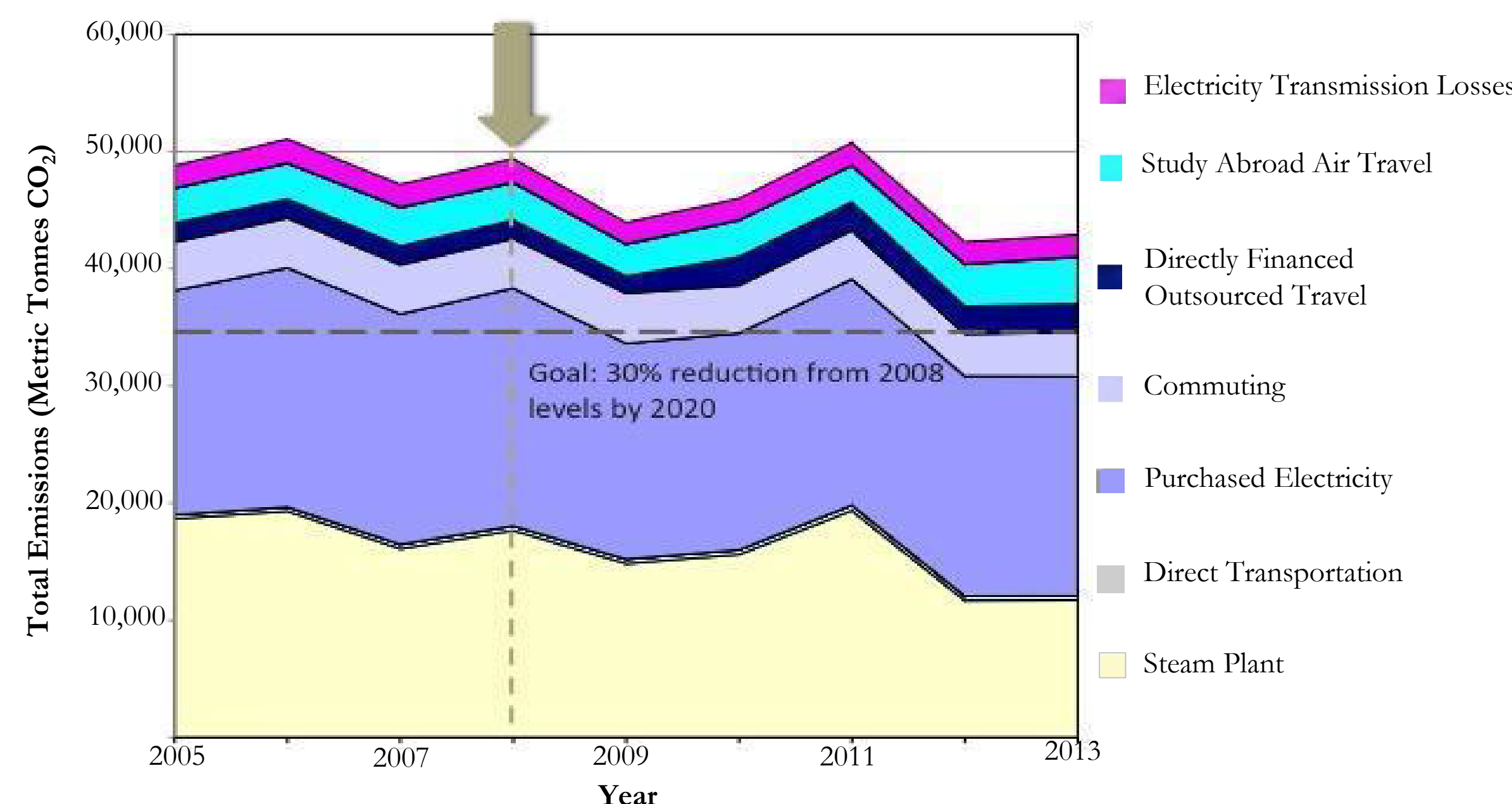


Figure 2. University of Richmond greenhouse gas emissions profile for 2013, showing that one of the largest portions of the University's emissions are due to Study Abroad Air Travel (turquoise bar).

Report Card Results

Table 1: Grades for carbon offset programs in six report card categories we selected based on research conducted on each program. Refer to Methodology for specific information on the criteria.

Country	Program	Experience	Education	Incentive	Price	Effectiveness	Impact
Spain	ZeroCO ₂ -NO	C	F	C	F	B	B
Mexico	MyClimate	C	A	C	F	B	A
Argentina	World Land Trust	B	B	B	A	B	B
South Africa	Credible Carbon	B	A	A	A	A	A
Australia	Carbon Neutral	A	C	D	C	A	A
China	Native Energy	F	F	D	C	A	A
Italy	Enel and Aker Clean Carbon	C	F	C	C	B	B

How much carbon does UR international travel produce?

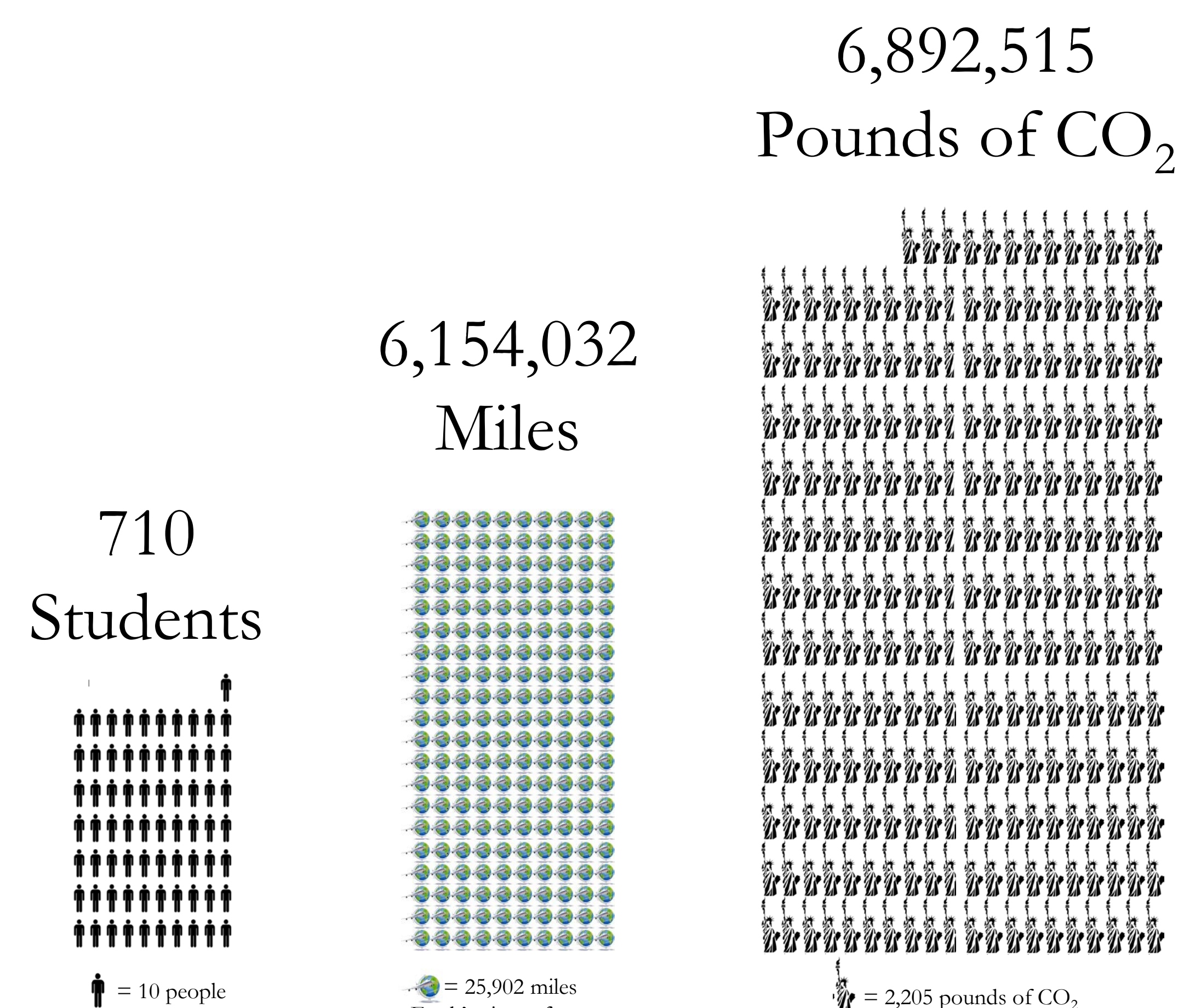


Figure 3: Representation of the number of students, miles traveled, and pounds of CO₂ that UR is responsible for through study abroad programs in 2013.

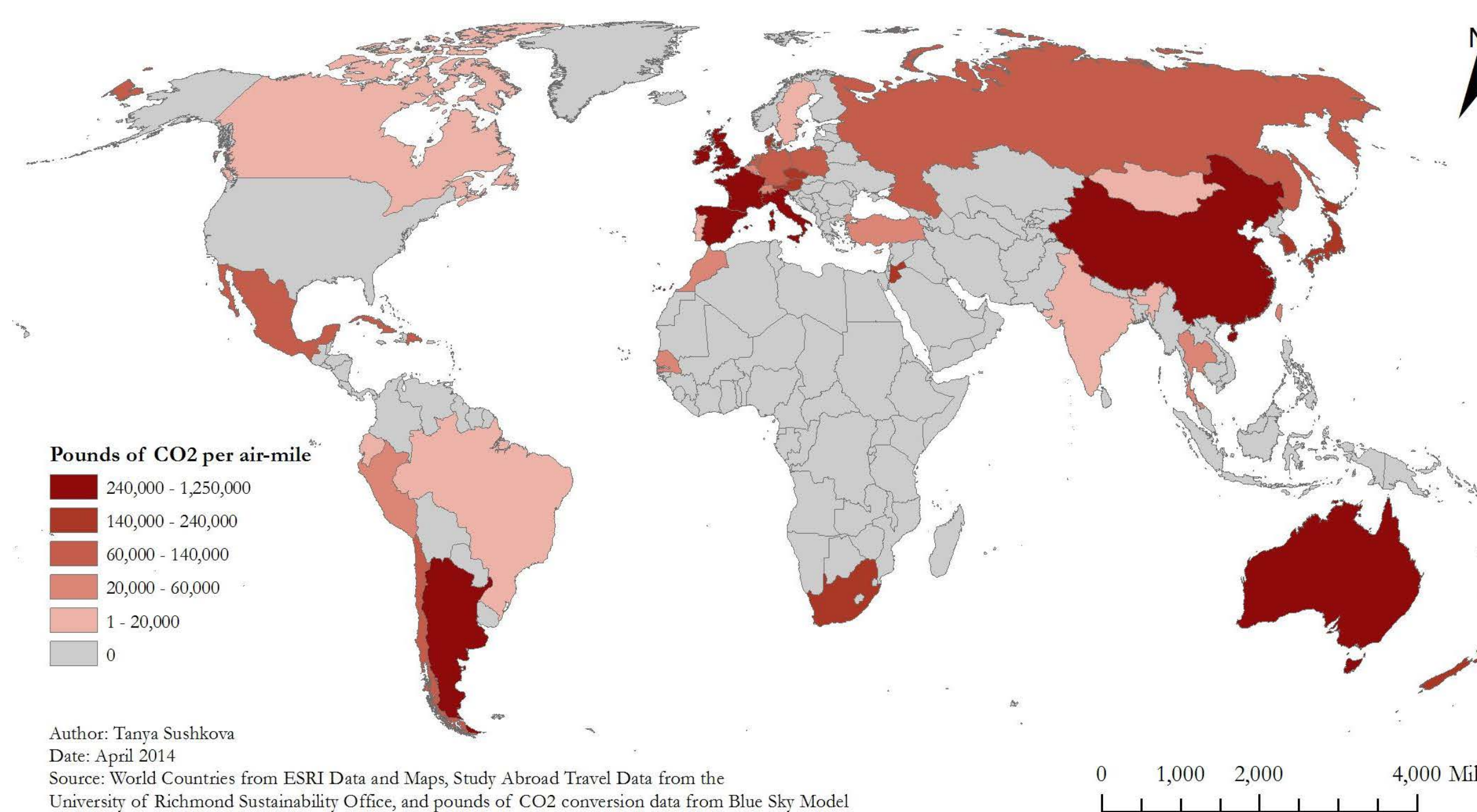


Figure 4: Choropleth map representing total carbon emissions (in pounds) per UR study abroad country for the year 2012-2013.

Recommended Carbon Offset Programs Abroad

1. Spain

ZERO CO₂-NO

Overall Grade: **C**

ZeroCO₂-NO offers the Compostilla CCS Project in northern Spain. This is a research and development pilot storage site monitored through a larger corporation called Endesa, one of Spain's main gas suppliers. Student contributions help advance public research initiatives while learning about the EU's European Energy Programme for Recovery (PEER).

7. Italy

Aker Clean Carbon

Overall Grade: **C**

Enel and Aker Clean Carbon have a carbon dioxide capture and storage project in Porto Tolle, Italy. This project allows students to learn about the post-combustion process and sequestration in saline aquifers. Although they are currently experiencing permitting and legislation issues, the project will continue in 2016.

2. Mexico

myclimate

Overall Grade: **B**

MyClimate in Cambio Azul, Mexico, offers a sustainable, energy efficient, water-saving, purification project for low-income urban homes. Students contribute to reducing GHG emissions by helping to lower the use of fossil fuels for water heating.

6. China

native energy

Overall Grade: **C**

Native Energy allows students to contribute to several wind farms throughout China. These programs aim to generate renewable electricity while also increasing local incomes and job opportunities for the communities. They are validated under the Verified Carbon Standard, and demonstrate financial additionality according to the UNFCCC definitions.

3. Argentina

WORLD LAND TRUST

Overall Grade: **B**

World Land Trust's Misiones Rainforest Corridor project facilitates the creation of a wildlife corridor connecting 3 Guarani communities. Students may participate to protect 9,301 acres of land in a nature reserve.

5. Australia

carbonneutral

Overall Grade: **B**

Carbon Neutral offers individuals the opportunity to donate money to plant native Australian trees. Through planting trees, Carbon Neutral hopes to increase biodiversity conservation as well.

4. South Africa

CREDIBLE CARBON

Overall Grade: **A**

Credible Carbon constantly seeks to reduce the transaction costs for small, poverty alleviating initiatives that result in a quantifiable reduction in greenhouse gas emissions.

Methodology

In order to assess the quality of the various carbon offset programs (COP) around the globe, we identified the following six criteria that we used to grade each option: experience, education, incentive, price, impact, and effectiveness.

Experience

Experience in the form of distance-place attachment is important for COPs to encompass. One crucial piece of evidence for an experience-based COP states, "visitors who resided in neighboring regions were more willing to donate 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). Climate change (CC) will not only physically alter places, but also related meanings, identities, and emotional bonds (Devine-Wright 2013). A significant correlation also exists between sense of place and community, where both are key to examine how individuals view energy development and how such projects affect a place of shared concern (Boyd 2013). The level of COP involvement abroad affects the quality of impact the student has towards diminishing their carbon footprint from travel emissions.

Education

The University of Richmond's Office of International Education (OIE) can coordinate with the Office of Sustainability for the implementation of an academically focused COP. Srinivasamohan and Lee (2010) argue that "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, many benefits can be gained from increased educational opportunities for classes abroad that incorporate the COP and environmental studies, or a similar field. Students and other individuals should explore the potential for COPs in conjunction with study abroad, particularly because the changes and actions already materialized have had tangible impacts (Srinivasamohan and Lee 2010). Dvorak *et al.* (2011) propose a multitude of strategies that can be taken by international educators, faculty, and higher education in order to better motivate students to learn more about the global CC problem.

Incentive

Incentives are an important part of changing behavior towards being more environmentally friendly, and thus should be incorporated into COPs in order to achieve maximum participation in the program. For example, De Young (1993) writes that incentives are one way to change behavior for the long term, minimizing the need to repeatedly convince people to act in a certain way or participate in an environmental program. He recommends ensuring that there are positive incentives to encourage participation in environmentally beneficial programs in place to maximize program participation (1993). Stern 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" (2002). Gardner and Stern (1996) found that most effective behavior change programs were those that included incentives, along with other behavior change strategies.

Price

The price of a study abroad COP is one of the key factors that will influence student participation. Diekmann (2003) found that 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" (2003). Ensuring that the study abroad COP is financially possible for students will be necessary. If the program costs are too high, many students will be unable to participate. Therefore, minimizing costs is essential in order to maximize student participation.

Impact

The impact of a study abroad carbon offset program is defined as the social, economic, and environmental changes it produces. Improved stoves are capable of significantly reducing fuel consumption while bettering 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 (Satanarayanan 2008). However, currently, carbon offsetting only increases global wealth and power disparities (Satanarayanan 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).

Effectiveness

The potential for carbon offsets to reduce greenhouse gas emissions is limited. 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 that offsets from renewable energy are best, followed by energy efficiency projects, with forestry projects 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).

Conclusion

In our research, we discovered seven programs that would have the greatest impact in offsetting carbon dioxide emissions from study abroad travel, which are highlighted on the map to the left. While these programs will impact the greatest number of students and create the most change, they each have their own limitations in program effectiveness and implementation, based on our research of the six qualities of effective carbon offset programs.

The following recommendations are directed towards the University of Richmond's Office of International Education (OIE) and the Office of Sustainability.

- Educate students about the carbon offset options available
- Implement a program for students to more easily engage with the programs
- Oversee new partnerships for all locations
- Design Carbon Offset Programs for locations without adequate services

Works Cited and Acknowledgements

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