

Carbon Footprinting

The Kendall Foundation's Experiences and Lessons Learned

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What follows is a description of all we have learned in the process of measuring the Henry P. Kendall Foundation's carbon footprint. It is an introduction to determining a carbon footprint, serving to provide a precursory yet solid background on the topic and guidance in conducting an organizational carbon footprint analysis. What is your organization's carbon footprint?

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Executive Summary

The Kendall Foundation has instituted an annual review of its carbon dioxide emissions through a carbon footprint analysis, a quantification of the greenhouse gases that are released as a result of all activities of an individual or organization. Based upon the three primary emission sources of office operations, staff transportation, and paper usage, our 2005 emissions measured 42.5 tons of carbon dioxide (8.5 tons per staff member). Our emissions levels in 2006 rose to 60.2 tons of carbon dioxide (8.6 tons per staff member) reflecting an expansion of staff and programs. In an effort to become a carbon neutral foundation, we have implemented an extensive reduction strategy and have pursued carbon offsets to negate remaining emissions.

Our interest in this endeavor stems from the restructuring of our program to place climate change at the center of all our programming and funding. We see the *awareness* of personal contributions to climate change that this work encourages as its most valuable impact and hope to encourage others to follow us on this track of voluntary responsibility.

A carbon footprint analysis is a logical quantification of emissions and can be most effectively and efficiently approached in a stepwise manner. In our experience, we have found that the process can be best described in four basic steps:

1. *Developing the framework for the analysis.* This initial step involves defining the parameters of the analysis. Questions to be answered here are what sources will be measured, what staff (core staff, consultants, etc) will be included, and what array of physical infrastructure (for organizations with multiple buildings/locations) will be included?

2. *Collecting the necessary data.* Raw consumption data serves as the basis for the calculation of emissions figures. "Office operations" data in the form of units of energy consumed (electricity, heating fuel) is gathered from utilities' records. "Staff transportation" data will be in the form of distances traveled (and mode of travel). The gathering of this data will likely require a staff survey (commuting) and a review of expense reports (business travel). Other emissions sources defined in the framework may require unique data. For instance, the weight of paper used is the primary data point for calculating paper usage emissions.

3. *Converting the raw data to emissions levels.* This calculation step is facilitated by emissions calculating software tools that automatically compute emissions figures as the data are entered. The World Resources Institute (WRI) has developed a written guide and spreadsheet tool that is the leading resource for office-based organizations. This tool calculates emissions from office energy usage and staff travel, which are the central

components of the analysis. Other specialized calculating tools, such as the Environmental Paper Calculator that estimates emissions from paper usage, can be used to supplement these components.

4. Responding to the results. The calculation of annual emissions establishes the groundwork for the valuable discussion of how to alter the organization's action and operations to minimize environmental impacts. Direct reduction strategies and carbon offsets offer two avenues by which to shrink an organization's footprint. *Reductions* are initiatives designed and implemented to decrease the emissions that are produced directly on site through the organization's actions. Through energy conservation and energy efficiency, the volume of greenhouse gases emitted drops. *Carbon offsets* are a mechanism to mitigate emissions by investing in off-site projects to negate a quantifiable amount of emissions; these investments reduce emissions elsewhere to counteract emissions that are still produced onsite. Offset projects typically achieve these reductions by removing carbon dioxide from the air (carbon sequestration) or preventing its actual release (renewable energy and energy efficiency installations).

With each passing month, we become more convinced of the relevance of measuring carbon. A future in which carbon emissions must be measured and reported – be it through a cap-and-trade framework or a carbon tax – is easy to envision and is perhaps fast approaching. The importance of the carbon footprint analysis then cannot be understated.

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A Note on Content: Two introductory sections transparently report our results and detail the context in which we instituted a carbon footprint analysis as an integral part of our program. These are followed by a discussion of the actual process of calculating an organizational carbon footprint; for each step in this section, we present two components. First, we explain and outline the rationale and general procedure behind the step, and then we detail how we proceeded at the Kendall Foundation. We close with a discussion of possible next steps to reduce an organization's impact that grow out of the analysis.

I. Transparency: The Kendall Foundation is committed to annually measuring and publicly reporting its carbon footprint, a quantification of the amount of greenhouse gases released through the Foundation's operation. The Foundation emitted 42.5 tons¹ of carbon dioxide in the 2005 calendar year. Emissions levels rose in 2006 to 60.2 tons of carbon dioxide. The emissions were measured from the three sources of office operations (23.4 tons in 2005 and 23.5 in 2006), staff transportation (17.0 tons in 2005 and 33.5 in 2006), and paper usage (2.1 tons in 2005 and 3.2 in 2006)². These figures result from a basic carbon footprint analysis that focuses on carbon dioxide emissions³. As such, these should not be viewed as exact measurements but instead represent accurate estimates of our emissions profile.

The Kendall Foundation is a small organization, leasing 2,500 square feet of office space in the downtown financial district of Boston, Massachusetts. The 2005 carbon emissions profile represents an employee complement of five full-time staff positions, translating to a per capita emissions rate of 8.5 tons of CO₂. Per capita emissions were 8.6 tons of CO₂ in 2006, as the Foundation's staff expanded to seven full-time positions and our efforts intensified with a ~40% increase in grantmaking budget.

With a baseline measurement for our carbon emissions in place, we are now working to reduce our climate impact. Our onsite reduction strategy has included such steps as replacing incandescent light bulbs with compact fluorescent bulbs throughout the office; initiating the use of post-consumer recycled content paper in our printers and copier; and activating power management features on office computers. To counteract the emissions we have not been able to reduce and eliminate, we have partnered with a carbon offset organization, allowing us to invest in Pennsylvania farm methane projects. Through this avenue we have offset the 43 tons of CO₂ we emitted in 2005 and the 61 tons of CO₂ we emitted in 2006, making the Foundation carbon neutral over these two years.

¹ Such figures throughout this document are expressed in units of metric tons.

² Our calculations were aided by use of the World Resource Institute's "Working 9 to 5 on Climate Change," a guide and toolset for office-based organizational carbon footprints, and the Environmental Defense's "Paper Calculator," a tool for calculating the environmental impact of paper use.

³ Carbon dioxide is the dominant greenhouse gas, accounting for over 75% of global emissions. However, five other major gases – methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride – are defined by the Kyoto Protocol as greenhouse gases.

II. Background/Justification of the Analysis: Over the past year and a half, the Kendall Foundation has realigned its programs to place climate change at the forefront. An emphasis of this expanded climate change program is specific, systematic approaches aimed at rapidly achieving significant greenhouse gas emissions reductions. Efforts to quantify such reductions demand the establishment of accurate baseline measurements of emissions levels. In this light, we initiated a review of our own carbon emissions.

We intend to monitor and evaluate our carbon emissions on an annual basis, and to use these assessments as a means to guide efforts to reduce our emissions. By doing so we are measuring our annual “carbon footprint,” the amount of greenhouse gas emissions we create and cause through the Foundation’s operation. Such an analysis provides three key positive outcomes: first, it creates internal awareness of our personal and organizational contribution to climate change; second, it allows us to plan and execute strategies to achieve direct reductions in our footprint; and third, it allows us to educate others and provide solutions for climate change. Spreading the awareness that grows out of such an analysis – and the concomitant behavioral change that such awareness promotes – is the greatest value that we see in the carbon footprint concept. We hope that our efforts here will encourage others to likewise complete a carbon footprint analysis.

III. The Carbon Footprint Process:

A carbon footprint analysis may initially appear daunting, comprised of a complicated and involved series of mathematical calculations. However, when approached in a stepwise manner, the process becomes straightforward and logical. We have taken to describing the process in four basic steps, the first three of which result in the actual measurement of carbon emissions with the fourth step focusing on utilizing and applying the results. The first three steps – defining the parameters of the analysis, gathering the necessary data, and calculating the emissions – are addressed here under “The Carbon Footprint Process.” The fourth step, reflecting the weight we feel it deserves, is addressed in the following section, “The Next Step.”

1. Defining Parameters:

A. Commentary and Background Explanations: Organizations have diverse and unique interests, circumstances and work environments. This inherent heterogeneity necessitates a flexible and dynamic blueprint for determining organizational carbon footprints; the initial step in a successful carbon footprint analysis is the establishment of parameters, defining what will be measured and analyzed. To create an effective framework, two basic questions must be resolved: first, what emissions sources will be measured, and second, how will the particular circumstances of the organization be addressed in the analysis.

Sources: Carbon emissions sources are numerous and extend beyond the obvious ones, such as electricity and direct fossil fuel consumption. The manufacture of products and supplies, the production of food, the shipping of goods, the generation and disposal of waste, and the distribution and delivery of water all carry carbon costs and are sources of carbon emissions. Because of this diversity, sources are systematically grouped and classified to allow for consistent discussion and comparison. Sources can be initially defined as direct or indirect. Direct emissions sources are emissions that arise from apparatus or infrastructure that an organization directly owns; indirect emissions sources are emissions resulting as a consequence of the actions of an organization, but occur at sources owned and operated by a separate entity.

A secondary classification further refines emissions into three “scopes.” This classification system evolved to address the reporting of emissions. Scope 1 emissions are all direct emissions. Indirect emissions are divided into the two remaining scopes: scope 2 emissions are those emissions arising from the usage of purchased electricity, steam or heat; and scope 3 emissions are all other indirect emissions. Scope 3 emissions would include commuting and travel (not conducted via a company-owned vehicle) emissions, life-cycle carbon emissions of products and supplies, and emissions from mailings and shippings. This classification of sources as direct or indirect and by scope is the standard by which emissions and sources are discussed, so it is worthwhile to understand the distinctions.

The quantification of all carbon emissions is not plausible. The scientific basis for calculating emissions from many of the minor scope 3 sources is not firmly established (the carbon costs of physical office supplies such as computers, furniture, and

pens are challenging to define) and trying to reach such a degree of detail would be cripplingly time-intensive.

A key step in conducting a credible carbon footprint analysis then is crafting an effective framework to quantify the vast majority of an organization's emissions from the measurable and significant sources. The Greenhouse Gas Protocol Initiative⁴ provides a discussion of emissions sources, and can be an important guide in determining which sources should be included. This Initiative is the basis for nearly every accounting mechanism of greenhouse gas emissions, and requires the inclusion of scope 1 and scope 2 emissions (direct emissions and indirect emissions from purchased electricity and heat). Scope 3 emissions are optional, but some (such as commuting, travel, and paper use) are readily included and increase the credibility of an analysis.

For office-based organizations (i.e. no manufacturing activities) the primary carbon emissions sources are energy consumed to power equipment and condition the air of the office space and equipment (what we have termed "office operations") and staff commuting and travel (what we have grouped together as "staff transportation"). Other sources, including paper usage and waste production and disposal, may also be quite significant for many office-based organizations and represent additional sources of emissions.

In determining the sources to include, it is also important to consider the metric of measurement to be used in quantifying emissions. Basic carbon footprint analyses measure carbon dioxide emissions while comprehensive analyses quantify emissions from a suite of greenhouse gases. The term "greenhouse gases" refers to the six gases defined as such under the Kyoto Protocol: carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), sulfur hexafluoride (SF₆), hydrofluorocarbons (HFCs), and perfluorocarbons (PFCs). Of these carbon dioxide is by far the most prevalent, accounting for over 75% of the greenhouse gases released annually, and is therefore frequently accepted as a proxy for greenhouse gases in general. Further, many of these gases (SF₆, HFCs, and PFC namely) are only significant in commercial or industrial sectors, and office-based organizations without manufacturing do not produce these emissions. Office-based organizations may credibly decide to conduct a basic carbon footprint measuring only carbon dioxide or to complete a comprehensive analysis that captures emissions from all greenhouse gases.

Organizational Circumstances: Organizational circumstances need to be addressed in crafting parameters as well. Staffing is one circumstance that must be clearly defined. What constitutes an organization's staff? The analysis may address only core staff, but in today's world outside consultants and service providers are increasingly prevalent. The rationale for including or excluding certain staff components should be clearly defined at this juncture.

Larger organizations with multiple office locations are faced with a second consideration: what facilities should be included? Separate analyses can be conducted for

⁴ The Greenhouse Gas Protocol Initiative (www.ghgprotocol.org), launched in 1998, is a partnership between the World Resources Institute and the World Business Council for Sustainable Development. Working with businesses, governments, and environmental groups across the globe, it has created the program that is the most widely used international accounting tool for understanding, quantifying, and managing greenhouse gas emissions.

the individual offices, or an organization-wide assessment in which all office locations are included can be pursued. Some large organizations may lack the upper-level management commitment to carry out a company-wide analysis and thus staff members may have more success focusing on the carbon impacts of their individual units. Some organizations may also find it beneficial to see individual analyses for separate office locations (although doing a company-wide measurement certainly does not preclude the presentation of this information as a component of the larger analysis). The inclusion or exclusion of subsidiaries and partnerships too needs to be considered. Based on organization circumstances, a logical and justifiable decision should be made.

The crucial aspect of this step then is determining the breadth of the assessment. Organizations vary in work environments and circumstances, and may face unique situations in exploring this analysis. Outlining, as the initial step, what emissions sources will be measured, which staff are to be included, and how various office locations and branches will be addressed establishes the groundwork for an efficient and successful analysis.

B. The Kendall Foundation Experience: We developed a solid understanding of emissions sources by reviewing a range of sources, including the Greenhouse Gas Protocol Initiative. Our review revealed that direct (scope 1) and selected indirect (scope 2 and scope 3 sources arising from travel) emissions are the dominant emissions sources for office-based organizations. As tenants in an independently owned building, the Kendall Foundation has no direct emissions. Our indirect scope 2 emissions stemming from office operations would be quite significant though. The frequency of staff travel also suggested that indirect scope 3 emissions from travel would constitute a major component of our emissions profile.

We considered additional indirect scope 3 emissions and realized that our use of paper could represent a significant emissions source. The methodology of calculating emissions from this component – compared to office operations and staff transportation computations – is less refined due to the complex nature of the carbon implications of paper, but we felt the potential significance of this emissions source warranted its inclusion. Waste production and disposal represents an additional indirect scope 3 source that can be significant for organizations, but outside of paper (which is collected for recycling) our waste stream is quite small. Further we do not have a ready method for tracking this stream (waste is collected building-wide by building service staff), and the calculation of emissions from this source also faces many uncertainties. We thus decided to exclude this waste stream from our analysis. Our final framework then established the three emissions sources of office operations, staff transportation, and paper use.

We chose to measure a basic carbon footprint resulting from these sources, focusing solely on carbon dioxide emissions. The concept of ‘carbon’ struck us as more tangible than ‘greenhouse gases.’ The opportunity to encourage others to conduct analyses and increase awareness of carbon implications were compelling reasons behind our decision to conduct our analysis, and we felt carbon would prove more accessible to others hoping to replicate the process. Expanding to a comprehensive analysis is quite feasible with this solid basic analysis in place (see Appendix 1).

The Kendall Foundation's organizational circumstances are relatively simple. We operate out of a single office location, leasing a portion of a floor in a six-story building in downtown Boston. We did not have to consider multiple office locations, and our indirect emissions resulting from the operating of this sole central location would constitute the core of the analysis. The Foundation has a small core staff, but does occasionally engage consultants to complement the core staff. We have included consultants' Foundation-related transportation in our analysis, but electricity consumption of consultants working outside the office is not easily tracked and has not been included in our analysis. The office building in which we operate does contract a service and maintenance staff that attends to the entire building. We have not attempted to capture their carbon emissions in our footprint analysis.

2. Gathering Data:

The calculation of carbon dioxide emissions follows a general formula: multiple consumption data by an emissions factor to yield a representation of emissions levels. A growing number of "carbon calculators" have been developed to aid in these calculations. To use such calculators, data must be collected and inputted. The necessary data is readily collected once the parameters of the analysis have been defined.

A. Office operations:

Commentary and Background Explanations: Operating office space – powering equipment and lighting and maintaining a comfortable working environment (heating, cooling, ventilation, etc.) – requires electricity and fossil fuels. Computing carbon emissions from such energy usage requires electricity and heating fuel consumption data in the form of kilowatt-hours of electricity used and units of fuel consumed. This information should be readily available in utilities billing records.

Access to this data can be dependent on the ownership arrangements of the office space. Organizations that own and occupy an entire building directly contract the utilities and have an accurate record of energy use. Organizations that lease space in a office buildings are often responsible for separately metered utilities. In both cases, direct utilities records should supply the necessary annual energy data.

Organizations that lease space without separately metered utilities have no direct record of energy usage. In these cases, utilities usage estimates can be made based on the energy consumption of the entire building. The owner or building manager should have the utilities records that provide the building's energy data. To calculate a reasonable estimate of an organization's proportional share of this total energy consumption, a ratio needs to be established comparing the organization's leased office space to the building's total leased space. Applying this ratio to the building's total utilities data yields an estimate of the organization's energy consumption⁵. The underlying assumption of this

⁵ Some emissions calculating tools can do this automatically. For instance, the World Resources Institute's tool (see Appendix 2) is designed to do this calculation; simply providing the energy consumption figures for the entire building, the area of the organization's leased office space, and the total area of leased space in the building allows the spreadsheet to automatically calculate the organization's portion of the building energy impact.

calculation is that all occupants have similar energy consumption patterns, but without direct metering of utilities this represents the best possible estimate.

The Kendall Foundation Experience: The Kendall Foundation's office space is located in a building in which all systems (including heating, cooling, and ventilation) are powered electrically. Electricity data is the sole energy data point for a calculation of our office operations emissions. However, our space is not separately metered, leaving us without a direct record of our annual energy consumption. We were able to obtain annual electricity usage data for the entire building by contacting the building manager. We also obtained a figure for the leased space in the building, allowing us to determine our proportional share of annual electricity usage using an area ratio (the Kendall Foundation leases 2,502 sq. ft in a building with 82,287 sq. ft of leased space)⁶.

B. Staff transportation:

Commentary and Background Explanations: Conventional modes of transportation are powered by fossil fuels and therefore represent a significant source of carbon emissions. Staff members rely on such transportation daily to get to and from work and also to make business-related trips away from the office. Commuting typically represents a small (distances are generally short) but regular source of emissions. Additional business travel is a more sporadic source, but one that may carry a larger emissions burden, especially if frequent air travel is involved.

Typically transportation to and from work is not tied financially to the organization, and data collection for this component requires participation and cooperation by staff. A survey of staff can determine commuting patterns, with staff members reporting the mode of transit (personal vehicle, bus, subway, etc.) and distance traveled daily. Fuel efficiency for any personal vehicles that are used should be reported as well. Annual commuting figures can be extrapolated from these daily figures (or from a representative week if patterns are not consistent day-to-day) for each staff person, taking into account the organization's work schedule (holidays, vacations)⁷. Depending on the size of an organization, such a survey can be designed to collect data from the entire staff or from a representative sample. Organizations with large staff numbers should try to select a group of staff members to survey that includes all levels of positions (from administrative to managerial) and is likely to be representative of the entire staff population.

Work-related travel away from the office can dwarf commuting as a source of emissions. The calculation of these emissions is again based on measures of distance and mode of travel. This data may be easier to gather as frequently expense reports contain

⁶ Establishing the ratio as our leased office space compared to the building's total leased space (as opposed to the building's total area) accounts for our share of the energy consumption of the common space (such as lobbies and elevators).

⁷ Some calculating tools do this calculation automatically. For instance, the World Resources Institute tool (see below in the "Calculating Emissions" section) is designed to base calculations on the commuting week and number of weeks commuted annually. The spreadsheet takes weekly data and extrapolates it over the course of the year in determining the carbon emissions. The spreadsheet also allows for the extrapolation of commuting data from representative smaller samplings of staff patterns for organizations in which large staff sizes would create a data headache.

most of the necessary information. Distances can often be determined by reviewing these reports, but staff input will likely also be required to fill in gaps and provide additional information (such as vehicle fuel economies).

Business travel distances can generally be summed to get a single annual total distance for each mode, with two exceptions. Car travel should be summed for each separate vehicle, while noting the fuel economy of each vehicle. Air travel, a highly carbon-intensive mode of travel, should be recorded as individual flight leg distances as opposed to the total annual distance. Taking off is by far the most energy-intensive (and thus carbon-intensive) aspect of flying. Because of this, short flights produce higher levels of carbon emissions per mile traveled than longer flights, and hence emissions factors are not uniform.⁸

The Kendall Foundation Experience: At the Kendall Foundation, we found a staff-wide email survey worked to efficiently gather the necessary commuting data. Each staff member reported the distance and mode used to commute daily. We asked employees to note if the commute changed over the year (for instance, residence moves) and to estimate how frequently they worked from home, as applicable.

Business travel was assessed through a thorough review of expense reports. This review allowed us to determine the distances traveled and the mode of transit (car, bus, train, plane) used on trips out of the office. Air travel by staff members was recorded on an individual flight leg basis, using the past itineraries to track the distance of each flight leg. Mileage from car travel was summed for each vehicle separately. For rental cars, we found that the receipt for the car carries a notation of the vehicle model (which enables us to determine vehicle fuel economy⁹) and the miles driven, providing accurate data on this component of travel. Travel via taxi was based on estimates of distances traveled with the assumption that the vehicle used was the traditional taxi vehicle – a Ford Crown Victoria.

Effective management of our grant programs necessitates extensive time spent ‘in the field’ with grantees and potential grantees. In tracking business travel, it was apparent that staff members were spending significant amounts of time away from the office. This limited the accuracy of our annual commuting data, which was extrapolated from daily patterns using assumptions of a basic yearly work schedule. Thus, to ensure an accurate portrayal of actual commuting patterns, we noted the number of days spent on the road for each staff member (when commuting to the office was not occurring). This information was factored into commuting data to increase the accuracy of the data.

The comprehensive commuting and business travel profiles of staff serve as the basic data for the calculation of the transportation emissions figures. Gathering this transportation data was the most time-intensive aspect of our analysis. An annual review of expense records to determine the previous year’s business travel is both time-consuming and inefficient. Realizing this, we sought to streamline the process by institutionalizing data collection so it occurs on a rolling basis. We have amended our

⁸ If using the World Resources Institute tool, differing emissions factors are used for groupings of short (less than 280 miles), medium (280 to 990 miles) and long (over 990 miles) flights.

⁹ Fuel economy data was obtained from www.fueleconomy.gov, a joint effort of the U.S. Department of Energy’s Office of Energy Efficiency and Renewable Energy and the U.S. Environmental Protection Agency.

expense reporting procedures so that pertinent information (distance, mode of transit) of business travel is now continually collected and recorded. Staff must now submit a supplementary form with expenses that details travel data (the miles driven and fuel economy of the car, miles flown on a per flight-leg basis, train miles, bus miles, and taxi miles). Data from these sheets are inputted into a Microsoft Excel spreadsheet, making it readily available at all times. We anticipate this will greatly ease the data collection process in future years.

C. Paper Usage:

Commentary and Background Explanations: The climate change implications of paper use begin with the raw material, as we have learned that the harvesting of forests limits the potential carbon sequestration in biomass and additionally increases the release of greenhouse gases from soil. These hard-to-quantify aspects begin to highlight the challenging nature of determining the greenhouse gas emissions implications of paper. Other confounding factors include the wide range of manufacturing and finishing processes, the use of recycled content, and the diverse set of disposal options (incineration, landfilling, recycling).

Because of these factors, it is presently difficult to match the same degree of the scientific rigor as emissions calculations of staff transportation and office operations. By accepting a series of assumptions though, general estimates of greenhouse gas emissions resulting from the use of paper can be made. These estimates are based on data of the type of paper (its percent recycled content) and the amount in weight used annually. This information is most easily found in a review of purchasing records, and an office manager or purchasing agent should be helpful in acquiring this information.

The Kendall Foundation Experience: The Kendall Foundation reviewed its purchasing records to determine the amount (in weight) of paper used over the course of the year. It was clear from the records that we had been purchasing paper made of 100% virgin material.

3. Calculating Emissions:

A. Commentary and Background Explanations: The data collected above is in the form of units of electricity, heating fuels, transportation fuels, and paper, and only reveals consumption patterns. To calculate carbon emissions, the general formula of multiplying the consumption data by an emissions factor must be applied to this data. The growing prevalence of measuring or inventorying carbon emissions has led to the creation of many carbon calculators, online and computer-based software programs that calculate emissions figures from consumption data. These basic structures rapidly and easily translate the collected data into emissions figures without requiring the investment of significant staff time.

Carbon calculators rely on specific emissions factors to conduct the calculations. Emissions factors are metrics that quantify the amount of carbon dioxide emitted per unit of consumption for a given activity. An emissions factor for electricity, for instance, represents the amount of carbon dioxide released in producing each unit of electricity.

Many emissions factors are standard, such as for heating fuel; the amount of carbon dioxide that will be released in burning each type of fuel is uniform and constant. Other emissions factors are more complicated and varied; the amount of carbon dioxide released in the production of electricity is reliant on the combination or mix of energy sources used in the process (hydropower, coal, natural gas, wind, etc.). This mix can vary dramatically in different regions of the country and world.

Emissions factors have been scientifically determined and verified, and are readily available. Government agencies frequently release this type of information. The Energy Information Administration is an excellent resource for emissions factors in the United States. The Environmental Protection Agency is another resource, and in particular, its eGRID database and its Power Profiler may prove helpful for electricity emission factors¹⁰. Frequently, though, the calculating tools have the emissions factors readily available or already embedded.

The World Resources Institute (WRI), an international environmental non-profit based in Washington, D.C., published a report in 2002 entitled “Working 9 to 5 on Climate Change: An Office Guide”. Drawing on experiences learned in measuring its own carbon footprint since 1999, WRI drafted this thorough document to guide office-based (i.e., no manufacturing activities) organizations through a review of carbon dioxide emissions.

The guide is accompanied by a carbon calculator in the form of downloadable Microsoft Excel spreadsheets that enable users to conduct their own analysis. With the input of the collected consumption data and appropriate emissions factors, the spreadsheets automatically run embedded calculations to yield a representation of carbon emissions. The tool is comprised of four separate spreadsheets, each of which calculates a component of the carbon footprint. These component pieces – direct emissions, indirect emissions, business travel, and commuting – can be summed to determine the organization’s carbon footprint stemming from the emissions sources of office operations (combined from direct and indirect spreadsheet) and staff transportation (combined from business travel and commuting spreadsheets), as measured in tons of carbon dioxide¹¹. This resource, refined and updated periodically, has emerged as the credible standard for small office-based organizational carbon footprint analyses.

The WRI spreadsheets facilitate the calculation of carbon emissions from office operations and staff transportation – the two predominant emissions sources for office-based organizations – but the tool is not presently designed to account for additional emissions sources. Other calculators can be utilized to add breadth to the analysis. For instance, Environmental Defense, drawing its background information and assumptions from the work of the Paper Task Force¹², has created a basic Paper Calculator that is

¹⁰ The eGRID database can be found at <http://www.epa.gov/cleanenergy/energy-resources/egrid/index.html> while the Power Profiler can be accessed at: www.epa.gov/solar/powerprofiler.htm

¹¹ The calculator limits its analysis to emissions of carbon dioxide, the dominant but by no means only greenhouse gas emitted (CO₂ constitutes over 75% of greenhouse gases annually emitted).

¹² The Paper Task Force is an unusual mix of partners working to assess paper’s environmental impacts and methods for reducing these impacts. It is comprised of four of America’s leading corporations (Johnson & Johnson, McDonald’s, the Prudential Insurance Company of America, and Time, Inc.), a major academic institution (Duke University) and a leading environmental advocacy organization (the Environmental Defense Fund).

noteworthy for its ability to take an exceedingly complicated issue and provide a reasonable estimate of its environmental impact.

This Paper Calculator provides a life-cycle analysis of the environmental impacts of paper. For virgin paper, the calculator estimates the greenhouse gas emissions associated with the process from the initial production of the paper from wood to its disposal in landfills and incinerators. Pre-consumer recycled content is subjected to the same assumptions. For post-consumer recycled content, the estimates for greenhouse gas emissions stem from a review of the energy consumption in the paper production from the recovered material through the recovery and processing system for recycling. The calculator requires an input of the total amount of paper (as measured by weight) annually used and the amount of post-consumer recycled content. It then estimates the amount of greenhouse gases – expressed in pounds of carbon dioxide equivalents¹³ – released in the production and disposal of the paper. The calculator’s inability to incorporate user-defined paper disposal methods is a limitation, yet it represents the best available estimate of carbon emissions arising from the use of paper.

B. The Kendall Foundation Experience: The calculation of our carbon footprint was greatly facilitated by the use of carbon calculators. We jointly utilized the WRI calculator (to measure carbon emissions from office operations and staff transportation) and the Environmental Defense Paper Calculator (to measure emissions from paper usage) to determine the Kendall Foundation’s carbon footprint¹⁴.

The WRI calculator provides for the calculation of emissions caused by an organization’s office operations and staff transportation. For a complete and comprehensive review of our experiences in using this tool, refer to Appendix 3. Briefly though, this calculator is comprised of four individual spreadsheets: direct emissions, indirect emissions, business travel, and commuting. The Kendall Foundation does not have any direct emissions, and thus we entered data into the three remaining spreadsheets.

The *commuting* spreadsheet requires the entry of data collected from the staff survey of commuting patterns. We inputted weekly commuting patterns for each staff member, adjusted to reflect travel time and starting/ending dates for any staff turn over. The spreadsheet then used a user-defined assumption of the number of weeks worked annually (which we set at 48 weeks to reflect holidays and vacation and personal time) to extrapolate an estimate of carbon emissions resulting from this transportation pattern.

The *business travel* spreadsheet requires the user to enter data in the form of distances traveled or fuel consumed. We calculated emissions from most modes of transportation by entering distance data. Air travel was readily entered as a distance per

¹³ A carbon dioxide equivalent is the common metric used to quantify greenhouse gases collectively, relying on the varying global warming potential of the various greenhouse gases to describe the amount of carbon dioxide required to cause the same impact on the atmosphere as the actual composite of gases.

¹⁴ An obvious concern with using these calculators in conjunction is the metrics of measurements differ: the WRI calculator measures carbon dioxide emissions whereas the Environmental Defense Paper Calculator accounts for the six greenhouse gases listed under the Kyoto Protocol. We understand that this represents an inconsistency in our analysis, while also recognizing that the WRI and Environmental Defense tools are the leading available resources for their intended purposes. Our emissions estimates are not seriously impacted by this inconsistency (given that CO₂ is the dominant greenhouse gas), and we feel that using the leading, most credible tools outweighs this drawback.

flight leg, allowing the spreadsheet to apply the appropriate emissions factor to each flight. For car travel, though, we utilized the fuel data framework to calculate emissions, as the distance framework required general assumptions (small, medium, or large vehicle) in determining emissions factors. By using reported vehicle fuel economies to convert distance data into fuel data, we were able to use more precise emissions figures to calculate emissions from car travel. Using both frameworks in conjunction, we were able to obtain an accurate estimate of our business travel emissions.

The *indirect emissions* spreadsheet quantifies electricity consumption emissions. Without separately metered utilities for our leased office space, we did not have direct and precise measurements of our electricity consumption. However, the spreadsheet allowed us to estimate electricity use by determining our proportional share of the building's total electricity use based on an area ratio. Entering the area of our office space, the area of the total leased space in the building, and the annual electricity consumption of the building, we were able to estimate our indirect emissions from electricity use.

The calculation of the emissions from paper using the Environmental Defense's Paper Calculator was straightforward, requiring two inputs: the weight of paper used over the course of the year and its percent recycled content. The calculator then automatically determined the amount of emissions such a level of use constituted, based on its internal assumptions. We were able to easily convert the tool's metric of pounds of carbon dioxide equivalents to tons of carbon dioxide equivalents for inclusion in our carbon footprint.¹⁵

Once the separate sections of the analysis are completed with the help of these calculators or others, the individual components can be pieced together. Summing the results of WRI spreadsheets capturing emissions from office operations and staff transportation with the Environmental Defense tool presenting emissions from paper usage yields a complete analysis that conforms to the parameters initially defined. This left us with an accurate estimate of the Kendall Foundation's carbon footprint and allowed us to begin considering ways to reduce our impact.

¹⁵ One metric ton equals 2,205 lbs.

IV. The Next Step: Reduction Strategies and Offsets:

Measuring and reporting an accurate estimation of carbon dioxide emissions is an important outcome of this project. The impact of the analysis increases however when this newly acquired knowledge is used to inform decisions on how an organization acts and operates to reduce its environmental impact. Carbon reduction strategies and carbon offsets present a two-pronged approach to achieving responsible organizational behavior through the limiting of greenhouse gas emissions.

The implementation of reduction strategies will ultimately be needed to effectively address climate change. *Reduction strategies* are initiatives designed and instituted to limit or decrease the amount of greenhouse gases directly emitted through the operations of an organization. Such on-site strategies generally consist of energy efficiency improvements and behavioral changes to conserve energy. Pursuing reductions implicitly recognizes and accepts the organization's responsibility for its carbon emissions. This represents a societal shift from the current model in which the implications of the consumption of fossil fuels and concomitant release of greenhouse gases are ignored externalities.

The current fossil fuel-dependent infrastructure limits the ability to completely reduce all greenhouse gas emissions. Credible and high-quality offsets thus can be a way to supplement reductions and allow organizations to consider carbon neutrality, where their net impact on greenhouse gases in the atmosphere is zero. *Carbon offsets* are a mechanism to mitigate an organization's greenhouse gas emissions by financially investing in off-site projects that negate a quantifiable amount of the organization's onsite emissions. Qualifying offset projects achieve carbon reductions by removing carbon dioxide from the atmosphere (carbon sequestration) or by preventing its initial release (renewable energy installations and energy efficiency) and counteract an organization's on-site emissions.

Offsets generally fall into three broad categories: land/forest protection and reforestation, renewable energy installation, and energy efficiency improvements. These projects can be directly pursued and arranged by an organization interested in offsetting its emissions, although this requires a substantial investment of time and resources. Third-party organizations have also emerged to facilitate offset projects, providing a less time-intensive option. Acting as brokers, these organizations identify and certify offset projects and evaluate the emissions reduction potential to determine the necessary investment to counteract calculated levels of emissions.

At the Kendall Foundation, we are seeking to reduce our emissions as low as possible before pursuing offset options for the remaining emissions.

1. Reduction Strategies:

A. Commentary and Background Explanations: Reduction strategies – onsite efforts to minimize the actual emissions caused by an organization – are the backbone of an effective action plan for reducing a carbon footprint. The diverse and unique nature of organizations though precludes the presentation of a cut-and-dry list of reduction actions to be taken. Instead, it is best to approach the subject with an open mind and a strong knowledge of the organizational interests, circumstances, and culture.

An energy audit may provide an initial framework from which to make efficient and financially sound investments to reduce emissions. This assessment by an energy expert (frequently contracted through utility companies) will reveal where the largest gains in reducing energy demand can be realized and will also provide information on the cost-effectiveness of various options. This assessment can establish a firm foundation for advancing an aggressive reduction strategy, helping an organization develop a solid knowledge on what options are feasible, and may even result in recommendations that can be easily implemented.

As an organization begins to consider reduction initiatives, the diversity of options becomes readily apparent. Some efforts cost nothing to implement and will reap immediate financial benefits. These are predominantly behavioral changes, such as activating the power-saving modes on computer monitors or powering down equipment when it is not in use, thereby decreasing electricity consumption and resultant carbon emissions. Other steps carry initial upfront costs, but make financial sense when viewed in the context of a short to mid-term timeframe. Included here would be the replacement of traditional lighting with energy efficient lighting and the purchase of leading energy efficiency office equipment when upgrades are needed. Initiatives with longer payback periods could include improving the insulation of the building's envelope or replacing an old, inefficient boiler with a highly efficient modern model. Again, these efforts decrease emissions and result in lower electricity and energy costs that will shortly or eventually surpass the initial incremental investment. Still other efforts will not be financially beneficial to the organization, but do provide avenues to achieve reductions in carbon emissions. Switching to a paper with a high post-consumer recycled content (which may cost more than 100% virgin paper) is one such effort that falls in this category. Compensating staff public transportation access and use is another such effort.

The above examples highlight the diversity and range of options available to organizations seeking to actively reduce its carbon footprint. Other ideas and options certainly exist. This brief discourse should serve to encourage organizations to engage in healthy discussions in the exploration of possible emissions reducing options.

A final crucial component of an effective reduction strategy is the frequent assessment and review of its status. Successful reduction strategies are not static and instead should be continually updated and refined as new ideas and technologies emerge. Some initiatives may not initially take hold and require sustained attention before they become successes. The reviewing and evaluation of a reduction strategy will keep an organization striving to maximize its reductions of carbon emissions.

B. The Kendall Foundation Experience: At the Kendall Foundation, we engaged in a staff-wide discussion to explore the possibility of reducing our carbon footprint. A series of initiatives were proposed and discussed. Coming out of this meeting, we developed a reduction strategy that includes a diversity of initiatives: replace incandescent light bulbs throughout office with compact fluorescent bulbs; activate power saving modes on computers and work to reduce phantom load throughout the office; consider environmental impacts in plotting travel plans and attempt to consolidate trips when possible; explore the possibilities of teleconferencing and video-conferencing; initiate the use of 30% post-consumer recycled content printer paper to replace 100% virgin paper in our printers and copier; print double-sided and reuse single-sided printed paper for

internal printing; incorporate environmental considerations (for paper, ink, and printing companies) when outsourcing printing jobs; establish criteria for purchasing leading energy-efficiency equipment in the office; and continue providing public transportation access to staff members. These initiatives have been implemented with varying success, and we are now reviewing our progress to identify successes and areas where we still need to improve.

The Kendall Foundation is somewhat limited in our ability to achieve extensive emissions reductions because we do not own or operate our office space. However, in our reduction strategizing session, we discussed the possibility of engaging the building owners in an energy review and retrofit of the building. We hope to initiate this “greening” process, providing our knowledge, experience and connections in the energy field to help retrofit the building to improve its energy efficiency and reduce its carbon footprint. A host of retrofits including lighting upgrades, heating and cooling systems upgrades, water conservation measures, and energy efficient window installations could be considered. This could have financial returns for the owners while minimizing the building’s environmental impact, allowing us to realize reductions in our organizational carbon footprint.

2. Carbon Offsets:

A. Commentary and Background Explanations: Carbon offsets can be most effectively and responsibly used to complement reduction efforts. Offsets provide an avenue to negate remaining emissions after a committed reduction strategy has been crafted and implemented. It is a topic that has been somewhat controversial, with questions on the appropriateness of such a mechanism and the credibility of the available options. As to the first question – whether offsets simply provide a guilt-free invitation to continue consuming and polluting unabated – we feel that when used to complement reduction efforts, the offset option provides an effective path to spread awareness and responsibility while influencing positively the composition and evolution of the energy system (i.e. a diversification of energy sources, with a greater emphasis on energy efficiency and increased reliance on localized renewable energy). The question of credibility is more complicated and although we are certainly not experts on the topic, we have explored the field deeply enough to develop a basic working knowledge. We have come to appreciate that the key points of offsets include additionality, certification and verification, and retirement. High quality offsets fulfill the basic criteria of these concepts.

The concept of *additionality* focuses on ensuring that offset projects extend beyond a business-as-usual scenario. Strict measures of additionality – which are required for credible, meaningful carbon offsets – ensure that projects billed as offsets are not occurring by regulation, mandate or conventional business models, and instead are initiated through the participation of offset purchasers and the carbon offset market. If the project is already in place or required by law or regulation, the claim that one’s investment is directly causing the reduction of greenhouse gases is baseless.

Review processes or governing entities intended to clearly define and approve additionality standards in voluntary offset markets have been slow to emerge. The consumer must develop the necessary knowledge and understanding to undertake a

careful review of the available information to ascertain the additionality of a proposed project. A series of sources and materials can be reviewed in developing a practical working knowledge on this topic. A report published by the Tufts Climate Initiative entitled “Voluntary Offsets for Air-Travel Carbon Emissions,” provides a particularly helpful discussion on the question of additionality¹⁶.

The concepts of *certification and verification* focus first on ensuring offsets are calculated and created in a reasonable and logical process, and second on ensuring that project investments are reducing greenhouse gas emissions in the anticipated manner once implemented. The emphasis is on ensuring third-party oversight to provide a credible read on the state of the offset offerings. Such oversight certifies that the offset project are calculated in a manner that provides credible measures of reduction estimates, and verifies that the project achieves, in practice, the reductions that it proposed in principle. However, no entity or governing body has yet emerged to provide an industry-wide standard to certify and verify offset providers.

The *retirement* of offsets is a critical consideration in making statements about carbon neutrality. To make such statements, one needs to ensure that the environmental benefits purchased in the form of the offset (i.e., the reduction of greenhouse gas emissions) can not be claimed by others or resold again for their greenhouse gas reduction achievements at a future date. Retiring generally requires the involvement of an independent third-party organization to hold the offset in perpetuity, removing it from the market and allowing the purchasing organization to definitively claim credit for the reductions achieved. This step credibly and permanently delineates the proportion of the carbon benefits of the offset project that an organization can claim. This arrangement helps to prevent the double counting of reductions, with multiple organizations trying to claim the reduction realized. It is only with such a transparent and clear definition of the achieved reduction ownership that meaningful statements of carbon neutrality can be made.

There has been a dearth of independent oversight and credibility-lending governance to this burgeoning voluntary offset market. Offset markets at the national and international level first emerged in the mechanisms and protocols of the Kyoto Protocol. Under the Protocol, nations can achieve their reduction goals through direct internal reductions or through financing reduction projects in other countries. The Gold Standard, a project of the Gold Standard Foundation¹⁷, is the international standard for the design of national-level carbon offset projects. This framework was crafted to address projects proposed through the Protocol’s Clean Development Mechanism (CDM)¹⁸ and Joint Implementation (JI)¹⁹. As an established standard for projects in these

¹⁶ This report, available at http://www.tufts.edu/tie/tci/pdf/TCI_Carbon_Offsets_Paper_April-2-07.pdf, focuses on carbon offset options available for consumers looking to offset air travel. However, the report contains a solid discussion on offset characteristics and qualities in general, and is a great resource for developing an understanding of carbon offsets.

¹⁷ The Foundation is a joint endeavor of the World Wildlife Foundation, SouthSouthNorth, and Helio International. More information and materials are available at www.cdmgoldstandard.org.

¹⁸ This mechanism under the Kyoto Protocol allows developed countries to finance projects in developing countries to gain emissions credits.

¹⁹ Similar to the Clean Development Mechanism, this mechanism of the Kyoto Protocol allows developed countries to finance projects in other developed countries to gain emissions credits.

mechanisms, it provides guidance to governments and nations working to develop projects that create carbon credits to use in reaching reduction goals established under the Protocol.

Uniformly accepted standards for the small-scale voluntary carbon offset market though remain absent. The Gold Standard has recently expanded to begin addressing this gap, with its materials serving as a technical resource on offset project design and quality. This is a developing resource though and it remains to be seen how it is adopted in this market. At present, it falls to the consumer to conduct the proper due diligence in pursuing offset options.

This is highlighted by the recent publication of the Clean Air-Cool Planet report, *The Consumer's Guide to Retail Carbon Offset Providers*²⁰, which provides a practical and accessible assessment of the current offset market and identifies quality offset providers. The report, which has sparked much discussion within the field, does not review the quality of the offsets that are being provided but instead focuses on the credibility of providers based on basic criteria of certain business operations²¹. The conclusion to be drawn from this report is that currently no widely-accepted and recognized independent standard exists for offsets or offset providers, requiring the buyer of offsets to be educated and informed in making smart decisions on purchasing offsets.

Without governing or regulatory standards, consumers can only ensure the credibility and veracity of carbon offsets through a thorough and complete review of offset options. Many resources have recently appeared to provide guidance to consumers as they try to operate in this unsettled market. A Carbon Trust report, "The Carbon Trust three stage approach to developing a robust offsetting strategy," and a Business for Social Responsibility report, "Offsetting Emissions: A Business Brief on the Voluntary Carbon Market," provide solid examples for organizations to follow in effectively conducting a thorough review of offset options. These two reports, along with the Tufts Climate Initiative and the Clean Air-Cool Planet reports, serve as the leading resources for determining offset quality and credibility. These reports will jointly guide and educate organizations as they pursue offset options.

B. The Kendall Foundation Experience: Given the rapidly expanding and somewhat unsettled nature of the offset market, we spent considerable time weighing potential steps to take. Carbon offsets can be generally classified into three major types: land/forest protection and reforestation, renewable energy installations, and energy efficiency improvements. Central to all of these offset projects are questions and concerns about additionality. We feel that all offer the potential to provide the carbon offsetting traits that they are advertised under, but that currently there are varying abilities to verify and ensure the additionality and effectiveness of these. Particularly for the land/forest offsets that focus on the sequestration of carbon, it is presently difficult to ensure these projects

²⁰ Clean Air-Cool Planet reports that this Guide has been downloaded 32,000 times in the first 6 months of its release. It is available for download on CA-CP's website: <http://www.cleanair-coolplanet.org/>

²¹ The report utilized seven evaluative criteria, including: providers' prioritization of offset quality, buyers' ability to transparently evaluate offset quality, transparency in provider operations and offset selection, provider's understanding of the technical aspects of offset quality, providers' emphasis on educating consumers about global warming and global warming policy, ancillary environmental and sustainable development benefits of the offset portfolios, and use of third-party project protocols and certification. These criteria were weighted in the order they are listed here.

are effective (a reforested area for instance must maintain the forest ecosystem for 100 years to achieve the offsetting potential sold in an offset). We felt that the most credible offset projects we could pursue would be in the energy efficiency or renewable energy sectors. While there certainly remain some rather large questions to be answered in the burgeoning market, we were able to find some options that we deemed credible.

The Kendall Foundation purchased carbon offsets from *NativeEnergy* to offset all of our emissions in 2005 and again for our 2006 emissions.²² The Charlotte, Vermont based company has emerged as a credible and leading offset provider, focusing on developing renewable energy projects throughout the United States. Specifically we invested in the company's "Remooable" Energy Program, which works with Pennsylvania family farms to help fund the installation of anaerobic digesters that capture and utilize methane gas released from animal waste to produce electricity. This reduces the amount of methane gas, a potent greenhouse gas, released directly on the farm while simultaneously adding renewable energy to electrical grid. Methane digesters have multiple other environmental and social benefits (such as support of local family farms, cleaner farms, and less polluted runoff) that we also found attractive.

The burgeoning nature of the voluntary small-scale carbon offset market will likely draw the attention of governing bodies, and there are already indications that this is occurring (the Gold Standard project is beginning to develop protocols for voluntary carbon offsets). A more structured framework for creating and marketing offsets is likely on the horizon, and we will continue to review offset options in light of new developments in this direction.

²² Our emissions results are in units of metric tons of carbon dioxide, whereas *NativeEnergy* measures its offsets in short tons. One metric ton is equal to 1.1205 short tons. We converted our figures from metric tons to short tons before purchasing offsets.

V. Conclusion:

In the two years that have passed since we initially measured our carbon emissions, we have only become increasingly convinced that carbon will become a commodity of great importance in the coming years. The political landscape has evolved to the point where it appears inevitable that a mechanism for capturing the cost of carbon – be it in the form of a carbon tax or through a carbon cap-and-trade framework – will emerge in this country and throughout the world. When this happens, the measuring and reporting of carbon emissions will become a critical component of successful organizational and business management. Those already familiar with and comfortable working through carbon inventories will slide seamlessly into the new economic paradigm. Those that are not will face the challenge of quickly, efficiently, and smoothly instituting a nuanced practice, and will likely struggle initially. A goal then of this document has been to encourage other organizations to begin to voluntarily track and report carbon emissions. Doing so will help establish such organizations at the leading edge of the fast-approaching reality of a world in which carbon carries a cost. Doing so will also hopefully hasten the arrival of such a world.

Appendix 1. The Kendall Foundation and Public Reporting:

The Kendall Foundation has openly displayed the results of its first two carbon footprint analyses. The Foundation's most recent biennium report (2004-2005) includes a carbon footprint page that details and briefly explains our results, and the Foundation's website likewise highlights the carbon footprint project and results. The public reporting of emissions is a key step in helping to spread awareness and encourage others to consider the impact of their actions. Increasingly, more formal reporting mechanisms are emerging to facilitate the public reporting of carbon emissions and climate change implications.

One such mechanism is the Carbon Disclosure Project (CDP). This Project is an independent, not-for-profit organization that seeks greenhouse gas emissions data and information on the business risks and opportunities presented by climate change from the world's largest companies. Serving as a coordinating secretariat for over 315 of the world's largest institutional investors (representing a combined \$57 trillion of assets under management), the CDP annually solicits responses from the largest publicly listed companies globally. The project strives to use this information to facilitate a dialogue between investors and corporations that will help form a rational response to climate change.

Launched in 2000, the U.K.-based Carbon Disclosure Project has published an annual report on greenhouse gas emissions and climate implications of the 500 largest global corporations since 2002. The 2007 questionnaire has been sent to over 3,000 of the world's largest corporations, and data and results from those corporations that choose to respond will be published in September 2008.

The Carbon Disclosure Project represents a group of the world's largest investors and as such focuses on the globe's largest publicly held companies. The data collection process is initiated by the Project in the form of the questionnaire that it mails out. The Climate Registry represents another reporting mechanism that engages entities in North American and relies on voluntary submission of data.

The Climate Registry is a voluntary data collection mechanism that enables entities to create a credible, transparent, and accurate public record of their greenhouse gas inventories. The premise is simple: the Registry allows organizations and other entities to opt into an agreement to calculate and submit verified reports of their annual greenhouse gas emissions. The Registry then makes the data publicly available via its website, resulting in a large aggregation of North American emissions levels.

The Registry is an emerging framework for voluntarily tracking and reporting emissions. It first appeared in early 2007 and has since developed with the intent to begin accepting emissions data from reporting entities in 2008. The Kendall Foundation will track this framework as it emerges, and may explore the possibility of entering the Registry as a reporting entity.

Reporting through the Registry requires the verification of a comprehensive carbon footprint analysis, with a measurement of the six greenhouse gases listed under the Kyoto Protocol²³. We have conducted a basic carbon footprint analysis of the

²³ The Kyoto Protocol lists six principle greenhouse gases: carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), sulfur hexafluoride (SF₆), hydrofluorocarbons (HFCs), and perfluorocarbons (PFCs).

Kendall Foundation's operations since the calendar year 2005, and thus would need to expand our analysis to report in this mechanism.

A comprehensive inventory accounts for the six Kyoto Protocol greenhouse gases. Methane (CH₄) and nitrous oxide (N₂O), like carbon dioxide, result from the combustion of fossil fuels. The perfluorocarbons (PFCs) and hydrofluorocarbons (HFCs) are predominantly emitted through the use of refrigerants and air conditioners, and also in some manufacturing processes. For office-based organizations, these emissions will likely be non-existent or a minimal component of the emissions profile. Sulfur hexafluoride (SF₆) is a highly potent greenhouse gas but its emission result from such a limited series of actions (the gas is used in the manufacture of magnesium products and as an insulator in electrical power transmission and distribution equipment) that office-based organizations do not need to worry about this gas.

To expand the Kendall Foundation's basic analysis to the comprehensive analysis accepted by the Climate Registry, we would need to quantify emissions of methane and nitrous oxide. This expansion is readily accomplished as much of the work is already completed; the energy consumption data and travel data are already gathered and we simply need to apply emissions factors for methane and nitrous oxide to the data to produce estimations of these emissions.

While we do intend to explore publicly reporting the Kendall Foundation's emissions through a vehicle such as the Climate Registry, doing so may not be feasible or practical for all organizations however. Such reporting generally carries a significant financial cost. The Climate Registry requires an annual reporting fee²⁴. Verification of results by an independent third party organization is additionally required and the cost of verifying the results will fall to the reporting entity. Further, to ensure uniform reports and to allow for comparisons, reporting mechanisms also have strict and rigid measuring and reporting requirements. These are necessary and often quite helpful for very large entities (such as states or cities) but may prove encumbering to small office-based organizations. There is undoubtedly value in the public reporting of annual emissions, yet mechanisms such as the Climate Registry may not be a feasible or practical avenue for all organizations.

²⁴ This fee ranges from \$600 to \$10,000 presently, as determined by a sliding scale based on the reporting entity's size.

Appendix 2. Technical Supplement: Utilizing the World Resources Institute's Calculator.

The World Resources Institute's written guide, "Working 9 to 5 on Climate Change: An Office Guide," and accompanying carbon calculator together form the leading resource on carbon footprint analyses in office-based organizations. The guide and calculator will help quantify carbon emissions that are caused by an organization's office operations and staff transportation. The calculator is comprised of four individual spreadsheets: direct emissions, indirect emissions, business travel, and commuting. The Kendall Foundation utilized this tool to complete its carbon footprint analysis.

The Kendall Foundation does not have any direct emissions, as it does not own or operate any apparatus – such as a boiler or furnace – that directly causes the release of carbon dioxide through its use. Thus, in employing the WRI calculator, we relied on the three remaining spreadsheets to calculate emissions.

The *commuting spreadsheet* requires the input of staff commuting data into a commuting survey page. Two separate commuting "combinations" may be entered for each staff member to account for varying patterns (for example, if a staff member has to drop a child off at a day-care/school on Tuesday and Thursday but comes straight to work on the other days of the week). For each combination, the spreadsheet includes a column to enter the number of days per week that each combination is used. The spreadsheet can use this column to extrapolate the inputted data to reflect a typical week of commuting. The calculator then requires the user to input a single assumption of the number of weeks worked over the course of the year, which it uses to expand the weekly data to reach annual commuting measurements. Embedded equations within the spreadsheet automatically calculate the emissions that result from these annual commuting patterns.

This commuting spreadsheet is crafted to provide flexibility to organizations during the data collection and input processes. Data can be entered either of a representative sample of staff commuting patterns or as a complete record of commuting data for every staff member. A ratio factor comparing the extent of the inputted data to the organization's actual staff size must be set and adjusted to allow for this flexibility. With small organizations, it is feasible to collect commuting data from every individual and enter a complete staff survey into this spreadsheet. Setting the ratio factor (found on the "total emissions" tab of this spreadsheet) at one informs the program that the entered data is the complete data set for the organization, and it calculates the organization's emissions figures from this. For large organizations with dozens or hundreds of staff members, it may be impractical to gather data from every individual; commuting data can be collected from a smaller, representative sample of staff members. The ratio factor (which in this case would be set at greater than one) allows the emissions figures that are computed from this sample of staff commuting data to be extrapolated to provide an accurate estimation of the entire organization's commuting footprint.

The Kendall Foundation's small size (five full-time positions in 2005 and growing to seven in 2006) allowed us to collect and enter commuting data from the entire staff in this spreadsheet. Our small size also encouraged us to try to maximize the accuracy of our commuting emissions by considering situations that impact commuting. Staff members on extended business trips are not commuting to and from the office. Staff turn over creates situations in which some individuals may only be commuting to the

Kendall Foundation offices for portions of a year. Residence moves likewise would create two distinct and separate commuting patterns for a staff member. The WRI commuting spreadsheet is somewhat rigid and does not initially allow for the inclusion of these considerations. The spreadsheet's single user-defined input of the number of weeks worked annually is applied to all staff members, and there is no room for individual adjustments to staff members' annual commuting loads. To make such adjustments, we used a roundabout approach. We set a standard year of work at 48 (*check this*) weeks, allowing for holidays, vacation, and personal time. For each staff member we then considered how closely his or her actual commuting patterns would match the assumption of the spreadsheet. As needed the input of the number of days commuted per week of the staff member was factored down to account for days traveling or less than a full year of employment.²⁵ This adjustment enabled us to obtain more accurate estimations of the carbon emissions stemming from staff commuting.

The *business travel spreadsheet* of WRI's tool calculates the emissions stemming from business travel using modes of transport such as cars, trains, buses, and airplanes. Again, the spreadsheet affords users some flexibility in the data collection and input processes, with two pathways for calculating emissions from these sources: by distance traveled or by fuel consumed. Both pathways use emissions factors for each mode to convert the data into emissions figures once the data is inputted.

At the Kendall Foundation, we utilized both options to maximize the accuracy of our calculations. We entered distance measurements for all modes of transportation save car travel, for which we relied on fuel consumption measurements. The distance framework was effective for most modes of transportation as the data was easily inputted into the calculator, and resulted in solid estimates of carbon emissions from these sources. The spreadsheet requires data on air travel to be inputted on an individual per-leg distance due to the variability of the emissions factor based on distance traveled. However, the distance framework for calculating emissions from vehicular transportation relied on coarse generalizations (small, medium, or large car) in applying emission factors. We felt we could most accurately reflect emissions from this source by converting our collected distance data into fuel consumed. Personal vehicles, rental cars, and taxicabs were thus included in the emissions profile by mathematically determining and inputting the amount of fuel used in traveling the distances reported. The emission factor for the fuel was ten used to determine the resultant carbon emissions. A simple summing of this figure with the calculations derived from distance metrics allowed us to determine our total business travel emissions profile.

The *indirect emissions* spreadsheet focuses on quantifying the emissions arising from electricity consumption, which constitutes all of our emissions resulting from office operations (the Kendall Foundation's systems are all powered electrically). Because we lease space and do not have separately metered utilities, we do not have a direct measure of the amount of electricity we use annually. However, the spreadsheet allows for an estimation based on an area ratio; this calculation requires the input of three data points:

²⁵ This was accomplished by estimating the number of days in the year the staff member commuted (time spent traveling, and time not employed by the Kendall Foundation) and dividing this resultant number of days by the number of weeks worked annually (as inputted into the spreadsheet). With rounding, this provided a representation of the number of days per week commuted on average over the course of the year.

total electricity used in the building, total leased area of the building, and area of the Kendall Foundation's leased office space. After we defined the electricity emissions factor to be used (relying on the most-recently published EPA data on state electricity emission factors), the spreadsheet was able to determine the proportion of electricity for which we were responsible. It then was able to automatically calculate the amount of carbon emissions caused by the Kendall Foundation's office operations.

Tips for a Successful Carbon Footprint Analysis:

1. Draw upon the experiences of others. Organizations with experience conducting their analysis may be able to provide helpful hints and suggestions. As an introduction to the concept of the carbon footprint, this document can be used to open discussion and prompt thinking on how to apply an analysis to one's organization. Other organizations may be able to provide different perspectives; experiences shared can save significant time and effort and improve the quality of the analysis.
2. Begin by establishing the parameters to guide the analysis. Determine what will be measured and analyzed. It may make sense to begin with a basic analysis, measuring only carbon dioxide emissions. For small office-based organizations this is a reasonably accurate approximation of actual emissions, and it can be expanded as needed as the organization becomes comfortable with and adept at conducting the analysis.
3. Make use of credible and verified carbon calculators. These tools provide a relatively easy and quick mechanism to determine emissions and streamline the process. The World Resources Institute's framework has emerged as the leading resource for calculating carbon emissions in small office-based organizations and is available online at: http://www.wri.org/climate/pubs_description.cfm?pid=3756. Other tools can be used to supplement the analysis as necessary. For instance, Environmental Defense has provided an easy-to-use calculator for paper emissions, which provides as accurate an assessment of this emissions source as is currently available. It is available online at: www.papercalculator.org
4. Become familiar with the calculating tools that will be used. After choosing an appropriate calculator, review it prior to initiating the data collection process. Identify the needed data, note the units of the data, and consider how and where to collect the necessary data.
5. Keep a detailed and specific record of the steps taken and where data and information is collected. This is invaluable for double-checked and verifying the calculations and ensures the transparency of the analysis. This also provides a basic roadmap for the continuation of the analysis in future years even if the original staff person or team is no longer able to conduct the analysis.
6. Institutionalize the data collection process. The biggest hurdle in the initial calculation of an organization's carbon footprint may very well be the data collection (especially for staff transportation). Creating a system to collect data on a continuous basis can save significant time and effort in subsequent assessments. For instance, the expense reporting procedure can be modified

to require the reporting of transportation data along with expenses. With such a system, at the end of the year, the data is already collected and can easily be accessed for the actual analysis. Other methods certainly exist for streamlining this process and instituting these will greatly ease the replication of this exercise in future years.

7. Keep track of the units of the data throughout the measurements and calculations. Know what is being measured and make sure the units are consistent throughout a calculation. Be especially alert to the units of the emission factors utilized in the calculators and make sure the data align with these. If purchasing offsets, note the unit of the offset. Offsets are generally marketed in tons, and there are three types of tons (short, long, and metric).
8. Use the analysis as a starting point to a conversation on reducing your organization's footprint – both in terms of carbon emissions and in a more general discussion of natural resource consumption. Measuring and accounting for an organization's emissions is only the first step, and is generally the static, dry step; the engaging and dynamic process of discussing, strategizing, and collaborating to reduce the organization's emissions is where the most fun can be found, and where meaningful action can occur. Reduction strategies are thus a crucial outgrowth of this analysis.
9. Engage all levels of staff in the process of developing a reduction strategy. A staff-wide meeting to, first, present the results of the carbon footprint analysis and, second, discuss mechanisms for reducing this figure is a valuable step to take after completion of the calculations. This provides an excellent opportunity to spread education and awareness on carbon emissions. By engaging everyone in the process, the entire staff acquires a vested interest in achieving the reductions. Further, the various perspectives that individual staff members bring to the table will undoubtedly add unique and innovative ideas to the strategy, thereby improving the effort.
10. Maintain transparency. An important outcome of a carbon footprint analysis is the realization and quantification of an organization's (or individual's) contribution to the build-up of carbon in the atmosphere. Taking responsibility for this on an organizational and personal level is the type of shift in mindset that will be needed to achieve meaningful action on addressing climate change. Display and disseminate the results and be ready to discuss them with others. Use your experiences to motivate others to follow in your "footsteps."

Resources and Links:

1. General climate change resources

Intergovernmental Panel on Climate Change

The Intergovernmental Panel of Climate Change is a scientific intergovernmental body created by the World Meteorological Organization and the United Nations Environment Programme in 1988 to provide decision makers with an objective source of information about climate change. It serves to assess and collate the latest scientific, technical, and socio-economic literature to understand the risk of human-induced climate change, its observed and potential impacts, and options for adaptation and mitigation. It has emerged as the consensus of scientific thought on the topic of climate change. More information is available at: www.ipcc.ch

Pew Center on Global Climate Change

The Pew Center on Global Climate change is an environmental non-profit that strives to provide credible information, straight answers, and innovative solutions to address climate change. The Center is an in-depth and comprehensive resource that covers the science of climate change and additionally explores policy and business leadership in the face of this global challenge. More information is available at: www.pewclimate.org

David Suzuki Foundation's Carbon Neutral Program

The David Suzuki Foundation is a Vancouver-based environmental non-profit charity that strives to balance human needs with the earth's ability to sustain all life. Climate change and clean energy is currently one of four program areas. The Carbon Neutral Program is a component of this program area and an excellent resource to use in developing an understanding of carbon neutrality initiatives. The webpage includes a list of organizations working towards carbon neutrality to serve as examples and also highlights what the Suzuki Foundation has done itself. Further, it contains an extensive list of resources on calculating emissions, working to reduce emissions, and offsetting emissions. More information is available at: http://www.davidsuzuki.org/Climate_Change/What_You_Can_Do/carbon_neutral.asp

2. Calculating Carbon Footprints

The Carbon Trust's "Carbon footprinting: An introduction for organizations." August 2007.

This document is a brief and simple written explanation of the carbon footprint concept. It is not overly detailed or technical, and instead provides a solid overview of the topic. This document is available at: <http://www.carbontrust.co.uk/publications/publicationdetail?productid=CTV033>

World Resources Institute's "Working 9 to 5 on Climate Change: An Office Guide." 2002.

The World Resources Institute is a Washington D.C. based environmental non-profit that focuses on moving human society to live in ways that protect the earth's environment and its capacity to provide for the needs and aspirations of current and future generations. This Office Guide is based on experiences gained implementing WRI's CO2 reduction commitment and is designed to help other office-based organizations understand climate change and the practical steps they can take to measure and reduce their CO2 emissions. The written document is accompanied by Microsoft Excel spreadsheets that allow organizations to quantify their carbon emissions. More information is available at: http://www.wri.org/climate/pubs_description.cfm?pid=3756

World Resources Institute's "Hot Climate, Cool Commerce: A Service Sector Guide to Greenhouse Gas Management." 2006.

This document is an extension of the above Office Guide, focusing on the service sector. It provides insight on managing greenhouse gas (GHG) emissions, detailing the various steps necessary to manage, track, and reduce GHG emissions. The written document is available at: http://www.wri.org/climate/pubs_description.cfm?pid=4137

Environmental Defense's Paper Calculator

The Paper Calculator calculates the lifecycle environmental impacts of paper, basing these calculations on research done by the Paper Task Force, a peer-reviewed study on the lifecycle environmental impacts of paper production and disposal. This tool is available at: www.papercalculator.org. More information on the Paper Task Force is available at: <http://www.environmentaldefense.org/article.cfm?contentid=1689>

Clean Air-Cool Planet's Campus Climate Action Toolkit

Clean Air-Cool Planet is an environmental non-profit committed to finding and promoting solutions to climate change. One area of focus is college campuses, and this toolkit is a comprehensive guide designed to help colleges and universities improve sustainability and limit their impact on the climate. A key component of the toolkit is a greenhouse gas emissions inventory calculator specifically designed for campuses. This has emerged as the leading resource for calculating greenhouse gas emissions from colleges and universities.

The toolkit is available at: www.cleanair-coolplanet.org/toolkit/.

The Greenhouse Gas Protocol Initiative

The Greenhouse Gas Protocol Initiative is a decade-long partnership between the World Resources Institute and the World Business Council for Sustainable Development. It has emerged as the most widely used international accounting tool for government and business leaders to understand, quantify, and manage greenhouse gas emissions. The Initiative's website has a range of helpful resources. The GHG Protocol Corporate Standard, for instance, is a guide to preparing a greenhouse gas inventory for public and private sector organizations. More information is available at www.ghgprotocol.org

EPA's Climate Change Emission Calculator Kit (Climate CHECK)

The Environmental Protection Agency has developed a Microsoft Excel-based toolkit designed to enable students in high schools to calculate the greenhouse gas

emissions from the schools. It is designed to be a teaching tool in addition to its role as a calculating tool, and is designed specifically for high schools. It can be downloaded from www.epa.gov/climatechange/wycd/school.html

3. Reduction strategy resources

The Environmental Grantmakers Association's "Green Beyond Grants." April 2007.

The Environmental Grantmakers Association has partnered with The Funders Workgroup for Sustainable Production and Consumption and The Sustainable Agriculture and Food Systems Funders to launch this project. It is an introductory toolkit intended to help foundations improve the environmental sustainability of their operations, focusing on five broad areas: energy conservation, purchasing green materials and supplies, serving sustainable food and beverages, reducing waste, and conscious traveling. This guide is a helpful tool for organizations looking to implement initiatives aimed at reducing environmental footprints, and can be accessed at:

<http://www.ega.org/news/docs/GreenOffice.final3.pdf>

3. Carbon offset resources

Clean Air-Cool Planet's "The Consumer's Guide to Retail Carbon Offset Providers." December 2006.

Clean Air-Cool Planet is an environmental non-profit that is committed to finding and promoting solutions to climate change. This report is an independent survey and evaluation of retail offset providers, using seven evaluative criteria: providers' prioritization of offset quality; buyers' ability to transparently evaluate offset quality; transparency in provider operations and offset selection; provider's understanding of the technical aspects of offset quality; providers' emphasis on educating consumers about global warming and global warming policy; ancillary environmental and sustainable development benefits of the offset portfolios; and use of third-party project protocols and certification. The report can be found at: <http://www.cleanair-coolplanet.org/>

Tufts Climate Initiative's "Voluntary Offsets for Air-Travel Carbon Emissions." December 2006.

The Tufts Climate Initiative is an initiative of the Tufts University Institute of the Environment, and works closely with University operations, faculty, staff, and students on the four key issues of carbon dioxide reductions, research and monitoring, education, and outreach and events. The report examines the rapidly growing market for voluntary carbon offsets and seeks to provide assessments on the credibility of a selected group of providers. Although it focuses primarily on evaluating the offset of air travel emissions, the report provides a thorough description and discussion of the characteristics of offset quality and credibility in general. The report can be found at:

<http://www.tufts.edu/tie/tci/carbonoffsets/index.htm>

Gold Standard Foundation

The Gold Standard – originally created for the Kyoto Protocol's Clean Development Mechanism and Joint Implementation – is an independently audited, globally applicable

best practice methodology for project development that delivers high quality carbon offset credits. More information is available at: <http://www.cdmgoldstandard.org/>
Information on the Gold Standard for voluntary offsets is available at:
http://www.cdmgoldstandard.org/how_does_it_work.php?id=44

The Carbon Trust's "The Carbon Trust three stage approach to developing a robust offsetting strategy." November 2006.

The Carbon Trust is a U.K. based governmental organization that works with the business and public sectors to cut carbon emissions and capture the commercial potential of low-carbon technologies. This report aims to help consumers develop the understanding and knowledge to determine the quality of offset projects. It's intended to help organizations navigate the offset market and develop a robust offsetting strategy. This document is available at:
<http://www.carbontrust.co.uk/publications/publicationdetail?productid=CTC621>

Business for Social Responsibility and Ecosystem Marketplace's "Offsetting Emissions: A Business Brief on the Voluntary Carbon Market." December 2006.

Business for Social Responsibility is a nonprofit business association that provides innovative business solutions to many of the world's leading companies. Ecosystem Marketplace provides information on markets and payment schemes for ecosystem services in an effort to give value to these long-overlooked environmental services. This report is intended for companies considering purchasing voluntary carbon offsets. It intends to educate and help guide consumers through the assessments of offset credibility within the voluntary market. The report is available at:
http://ecosystemmarketplace.com/documents/acrobat/em_voluntary-carbon-offsets.pdf

4. Reporting resources

The Climate Registry

The Climate Registry is a newly emerging voluntary greenhouse gas emissions reporting mechanism. North American entities can opt into this mechanism and, beginning in 2008, will report verified emissions data which will be annually published on the Registry's website. More information is available at www.theclimateregistry.org

The Carbon Disclosure Project

The Carbon Disclosure Project is a U.K. based non-for-profit that serves as a secretariat for over 300 of the world's largest institutional investors to gather information on the risks and opportunities of climate change and collect greenhouse gas emissions data. On behalf of the investors, the organization creates and distributes a questionnaire to the world's largest corporations. The results from corporations that chose to respond are annually released in a report. More information and access to the reports, which date back to 2002, can be found at www.cdproject.net

Glossary

Additionality – a trait of carbon offsets that ensures projects extend above and beyond business-as-usual. At the root of this consideration is the question, would this project have happened without the investment by carbon offset providers?

Carbon Calculators – mathematical frameworks that use embedded equations and emissions factors to automatically calculate carbon emissions from energy consumption data. These are useful for determining the carbon footprint of an action or organization.

Carbon Dioxide Equivalent – the commonly unit used to express a quantity of greenhouse gas emissions. This unit is a representation of the amount of carbon dioxide that would equal the same warming effect as caused by the release of a certain amount of a different greenhouse gas. It is established based on the varying global warming potentials of greenhouse gases.

Carbon Footprint – an assessment of the amount of greenhouse gases released into the atmosphere by an action or series of actions. Individuals and organizations are increasingly using this tool to measure the impacts of their lives and operations.

Carbon Neutral – a term used to describe an activity or event that does not result in a net increase in the amount of greenhouse gases in the atmosphere. This can be achieved by switching consumption patterns away from sources that generate greenhouse gas emissions or by investing in qualifying carbon offsets.

Carbon Offset - a mechanism to mitigate an organization's GHG emissions by investing in off-site projects that negate a quantifiable amount of emissions. Qualifying offset projects achieve reductions by removing carbon dioxide from the atmosphere (sequestration) or by preventing its initial release (renewable energy and energy efficiency installations). Third party carbon offset providers often facilitate offset purchases.

Carbon Offset Providers – third party organizations (can be for profit or non profit) working in the voluntary carbon offset market of developed countries. These companies specialize in identifying carbon offset projects and bringing these to the public to allow interested consumers to financially support the project as a means to reduce their carbon footprint. These brokers identify and certify offset projects and also evaluate the emission reduction potential of prospective projects to determine the necessary investment to counter-act calculated GHG emissions.

Carbon Sequestration – the capture and permanent storage of greenhouse gas emissions. This can occur before the emissions have a chance to enter the atmosphere (i.e. technology to capture emissions at point sources) or after the emissions are in the atmosphere (forest and soil uptake of carbon).

Certification – the process in the voluntary carbon offset market that focuses on third-party oversight of offset projects to confirm set-up and credibility of the project.

Direct Emissions – emissions stemming from apparatus or infrastructure that is directly under the ownership of an organization; furnaces and/or boilers in an owned building are examples of sources causing direct emissions.

Emissions Factors – Metrics that quantify the amount of carbon dioxide and/or carbon dioxide equivalents released from a given unit of consumption, thereby allowing for the mathematical conversion of raw consumption data into the resultant amount of greenhouse gas emissions released through the activity.

Global Warming Potential – a metric to quantify the potency of each greenhouse gas. It is a measurement of the gas' potential to absorb and trap thermal energy over 100 years and uses carbon dioxide (GWP = 1) as the arbitrary reference point.

Greenhouse Gas Emissions – human-driven additions to the natural suite of greenhouse gases. The Kyoto Protocol identifies six specific greenhouse gas emissions, including carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride.

Indirect Emissions – emissions that are caused by one's actions but do not arise from physical apparatus or infrastructure that is directly own and operate; electricity is the prime example.

Reduction Strategies – Direct, on-site actions that achieve reductions in the amount of greenhouse gas emissions from an action or series of actions.

Retirement – the permanent removal of purchased carbon offsets from the market. Third party organizations are generally called on to sign agreements to hold the carbon benefits of the offsetting organization's share of the project in perpetuity.

Scope 1 Emissions – all direct greenhouse gas emissions from sources owned or controlled by an entity

Scope 2 Emissions – indirect greenhouse gas emissions that are associated with purchased electricity, steam, and heating or cooling.

Scope 3 Emissions – all indirect greenhouse gas emissions that are not associated with purchased electricity, steam, and heating or cooling.

Verification - the process in the voluntary carbon offset market that focuses on third-party oversight of offset projects to track the project to ensure that it is actually meeting the goals on which it was sold.