Society for Conservation Biology
Ecological Footprint Committee

2009 Ecological Footprint Assessment

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2009 Ecological Footprint Assessment

The Ecological Footprint Committee (EFC) of the Society of Conservation Biology (SCB) is tasked with measuring the ecological footprint and greenhouse gas (GHG) emissions of the organization. In addition to completing these annual assessments, the EFC's other main goals are to enable SCB to offset its GHG emissions, and to "reduce the ecological footprint of all SCB operations, purchases, and activities."[1]

This Ecological Footprint Assessment for calendar year 2009 marks our 2nd attempt to account for the environmental impacts of SCB's activities. The first Ecological Footprint Assessment for 2008 was a notable first step for our organization, and this year's iteration seeks to build upon and refine the methods used in the previous effort.[2] As before, this report presents both an annual GHG emissions assessment and an Ecological Footprint assessment for SCB's 2009 operations.[3] These twin assessments, while related, provide different metrics for analyzing SCB's environmental impacts.

- A GHG assessment, or "carbon footprint," converts activities such as air travel into the resulting amount of CO_2 emitted into the atmosphere.

- An Ecological Footprint assessment converts consumed resources into component raw materials, and finally to equivalent hectares of biologically productive land.

With both of these results in hand, SCB can have an understanding of both its contribution to global climate change in metric tons of CO_2 equivalent[4], as well as its demand for productive land and sea.

Having completed our first Ecological Footprint Assessment last year, SCB is now in the position to track changes in our environmental impacts over time. Adding data from each successive year will reveal the effects of any operational or institutional changes at SCB, and will allow us to weigh those choices against their ecological results. We are still very early in building this "time series" of information, and conclusions must bear this in mind. For example, SCB made improvements in data-gathering for some activities in this year's assessment, which allowed the EFC to use more accurate calculation methods. Simply changing the calculation methods can influence the results, however. Therefore, all of the year-to-year differences highlighted by this assessment cannot totally be ascribed to a change in behavior on the part of SCB. Such ambiguities are noted in the report.

On the other hand, some year-to-year changes are clearly explained by an actual change in activity – for example, the increased GHG emissions from Air Travel to the Global Congress in Beijing as

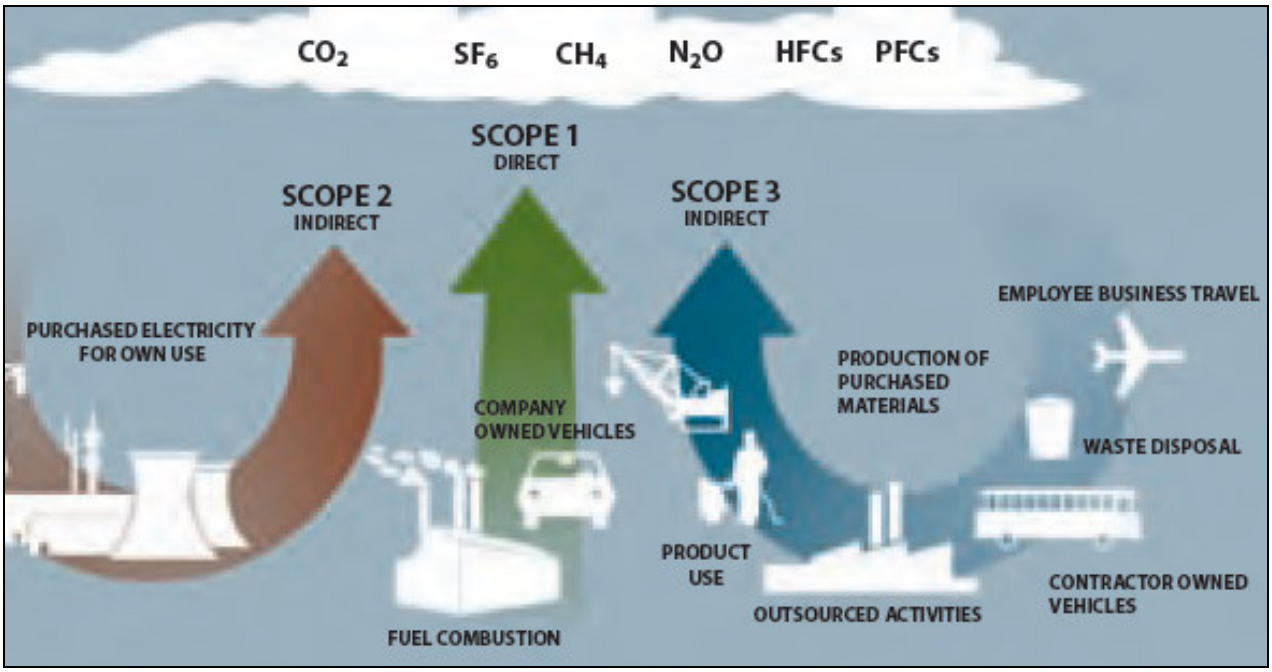
[1] See the Ecological Footprint Committee Terms of Reference, 2008, for a full description.
[2] See the SCB 2008 Ecological Footprint Assessment for reference and comparison. www.conbio.org/Activities/Committees/EcologicalFootprint/CarbonOffset/2008_SCB_assessment.pdf.
[3] See www.footprintnetwork.org/ for a more complete description of an Ecological Footprint.
[4] CO_2 equivalent, or CO_2 e, refers to the fact that emissions of all six classes of greenhouse gas are converted into an equivalent amount of carbon dioxide, based on relative global warming potentials.

compared to the previous year's meeting in Tennessee. Early conclusions or trends will also be discussed later in this report.

SCB aims to maintain its current operations and expand its scientific and educational outreach around the globe while simultaneously reducing its environmental impacts. This can only be accomplished by making SCB's activities more ecologically efficient. The 2009 Ecological Footprint Assessment for will enhance SCB's understanding of our own operations, and allow us to continue to build a framework for further improvements. , The following sections of this assessment explain the boundary of included activities, data gathering processes, calculation methods, and assumptions. The results from 2008 and 2009 are presented for comparison, along with conclusions and recommendations for the SCB Board of Governors. The complete raw data for the 2009 Ecological Footprint Assessment can be found in **Annex 1** at the end of this report.

Assessment Boundary: included activities

SCB carries out many activities, some of which are not directly controlled by SCB. Thus, there is some grey area in terms of what should be included in an environmental assessment of SCB's operations. A useful way to organize an organization's functions is presented in the figure below.[5]



Traditional Greenhouse Gas Assessments require only Scope 1 and Scope 2 activities to be included, while Scope 3 (indirect) emissions can be included based on the desires of the organization. The Environmental Footprint Committee decided to take an ambitious approach and include as many Scope 3 activities as possible. The boundary for the 2009 evaluation is essentially the same as 2008, for the sake of consistency. The list of activities for this assessment includes:

[5] Modified from the World Resources Institute Greenhouse Gas Protocol – www.ghgprotocol.org.

Scope 1 activities (owned or directly controlled by SCB)

- Physical area of SCB offices (for the Ecological Footprint Assessment)

Scope 2 activities (purchased energy)

- Electricity use at SCB Executive Office (EO)
- Natural gas use at SCB EO

Scope 3 activities (indirect impacts)

SCB Operations

- Water use at the SCB EO
- Paper use at the SCB EO
- Waste disposal from EO
- Air travel and car travel for SCB staff members
- Hosting of the SCB website
- Employee commuting
- Commercial printing, advertising and newsletters

SCB Annual Meeting (2009, Beijing)

- Air travel to and from the event for attendees
- Car travel to and from the event for attendees
- Field trips and local tours
- Hotel accommodations
- Catering (food and beverages)
- Waste and recycling at the conference
- Electricity use at the conference venue
- Printing and advertising

Smith Fellows Program

- Air travel to and from meetings for participants
- Car travel to and from meetings for participants
- Hotel accommodations
- Catering (food and beverages)
- Field trips

Conservation Biology

- Printing
- Shipping and distribution

Conservation Magazine

- Printing
- Shipping and distribution
- Other production and operations activities

Conservation Letters

- Printing
- Shipping and distribution

This list covers most of SCB's direct and indirect environmental impacts. We excluded an activity from the list if it was too difficult to measure or determined to be outside of SCB's potential influence. We encourage readers to advise the Committee of any significant activity we inadvertently overlooked. This assessment boundary can be revised in future years.

Data Gathering

Data for this assessment come from a variety of sources, and in a variety of formats. Several people contributed information for this assessment, going above and beyond their regular job duties to ferret out trip itineraries at the 2009 Beijing Global Congress, or natural gas bills for the SCB office. Because this was an all-volunteer effort among people with other jobs, we had to balance precision and practicality. We made reasonable attempts to obtain hard data from primary sources, but in some cases we had to rely on "best guess" assumptions and memory. When we were unsure about an assumption or calculation, we chose values that tended to over-estimate, rather than under-estimate an impact.

Some of the obstacles to data gathering for this assessment were new this year. For example, the Local Organizing Committee for the Beijing meeting did not respond to requests for information about the conference venue or the operations of the conference. This required us to make several assumptions that may not be accurate.

Furthermore, some of the difficulties identified in last year's Ecological Footprint Assessment still exist. For example, travel and commuting information for SCB staff was still recalled from memory and presented in different formats, rather than recorded consistently at the time of the actual trip. Also, flight itineraries were not available for Smith Fellows participants, and the production offices of SCB publications were unprepared to deliver necessary information. These obstacles impact the accuracy and consistency of the Ecological Footprint Assessments, and at the end of this report we present a few suggestions for improving the data-gathering process.

Calculation Methods

<u>Calculation of GHG emissions</u>

Producing an estimate of GHG emissions from a particular activity can proceed in one of three ways, depending on the quality of the available data. An overview of each method and the circumstances under which it was used is below and ordered from most to least precise:

- Given a known quantity of fuel, energy, or raw material, we multiplied this by an emissions factor, which is a rate of tons or pounds (lbs) of CO_2e emitted per quantity of the material consumed (for example, 24.692 lbs CO_2e/ gallon of gasoline).

- When the quantity of raw material was not known, or SCB's share of the total cannot be known, we used emissions factors based on secondary units of consumption, such as passenger air-miles flown (0.64 lbs CO_2e/passenger air-mile flown), or hotel room-nights (29.53 kg CO_2e/ hotel night). These emissions factors are based on published data and tools that have been scientifically vetted and produced for public use – for example, the World Resources Institute Greenhouse Gas Protocol. These emissions factors will be updated from time to time as new data become available.

- In cases where consumption data weren't available, we converted dollars spent on the activity into CO_2e emissions, using a Life Cycle Assessment tool. Two models that we used in this assessment were the Economic Input-Output Life Cycle Assessment (EIO-LCA) tool built by the Carnegie Mellon Green Design Institute and the Cascadia Seattle Climate Partnership tool. An EIO-LCA breaks an economic activity into its main component activities, estimates average CO_2e per dollar for the entire sector of the economy related to each activity, and sums the greenhouse gas emissions of each component activity.[6] For example, a dollar spent on "commercial printing" emits greenhouse gasses from several component sectors, including pulpwood harvesting, paper manufacturing, transportation, energy use, ink manufacturing, etc. Although EIO-LCAs are powerful tools, they rely on many assumptions and give outputs that represent an aggregated national perspective rather than a particular, localized activity. EIO-LCAs are becoming increasingly sophisticated; for instance some models discriminate between printing on recycled versus virgin paper.

Calculation of Ecological Footprint

The Ecological Footprint of an organization is a measure of the amount of biologically productive areas required to support the consumption activities of that organization. SCB's Ecological Footprint, for example, includes the forest needed to grow the trees that become the paper distributed in SCB journals and magazines, the cropland needed to provide the meals served at SCB meetings, the area needed to absorb the fossil carbon dioxide emitted from electricity use in the SCB office, and many other activities.

In simplest terms, the Ecological Footprint of a material (e.g., 1 kg of paper) is calculated by first translating that material back into its primary product equivalent (e.g., 1 kg of paper requires 2 kg of raw wood to be harvested), which is then divided by the yield, in metric tons per hectare each year, of the land from which the material was harvested. This provides an Ecological Footprint in units of hectare-years, representing the area required to produce that material over the course of a year. Most Ecological Footprint analyses normalize these hectares into *global hectare-years*, or hectares with world average biological productivity, for the purposes of adding areas together and comparing results across land types.[7] We follow this convention.

The Ecological Footprint of fossil carbon dioxide emissions generally forms a substantial part of the total Ecological Footprint of an organization. The Footprint of an organization's carbon dioxide emissions is calculated as the productive area of world-average forest required to absorb that amount of carbon dioxide. This method is designed to produce conservative values, as using carbon dioxide absorption yields for non-forest land types would yield higher Ecological Footprint estimates. We used an estimate of 0.2771 ha/ metric ton fossil CO_2e emitted. The full calculations for Ecological Footprint figures are presented in **Annex 1** of this assessment.

[6] Please see http://www.eiolca.net/cgi-bin/dft/use.pl for complete information on this particular tool and LCAs in general.

[7] Please see the papers listed at http://www.footprintnetwork.org/en/index.php/GFN/page/methodology/ for more details on Ecological Footprint accounting methodology.

2008 and 2009 Estimates of Greenhouse Gas Emissions and Ecological Footprint

The following table presents the summary of GHG emissions and Ecological Footprint values for the activities included in this assessment. 2008 and 2009 values are presented side-by-side for comparison. Values that were calculated using different methods have been noted, and the compete data and calculations for 2009 figures are presented in **Annex 1** at the end of this report.

Activity (by Scope)	2008 GHG Emissions	2008 Ecological footprint	2009 GHG Emissions	2009 Ecological footprint
	(metric tons CO2e)	(global ha-years)	(metric tons CO2e)	(global ha-years)
Scope 1 activities (owned or directly controlled by SCB)				
Physical area of the SCB Executive Office (EO)	NA, 3,235 sq. ft	0.04	NA, 3,235 sq. ft	0.04
Scope 2 activities (purchased energy)				
Electricity use at SCB EO	8.21[a]		8.80[a]	
Natural gas use at SCB EO	9.17[a]		5.50[a]	
SUB-TOTAL (Scope 1 and 2)	17.38		14.29	
Scope 3 activities (indirect impacts)				
SCB Operations				
Water use at the SCB EO	0.32[a]		0.07[a]	
Paper use at the SCB EO	0.03[a]	0.1[b]	0.03[a]	0.11[b]
Waste generated at SCB EO	NA, 720 gal/year		NA, 720 gal/year	
Recycling generated at SCB EO	NA, 720 gal/year		NA, 720 gal/year	
Company air travel for SCB staff members	43.44[b]		91.42[b]	
Company car travel for SCB staff members	0.38[b]		0.87[b]	
Hosting and maintenance of the SCB website	Not Available		2.18[d]	

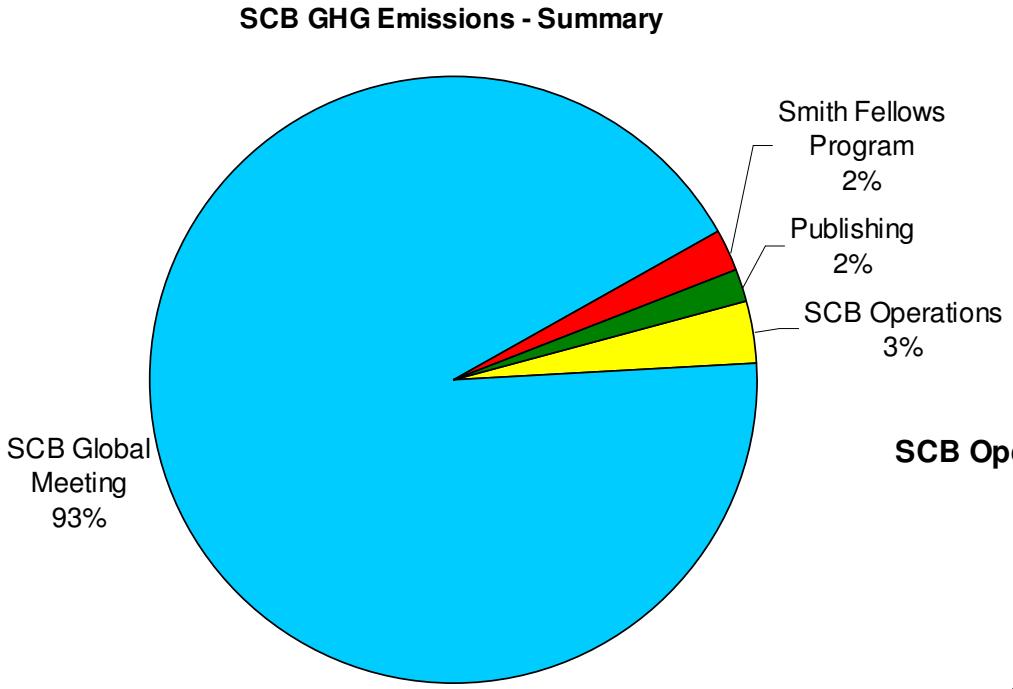
Employee commuting	1.53 [b]		5.82 [b,h]	
Commercial printing, advertising, and newsletters	16.62[e]	2.28 [b]	10.89 [e,h]	1.60 [b]
SUB-TOTAL (SCB Operations)	62.31		111.29	
SCB Global Congress (2008 in Chattanooga, TN and 2009 in Beijing, China)				
Air travel to and from the event for attendees	3026.63[c]		3292.37 [c,h]	
Car travel to and from the event for attendees	5.29 [c]		16.83 [c,h]	
Field trips and local tours	Not Available		59.82 [c]	
Hotel and dorm room accommodations	Not Available		121.75 [g]	
Catering (food and beverages)	56.50	1.32 [g]	18.28 [c,h]	0.81 [g]
Waste and recycling at the conference	Not Available		Not Available	
Electricity use at the conference venue	74.26 [d]		74.26 [f]	
Printing or advertising	1.01 [e]		1.01 [f]	
SUB-TOTAL (SCB Annual Meeting)	3163.69		3584.33	
Smith Fellows Program				
Air travel to and from meetings for participants	81.98 [b]		58.52 [b]	
Car travel to and from meetings for participants	3.39 [b]		4.36 [b]	
Hotel accommodations	6.07 [g]		6.08 [g]	
Catering (food and beverages)	9.87 [b, e]	0.49 [g]	18.40 [b, e]	0.38 [g]
Trips	Not Available		2.48 [b]	
SUB-TOTAL (Smith Fellows Program)	101.31		89.84	

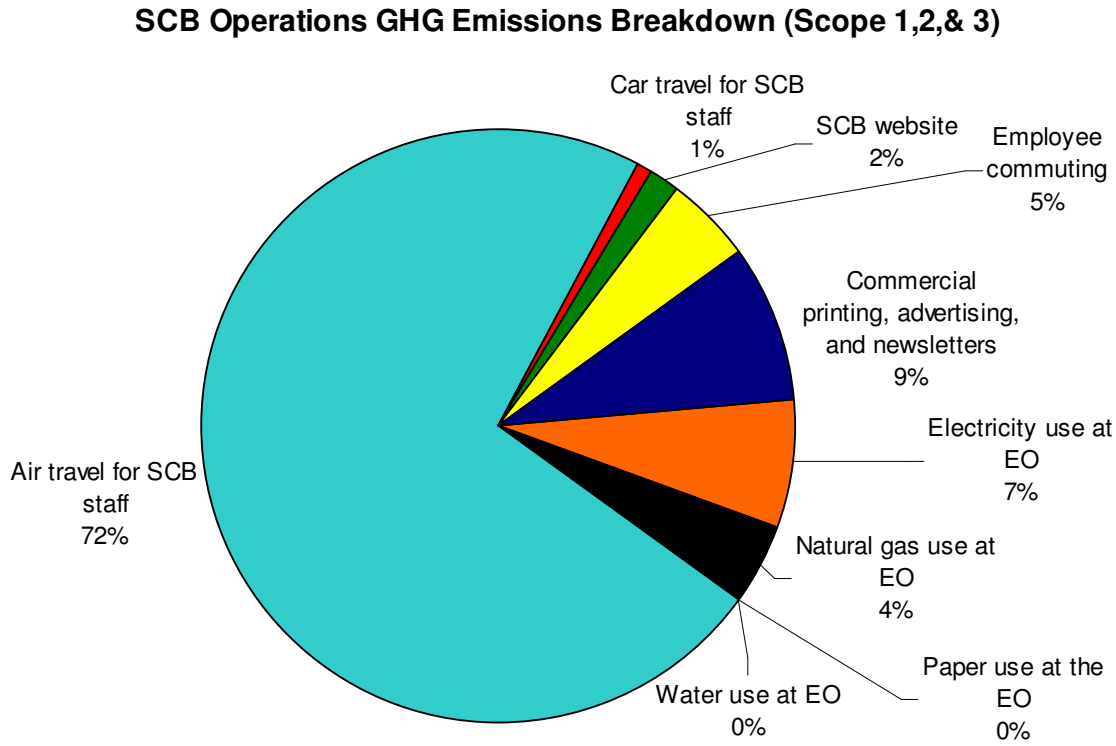
Conservation Magazine				
Printing and design	57.72 [e]	16.86 [g]	33.83 [e,h]	10.89 [b,h]
Shipping and distribution	4.18 [e]		5.05 [e,h]	
Other production and operational tasks	Not Available		20.92 [e]	
Conservation Letters (online publication)				
Printing and design	Not Available		Not Available	
Shipping and distribution	Not Available		Not Available	
Conservation Biology				
Printing	Not Available	41.95 [g]	Not Available	27.61 [d]
Shipping and distribution	25.00 [d]		Not Available	
SUB-TOTAL (Publishing)	86.90		59.80	
GRAND TOTAL ECOLOGICAL FOOTPRINT (EXCLUDING CO_2e)		63.04		41.44
GRAND TOTAL CARBON FOOTPRINT	**3431.60**	949	**3859.56**	1069.48
GRAND TOTAL ECOLOGICAL FOOTPRINT		**1012.04**		**1110.92**

Key to annotations in the table:

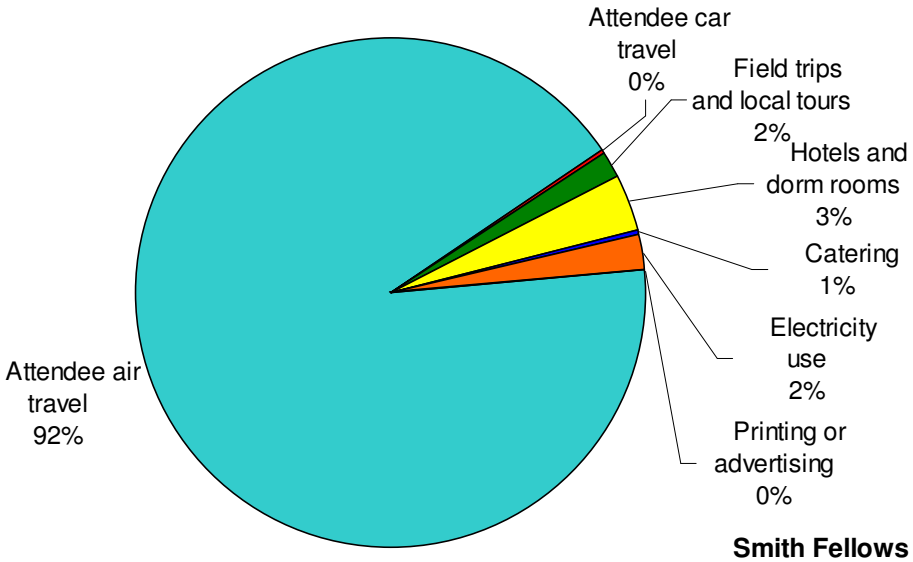
a = data gathered from bills and converted to consumption units
b = data gathered from staff notes and recollections
c = data gathered from conference registration records
d = data provided from an external 3rd party (for example: Intermedia Web Hosting or Wiley Publishers)
e = data gathered from purchasing records and calculated using an LCA tool
f = data unavailable for current year, so values are assumed to be the same as last year
g = not recorded directly, used a reasonable estimate
h = calculated using slightly different methods from the previous year (new emissions factors or new data categorization - see Annex 1 for further details)

The following charts present the relative contributions of the various activities to SCB's GHG emissions and Ecological Footprint values.

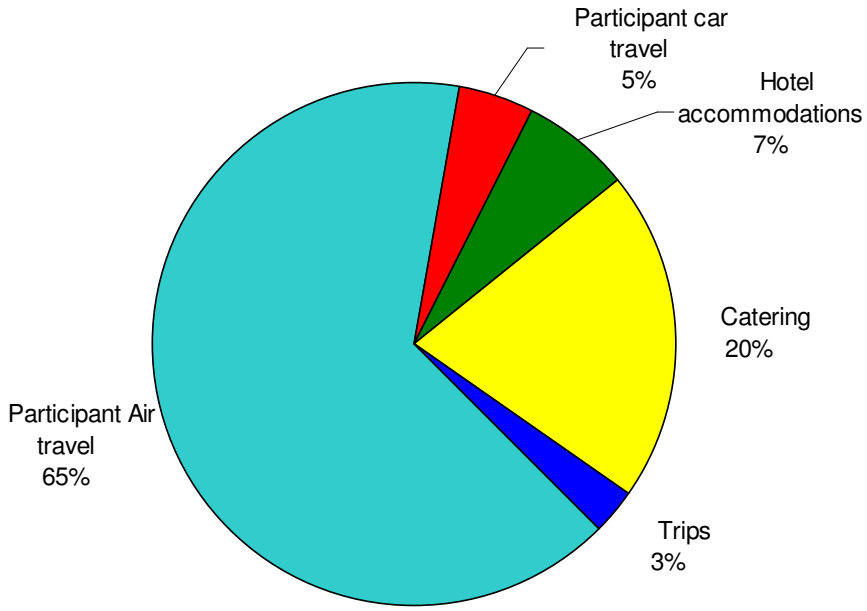




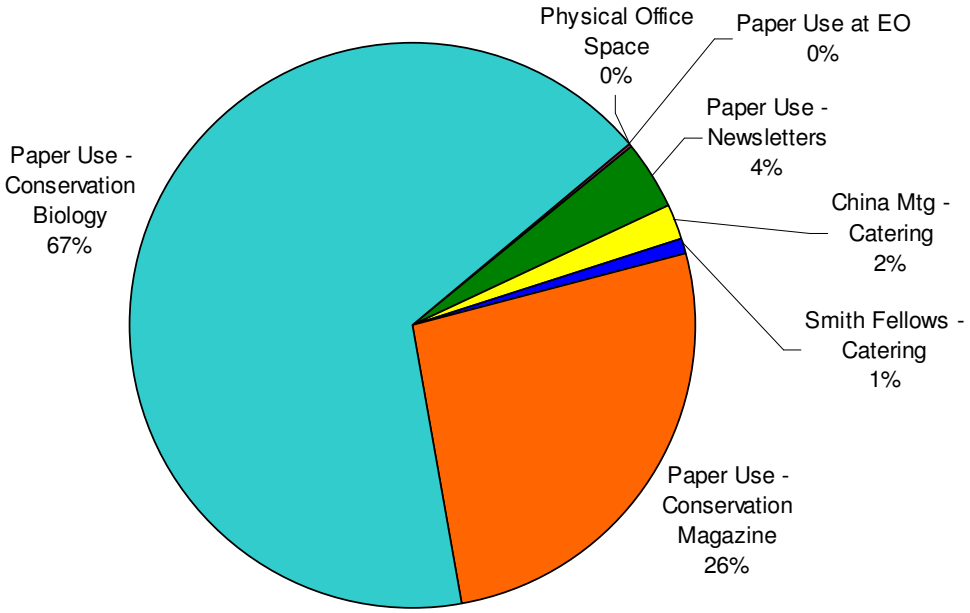
China Global Meeting GHG Emissions Breakdown



Smith Fellows Program GHG Emissions Breakdown



SCB Ecological Footprint Summary
(excluding GHG emissions)



Results: GHG emissions and Ecological Footprint

Carbon Footprint - GHG Emissions

In 2009 SCB was responsible for a total of approximately 3,860 metric tons of CO_2e emissions. This compares with an estimated total of 3,431 metric tons of CO_2e emissions in 2008. Some of the main differences between 2008 and 2009 GHG emissions are described below:

Global Congress

Much of the increase in GHG emissions (about 400 metric tons from 2008 to 2009) can be attributed to a larger carbon footprint from the 2009 Global Meeting in China. There are two main reasons for this increase: 1) Attendee air travel to the 2009 meeting was about 200 tonnes greater than the 2008 meeting (despite having ~25% fewer attendees); and 2) GHG emissions were estimated for more activities in 2009 than 2008 (hotel accommodations and field trips were not included in 2008 due to a lack of information). Overall, in 2009 approximately 85% of SCB's total GHG emissions were due to attendee air travel to the Global Congress in Beijing. In 2008, this activity represented 88% of SCB's total emissions. Attendee travel represented a smaller proportion of the total this year because of the addition of hotel accommodations and field trips to the covered list of activities.

SCB Operations

GHG emissions resulting from natural gas and water use at the SCB Executive Office declined from 2008 to 2009, however it is unknown if SCB staff have implemented any specific changes that led to this decline. Staff air travel in 2009 increased over 100% from 2008 figures, due to staff travel to Beijing for the Global Meeting.

Smith Fellows Program

The carbon footprint of the Smith Fellows Program showed a 10% reduction from 2008, primarily due to a substantial decrease in the GHG emissions from air travel of participants. This may have been a function of the event locations (which vary from year to year) and the number of attendees at each event.

Publishing

SCB publishing generally showed a decrease in GHG emissions, but this sector still suffers from information shortages and inconsistent calculation methods.

Overall, in 2009, core SCB operations (Scope 1, 2, and 3) account for only 3% of the total carbon footprint, while publishing and the Smith Fellows Program each account for an additional 2% of the total. The Global Meeting accounts for the other 93% of SCB's total carbon footprint.

Ecological Footprint

SCB's Ecological Footprint is about 1,110 global hectare-years, meaning that about 11 km^2 of land worldwide is needed to support or offset our operations. The bulk of our Ecological Footprint (96.3%) is comprised of global hectare-years of forest land that would be required to sequester SCB's GHG emissions. This is a slight increase from 2008. Excluding GHG emissions, SCB's Ecological Footprint declined by approximately 33% (63.04 to 41.44 global ha-years) from 2008 to 2009. This reduction can primarily be attributed to reduced impacts from newsletters and publishing. Conservation Magazine recently converted to FSC-certified paper sources with a 30% recycled content. The SCB office also uses paper with this same recycled content, so it is assumed that the SCB newsletter is printed on similar paper. New data from the Conservation Biology publishing staff has not yet been received, but it is our understanding that this journal uses a similar paper stock.
Ecological footprint values for food production were generally lower in 2009 than 2008, probably because of fewer attendees at both the China Global Meeting and the Smith Fellows events.

Recommendations for Future Assessments

This report is only as accurate as the data and assumptions that feed the calculations. To improve data and assumptions in future assessments, we offer the following recommendations:

- The Executive Office and organizers of our Global Meetings should strive to record more detailed information to upgrade components of the assessment. The Local Organizing Committee for the Beijing meeting did not respond to requests for information, which definitely hampered our efforts in this assessment. For future meetings, SCB should make it a prerequisite that certain information will be shared in a timely manner between the LOC and the EFC. For the 2010 Global Congress in Edmonton, EFC staff have already been in touch with LOC staff to pre-request certain information and inform them of our eventual data needs. This means that the 2010 assessment should go more smoothly, but this should be a standard requirement for all meetings.

- The Executive Office should modify its accounting procedures to track raw figures of resources used (instead of dollars spent) wherever possible. For instance, SCB should record actual kWh of electricity, therms of natural gas, reams of paper used in printing newsletters, etc. This will make calculations more accurate, avoiding assumptions on electricity delivery charges or printing costs. Our goal is to use the EIO-LCA models as rarely as possible. The EFC can inform EO staff what information is required, but this change will require internal support.

- Similarly, the Executive Office should track employee travel (plane trips taken, car trips taken) as they happen so the Committee doesn't have to rely on personal recollections at the end of the year. A simple record-keeping system can make this an easy process, which can be designed and used as an office or individually. A process for capturing this information is already under discussion among EO staff, and should be implemented when ready. It has already come to our attention that the assumptions we made for EO staff Air Travel were likely incorrect, due to different flight itineraries with more direct flights and fewer layovers. This could certainly have reduced the GHG emissions due to Air Travel, but the information was unavailable to the EFC at the time we were performing the calculations.

- Record-keeping for the Smith Fellows Program could also be improved and standardized, so it is easier to determine airline itineraries for attendees, how many hotel-nights were necessary, and how many meals were consumed. Again, this is a simple process that just needs to happen at the time of the event, rather than being recalled 8-12 months after the fact.

- If greenhouse gasses emissions for publications continue to be included in future assessments, the Executive Office and this committee should work with the various publishing teams to ensure a consistent approach for each publication. The staff members of Conservation Magazine and Conservation Biology are not currently prepared to support these assessments with actual data. This is an instance where the SCB EO either needs to formally request that certain information be tracked and shared, or we should quit trying to estimate the impacts from these publications.

- The EO and the team in charge of conference registration should add two questions to the registration process:
  1. Do you plan to drive or fly to the meeting?
  2. If flying, what will be your likely starting airport?

- The EFC and EO, working with local organizers of our global meetings, should reduce the time lag between collecting offset fees, calculating emissions from the meeting, calculating how many metric tons of CO_2e our dollars can buy, and making adjustments to future registration surcharges.

- The SCB Board of Governors has decided that carbon offset fees collected from Global Meeting attendees will be used to purchase offsets for attendee travel as well as the other estimated impacts of the meetings (energy use, local tours, etc). We should be sure to re-check that the carbon offset fees are sufficient to offset these calculated impacts, in case another fee adjustment is warranted. In our current contract negotiations with SCB's newest carbon offset project, the estimated dollar amount SCB will pay is almost not enough to cover the project's costs.

- Similarly, the Smith Fellows Program and the EO should be sure that there is sufficient funding in allocated in their annual budgets to offset estimated GHG emissions.

Decisions to be made by SCB Board of Governors

We recommend that the Board of Governors consider the following issues, and respond either by a formal Board vote, or communicating the sense of the Board to our Committee and to the staff of the Executive Office:

Will SCB continue to take responsibility for the GHG emissions and Ecological Footprint of our publications?

If so, we will need to make formal requests for information and coordinate this effort across publications. This would likely cause a significant increase in the overall SCB carbon footprint.

Will SCB Sections be included in future assessments, or encouraged to follow a similar model for estimating environmental impacts?

SCB Sections likely have similar impacts, and if these impacts are measured then the Sections can contribute more effectively to SCB's indentified carbon offset projects and take steps to reduce their GHG emissions and Ecological Footprints. This assessment could be a model for all SCB Sections.

Will SCB continue with the current model of selecting and sponsoring carbon offset projects?

SCB's participation in the Baviaanskloof thicket restoration project in South Africa ended in 2009, and we are still waiting for data on the acres planted and planting survival of that project before releasing the remainder of our allocated funds. The EFC is currently negotiating with a new carbon offset project at the Wild Rose Conservation Site in Alberta, Canada to purchase the carbon offset rights for 2010, 2011, 2012, and 2013 (to cover our next 3 Global Congress meetings). This process was started without the express permission or guidance of the BoG, and it is worth settling a few questions:

Should SCB continue with the model of sponsoring a project for the estimated future carbon benefits, as opposed to purchasing already certified carbon offsets from an international carbon market?

Our current model gives SCB much more familiarity with the project and generally a cheaper price per tonne of purchased CO_2. On the other hand, it is a great burden to negotiate a binding Emissions Reduction Purchase Agreement, as well as monitoring and reporting guidelines for tracking the progress of the projects. Purchasing certified carbon offsets from a carbon market registry would likely be more expensive, but would probably be more straightforward.

If SCB continues with the model of sponsoring the future performance of carbon offset projects, should there be a more formal process for soliciting and selecting projects?

To-date, the projects have been selected without the wider input of the SCB membership, and screening the projects has been an informal process.

Annex 1

2009 Ecological Footprint Assessment – Detailed Data and Calculations

This Annex is included to provide detail on the data gathered for each segment of the GHG Assessment, and the assumptions and calculation methods used to arrive at a final emissions output. In order to be transparent with our approach and to allow for consistency in calculation methods across years, we have included as much information as possible.

The following color code is used in each of the following tables:

	Information provided by SBC staff
	Standard conversion factor
	Calculated figure
	Greenhouse Gas (GHG) figure

SCB Operations

2009 Monthly Electricity Consumption

Date	Amount	Minus delivery charge [1]	Rate [1]	Electricity Use	Emissions Factor [2]	Line loss factor [3]	GHG Emissions [4]
	($)	($)	($/kWh)	**(kWh)**	(lbs CO2e/kWh)		(metric tons CO2e)
01/26/2009	228.24	213.28	0.15	1404.30	1.09	1.072	0.74
02/20/2009	253.24	238.28	0.15	1568.91	1.09	1.072	0.83
03/13/2009	232.2	217.24	0.15	1430.38	1.09	1.072	0.76
04/28/2009	206.78	191.82	0.17	1161.38	1.09	1.072	0.62
06/02/2009	191.03	176.07	0.17	1066.02	1.09	1.072	0.56
06/23/2009	209.96	195.00	0.17	1180.63	1.09	1.072	0.63
07/23/2009	287.26	272.30	0.17	1648.64	1.09	1.072	0.87
08/31/2009	281.05	266.09	0.17	1611.05	1.09	1.072	0.85
09/24/2009	325.97	311.01	0.15	2047.79	1.09	1.072	1.09
10/27/2009	187.74	172.78	0.15	1137.64	1.09	1.072	0.60
11/24/2009	178.64	163.68	0.15	1077.72	1.09	1.072	0.57
12/18/2009	207.08	192.12	0.15	1264.98	1.09	1.072	0.67
Total:	2789.19			16599.44			**8.80**

[1] = Delivery charge from Pepco rate sheet, http://www.pepco.com/home/
[2] = Washington DC average kWh emission factor is 1.09 lbs/kWh (EPA E-Grid 2005).
[3] = Standard line loss for electricity transmission = 7.2% (http://climatetechnology.gov/library/2003/tech-options/tech-options-1-3-2.pdf)
[4] = 1 metric ton = 2205 lbs

2009 Monthly Natural Gas Consumption

Date	Amount	Minus Fee [1]	Billing Rate [1]	Natural Gas	Emissions Factor [2]	Total building area [3]	SCB office area [3]	GHG Emissions [4]
	($)	($)	($/therm)	(therms)	(kg CO2e/therm)	sq. ft	sq. ft	(metric tons CO2e)
12/30/2008	101.8	93.85	0.3592	261.28	5.914	4495	3235	1.11
01/26/2009	151.52	143.57	0.3592	399.69	5.914	4495	3235	1.70
03/31/2009	162.32	154.37	0.3592	429.76	5.914	4495	3235	1.83
05/05/2009	17.87	9.92	0.3592	27.62	5.914	4495	3235	0.12
06/09/2009	7.95	0	0.3592	0.00	5.914	4495	3235	0.00
07/02/2009	7.95	0	0.3592	0.00	5.914	4495	3235	0.00
08/06/2009	7.95	0	0.3592	0.00	5.914	4495	3235	0.00
08/31/2009	8.03	0.08	0.3592	0.22	5.914	4495	3235	0.00
09/30/2009	7.95	0	0.3592	0.00	5.914	4495	3235	0.00
11/18/2009	7.95	0	0.3592	0.00	5.914	4495	3235	0.00
12/09/2009	18.54	10.59	0.3592	29.48	5.914	4495	3235	0.13
12/31/2009	59.51	51.56	0.3592	143.54	5.914	4495	3235	0.61
	Total:			1291.59				**5.50**

[1] = Fee schedule from http://www.washgas.com/pages/TariffsandRateSchedules
[2] = Emissions factor from the US Energy Information Administration (http://eia.doe.gov/oiaf/1605/coefficients.html).
[3] = Total natural gas use must be subdivided to represent the proportion of the total building occupied by SCB, because the building is metered as a whole.
[4] = 1000 kg equals 1 metric ton.

Date	Amount	Amount Minus Delivery [1]	Rate [1]	Water	Water	Electricity Use [2]	kWh	Line loss multiplier [3]	Emissions factor [4]	Total building area [5]	SCB office area [5]	GHG Emissions [6]
			$/ccf	CCF	Gallons	kWh/1000 gal			(lbs CO2e/ kWh)	sq. ft	sq. ft	(metric tons CO2e)
01/15/2009	67.25	63.25	5.77	10.96	8200.05	3.09	25.34	1.072	1.09	4495	3235	0.01
02/20/2009	48.38	44.38	5.77	7.69	5753.65	3.09	17.78	1.072	1.09	4495	3235	0.01
03/16/2009	35.8	31.8	5.77	5.51	4122.71	3.09	12.74	1.072	1.09	4495	3235	0.00
04/17/2009	73.54	69.54	5.77	12.05	9015.52	3.09	27.86	1.072	1.09	4495	3235	0.01
05/26/2009	36.04	32.04	5.77	5.55	4153.83	3.09	12.84	1.072	1.09	4495	3235	0.00
06/23/2009	36.83	32.83	5.77	5.69	4256.25	3.09	13.15	1.072	1.09	4495	3235	0.01
07/23/2009	42.96	38.96	5.77	6.75	5050.97	3.09	15.61	1.072	1.09	4495	3235	0.01
08/18/2009	36.83	32.83	5.77	5.69	4256.25	3.09	13.15	1.072	1.09	4495	3235	0.01
09/24/2009	36.83	32.83	5.77	5.69	4256.25	3.09	13.15	1.072	1.09	4495	3235	0.01
10/27/2009	56.18	52.18	5.77	9.04	6764.88	3.09	20.90	1.072	1.09	4495	3235	0.01
11/19/2009	33.9	29.9	5.77	5.18	3876.39	3.09	11.98	1.072	1.09	4495	3235	0.00
12/29/2009	27.21	23.21	5.77	4.02	3009.06	3.09	9.30	1.072	1.09	4495	3235	0.00
Total	531.75											**0.07**

[1] = Delivery charge from DCWASA rate sheet
[2] = Electricity use rate from Cascadia Seattle Climate Partnership tool
[3] = Standard line loss for electricity transmission = 7.2% (http://climatetechnology.gov/library/2003/tech-options/tech-options-1-3-2.pdf)
[4] = Washington DC average kWh emission factor is 1.09 lbs/kWh (EPA E-Grid 2005).
[5] = Total water use must be subdivided to represent the proportion of the total building occupied by SCB, because the building is metered as a whole.
[6] = 1 metric ton = 2205 lbs

Activity	Amount	Emission Factor [1]	GHG Emissions
	(reams)	(mt CO2e/ream)	(metric tons CO2e)
Paper Use	30.00	0.0010	**0.03**

[1] = The emissions factor for Paper Use comes from the Seattle Climate Partnership CO2 tool, based on standard copy paper with 30% recycled content.

Staff Air Travel

Employee	Origin	Layover [1]	Destination	Round-trip?	Number of Trips	Leg 1 [2]	Leg 2	Leg 1 [3]	Leg 2	GHG Emissions [4]
				1=no, 2=yes		Miles	Miles	metric tons CO2e	metric tons CO2e	metric tons CO2e
Autumn-Lynn Harrison	Paris		Beijing	2	1	5112		2.44	0.00	4.88
Kathy Kohm	Seattle	Chicago	DC	2	2	1735	595	0.83	0.33	4.63
Kathy Kohm	Seattle		San Francisco	2	1	680		0.37	0.00	0.75
John Fitzgerald	DC	Tokyo	Beijing	2	1	6783	1302	3.24	0.62	7.72
John Fitzgerald	BWI	Atlanta	Prague	2	1	577	4832	0.32	2.31	5.25
John Fitzgerald	DC	Phoenix	Flagstaff	2	1	1980	123	0.95	0.10	2.08
Heather DeCaluwe	DC	Chicago	Seattle	2	1	595	1735	0.33	0.83	2.31
Heather DeCaluwe	DC	Tokyo	Beijing	2	1	6783	1302	3.24	0.62	7.72
Gwen Coat	DC	Chicago	Seattle	2	1	595	1735	0.33	0.83	2.31
Gwen Coat	DC	Tokyo	Beijing	2	1	6783	1302	3.24	0.62	7.72
Marli Kaufmann	DC	Tokyo	Beijing	2	1	6783	1302	3.24	0.62	7.72
Rese Cluck	Oakland		DC	2	3	2429		1.16	0.00	6.96
Rese Cluck	Oakland	Seattle	Bozeman	2	1	678	551	0.37	0.30	1.35
Rese Cluck	Oakland		Seattle	2	1	678		0.37	0.00	0.75
Rese Cluck	Oakland	Tokyo	Beijing	2	1	5151	1302	2.46	0.62	6.16
Alan Thornhill	DC	Chicago	Seattle	2	1	595	1735	0.33	0.83	2.31
Alan Thornhill	DC	Tokyo	Beijing	2	1	6783	1302	3.24	0.62	7.72
Alan Thornhill	DC	Ottawa	Edmonton	2	1	456	1765	0.25	0.84	2.19
Alan Thornhill	DC	Phoenix	Flagstaff	2	1	1980	123	0.95	0.10	2.08
Alan Thornhill	DC		Los Angeles	2	1	2297		1.10	0.00	2.19
Shonda Foster	DC		Los Angeles	2	1	2297		1.10	0.00	2.19
Shonda Foster	DC	Chicago	Seattle	2	1	595	1735	0.33	0.83	2.31
Shonda Foster	BWI	Phoenix	Flagstaff	2	1	1980	123	0.95	0.10	2.08
Totals										**91.42**

[1] = Exact itineraries were not provided, so direct flight or single-stop itineraries were gathered from orbitz.com.
[2] = Flight leg distance determined using www.distance.to
[3] = Emissions factors for short, medium, and long (0.2897, 0.2028, 0.177 kg CO2/mile, respectively) are taken from the World Resources Institute GHG Protocol for Mobile Sources (http://www.ghgprotocol.org/). Short flights are up to 281 miles, medium flights are 281 to 994 miles, long flights are greater than 994 miles (single-leg distances).
[4] = We include a Radiative Forcing Index of 2.7 (IPCC 2007). 1000 kg equals 1 metric ton.

Staff Car Travel

Employee	Destination	Number of Trips	Miles Driven	Estimated MPG [1]	Gallons of Gasoline	GHG Emissions [2]
						(metric tons CO2e)
Heather DeCaluwe	BAI	5	107	23	4.65	0.05
Gwen Coat	IMCC	1	96	23	4.17	0.05
Marli Kaufmann	BAI	4	85.6	23	3.72	0.04
Marli Kaufmann	Fairfax	1	96	23	4.17	0.05
Alan Thornhill/ Shonda Foster	LA-Santa Barbara	2	380	23	16.52	0.19
Alan Thornhill/ Shonda Foster	Seattle-Bainbridge	2	200	23	8.70	0.10
Alan Thornhill/ Shonda Foster	Flagstaff-GC	2	320	23	13.91	0.16
Margaret Flagg	Gainsville	Ft. Myers	500	23	21.74	0.24
Totals						**0.87**

[1] = Car MPG estimated to be 23 MPG on average. City bus/train/metro emissions per passenger mile is a composite figure for local bus and subway, averaged from WRI GHG Protocol for Mobile Sources from the US EPA.
[2] = Emissions factor for a gallon of gasoline is 24.692 lbs CO2e/gallon, which includes upstream and downstream emissions, reported in the (Argonne GREET Fleet Footprint Calculator 1.0) and (US EPA Climate Leaders by way of WRI GHG Protocol Spreadsheet for Mobile Sources (April 2003)). 2205 lbs equals 1 metric ton.

2009 Website Server Electricity Consumption

Electricity Use [1]	Electricity Use [2]	Emissions Factor [3]	Line loss factor [4]	GHG Emissions [5]
(kWh/day)	(kWh/year)	(lbs CO2e/kWh)		(metric tons CO2e)
11.52	4120.70	1.09	1.072	**2.18**

[1] = The SCB website is hosted on a dedicated server by Intermedia. We received the following update from our Network Engineer: "The server is a dell 1950 with two 146g drives. At the low end, when it is doing virtually nothing, the server will pull 1.8amps @ 120volts. With busy disks, it could hit 2.2 amps. You should double this power usage to account for cooling and UPS overhead/inefficiencies." To estimate average energy use from the server, we assumed 2.0 amps and 120 volts. This means that the server uses approximately 240 watts of electricity each hour, or 5760 watts per day, which is doubled to equal 11.52 kWh/day.
[2] = We assume that the server is up and running for 98% of the time over the course of a year.
[3] = Washington DC average kWh emission factor is 1.09 lbs/kWh (EPA E-Grid 2005).
[4] = Standard line loss for electricity transmission = 7.2% (http://climatetechnology.gov/library/2003/tech-options/tech-options-1-3-2.pdf)
[5] = 1 metric ton = 2205 lbs

Staff Employee Commuting

Name	Days Commuted	Miles Per roundtrip	Total Miles commuted	Vehicle Type	Estimated MPG [1]	Gallons of Gasoline	GHG Emissions [2]
							(metric tons CO2e)
Rese Cluck	0	0	0	NA	NA	0.00	0.00
Gwen Coat	80	10	800	Bus/Metro	0.30 lb C02/pass-mile	NA	0.11
	16	10	160	Car	23	6.96	0.08
Laura Walko	15	50	750	Car	23	32.61	0.37
	25	105	2625	Bus/Metro	0.30 lb C02/pass-mile	NA	0.36
	10	105	1050	Car	23	45.65	0.51
Alan Thornhill	96	8	768	Bus/Metro	0.30 lb C02/pass-mile	NA	0.10
	48	8	384	Car	23	16.70	0.19
Marli Kaufmann	144	1.6	230.4	Bus/Metro	0.30 lb C02/pass-mile	NA	0.03
Kathy Kohm	160	10	1600	Car	23	69.57	0.78
Shonda Foster	50	20	1000	Car	23	43.48	0.49
	50	18	900	Bus/Metro	0.30 lb C02/pass-mile	NA	0.12
John Fitzgerald	235	17	3995	Bus/Metro	0.30 lb C02/pass-mile	NA	0.54
	5	17	85	Car	23	3.70	0.04
Heather DeCaluwe	140	14	1960	Bus/Metro	0.30 lb C02/pass-mile	NA	0.27
	80	14.8	1184	Car	23	51.48	0.58
Cathy McIntosh	12	80.4	964.8	Car	23	41.95	0.47
Autumn-Lynn Harrison	0	0	0	NA	NA	0.00	0.00
Ellen Main	0	0	0	NA	NA	0.00	0.00
Lyn Arnold	30	4	120	Bus/Metro	0.30 lb C02/pass-mile	NA	0.02
Margaret Flagg	0	0	0	NA	NA	0.00	0.00
Gary Meffe	0	0	0	NA	NA	0.00	0.00
Justin Matlick	160	10	1600	Car	23	69.57	0.78
Totals			**20176.2**				**5.82**

[1] = Car MPG estimated to be 23 MPG on average. City bus/train/metro emissions per passenger mile is a composite figure for local bus and subway, averaged from WRI GHG Protocol for Mobile Sources from the US EPA.
[2] = Emissions factor for a gallon of gasoline is 24.692 lbs CO2e/gallon, which includes upstream and downstream emissions, reported in the (Argonne GREET Fleet Footprint Calculator 1.0) and (US EPA Climate Leaders by way of WRI GHG Protocol Spreadsheet for Mobile Sources (April 2003)). 2205 lbs equals 1 metric ton.

Activity	2009 Dollars	1997 Dollars [1]	Emission Factor [2]	GHG Emissions [3]
			kg C02e/$ (1997)	metric tons CO2e
Advertising and Marketing	13,336.11	10,027.15	0.55	**5.49**

[1] = The EIO-LCA model for Printing requires an input in 1997 dollars. We used the calculator at www.dollartimes.com to convert from 2009 to 1997 dollars.
[2] = Emissions factors come from the Economic Input Output Life Cycle Analysis tool produced by the Green Design Institute at Carnegie Mellon University. We used the "Advertising and Marketing" sector.
[3] = 1 metric ton = 1000 kg.

Newsletter	2009 Dollars	1997 Dollars [1]	Emission Factor [2]	GHG Emissions [3]	EIO-LCA Sector
			kg C02e/$	metric tons CO2e	
Printing and Reproduction	12,886.96	9,689.44	0.477	4.62	Commercial printing
Postage and Shipping	3,004.12		0.257	0.77	
Total:				**5.39**	

[1] = When possible, we made use of the Cascadia Climate Partnership Tool. For activities that require the EIO-LCA analysis, the EIO-LCA model that we use for Printing requires an input in 1997 dollars. We used the inflation calculator at www.dollartimes.com to convert from 2009 to 1997 dollars.
[2] = Emissions factors come from the Economic Input Output Life Cycle Analysis tool produced by the Green Design Institute at Carnegie Mellon University. Those activities not converted to 1997 dollars are calculated using the Cascadia Seattle Climate Partnership Tool. Specific EIO-LCA sectors are listed in the right hand column.
[3] = 1 metric ton = 1000 kg.

2009 SCB Global Congress in Beijing, China

Air Travel and Car Travel for Attendees

This calculation is representative of how GHG emissions from air travel and car travel were calculated from the 2009 SCB Global Congress, because it would be impractical to list the raw data for all attendees. Because so many of the meeting attendees travel from overseas and from different regions of the world, a different method was employed to more accurately reflect the number of flight legs and layovers in a typical travel itinerary. This method strikes a balance between over-estimating on a given leg of an itinerary, but under-estimating (most likely) the number of flights taken per attendee.

For each attendee, SCB records show the work city, state, and country. Online travel sites (Orbitz.com) were used to construct a "typical" travel itinerary for a registrant's particular city or country, based on the cheapest and most direct travel options. The typical itineraries were split into numbers of flights in different distance categories. Because of a recording mix-up, flights were grouped differently than last year, when we used categories defined by the World Resources Institute GHG Protocol for Mobile Sources (http://www.ghgprotocol.org/). In the GHG Protocol, short flights are up to 280 miles, medium flights are 281-994 miles, long flights are 995-2,500 miles, and extended flights are over 2,500 miles (single-leg distances). Each flight category has a specific emissions factor (kg CO_2e/ passenger-mile). This year, the flight categories are grouped from 0-140 miles, 141-497 miles, 498-1250 miles, 1251-2500 miles, 2501-5000 miles, and 5000+ miles. Because of the extra categories, we had to use an averaged emissions factor in some categories.

Rather than calculating individual itineraries for each individual city of origin, nearby origin locations were grouped together and given the same profile of short, medium, and extended flights. For the USA, these clusters were adjacent states within a region of the country. Outside of the USA, neighboring countries were placed in the same group. For example, travelers from Minneapolis and Chicago received the same flight itinerary, as did travelers from Columbia and Venezuela.

For cities that were very far from the nearest major airport, we assumed that the attendees drove to the airport using an average vehicle. This is something that we did not assume for the 2008 meeting. We also assumed that 300 attendees from China drove an average of 40 miles round-trip to attend the meeting, based on conversations with SCB staff.

The following table is an example of how GHG emissions were calculated for the 2009 assessment.

Country	City	Nearest Airport	Flight Category						GHGs Flying	Est. Miles Driven	Gallons of gas	Emissions Factor	GHGs Driving
			0 - 140	141-497	498-1250	1251-2500	2501-5000	> 5000	(metric tons CO2e)			(lbs CO2e/ mile)	(metric tons CO2e)
Afghanistan	Kabul						1		3.582		0.00	24.692	0.000
Argentina	Buenos Aires						1	1	8.835		0.00	24.692	0.000
Argentina	Cordoba				2	1		1	8.844		0.00	24.692	0.000
Argentina	Jujuy	Cordoba			2	1		1	8.844		0.00	24.692	0.000
Armenia	Yerevan				1		1		4.482		0.00	24.692	0.000
Armenia	Yerevan				1		1		4.482		0.00	24.692	0.000
Armenia	Yerevan				1		1		4.482		0.00	24.692	0.000
Australia	Adelaide				2		1		5.382		0.00	24.692	0.000
Australia	Adelaide				2		1		5.382		0.00	24.692	0.000
Australia	Adelaide				2		1		5.382		0.00	24.692	0.000
Australia	Adelaide				2		1		5.382		0.00	24.692	0.000
Australia	Atherton	Cairns			2			1	7.053	63	3.00	24.692	0.034
Australia	Atherton				2			1	7.053	63	3.00	24.692	0.034
Australia	Brisbane				2			1	7.053		0.00	24.692	0.000
Australia	Brisbane				2			1	7.053		0.00	24.692	0.000
Australia	Canberra			1	1			1	6.153		0.00	24.692	0.000

Travel during the event

Trip	Destination	Travellers	Driving Distance [1]	Estimated MPG [2]	Gasoline	Number of Flights	Average Flight Dist. [3]	Emissions factor [4]	Hotel Nights	Emission Factor [5]	GHG Emissions [6]
			(miles)		(gallons)		(miles)	kg CO2e/mile		kg CO2/room-night	(metric tons CO2e)
Local Tour 1	GW-Jade Factory-Ming	127	1500	18	83.33					29.53	0.93
Local Tour 2	Olympic Park	45	90	18	5.00					29.53	0.06
Local Tour 3	T Square-Forbidden City	25	100	18	5.56					29.53	0.06
Local Tour 4	Pearl Factory-Summer	24	100	18	5.56					29.53	0.06
Pre-Tour 1	Guangzhou-Guilin	4	204	18	11.33	3.00	478.00	0.20	5.00	29.53	3.86
Pre-Tour 2	Shanghai-Suzhou	8	180	18	10.00	1.00	664.00	0.20	3.00	29.53	3.73
Post-Tour 1	Tibet	14	2740 car, 28000 train	18	152.22	1.00	1594.00	0.18	7.00	29.53	15.26
Post-Tour 2	Dunhuang-Jiayuguan	13	3520 car, 5902 train	18	195.56	2.00	941.50	0.20	4.00	29.53	17.13
Post-Tour 3a	Changqing Nature Reserve	20	4250	18	236.11	2.00	567.00	0.20	5.00	29.53	18.02
Post-Tour 3b	Xian	1	50	18	2.78	2.00	567.00	0.20	2.00	29.53	0.71
Totals											**59.82**

[1] = Driving distance estimated from www.distance.to.

[2] = MPG estimated to be 18 MPG on average for a minivan.

[3] = Flight distances estimated from www.distance.to.

[4] = Emissions factors for short, medium, and long (0.2897, 0.2028, 0.177 kg CO2/mile, respectively) are taken from the World Resources Institute GHG Protocol for Mobile Sources (http://www.ghgprotocol.org/). Short flights are up to 281 miles, medium flights are 281 to 994 miles, long flights are greater than 994 miles (single-leg distances). We include a Radiative Forcing Index of 2.7 (IPCC 2007).

[5] = Emissions associated with a one-night stay in a hotel are calculated at 29.53 kg CO2 per room per day for an average hotel. (Environmental Protection Agency). ClearSky assumes that attendees stayed in average hotel rooms.

[6] = 1000 kg equals 1 metric ton.

Hotel accommodations

Hotel-Nights [1]	Emission Factor [2]	GHG Emissions [3]
	kg CO2/room-night	(metric tons CO2e)
4123	29.53	**121.75**

[1] = Hotel nights estimated from conference registration figures - attendees to the full meeting assumed for 6 nights, one-day registrants assumed for 1 night.
[2] = Emissions associated with a one-night stay in a hotel are calculated at 29.53 kg CO2 per room per day for an average hotel. (Environmental Protection Agency). ClearSky assumes that Smith Fellows stayed in average hotel rooms.
[3] = 1000 kg equals 1 metric ton.

Catering

Buffet Lunches	Boxed Lunches	Snacks	% Vegetarian [1]	Estimated Cost [2]	Emission Factor [3]	GHG Emissions [4]
					kg CO2/$	(metric tons CO2e)
550	323	1581	40	18381	1.1953	**18.28**

[1] = Estimated, this information was unavailable.
[2] = Assumed $12 for each buffet lunch, $12 for each boxed lunch, and $5 for each snack - from Conference Registration data sheet.
[3] = Emissions factor from the Cascadia Seattle Climate Partnership tool. Vegetarian meals are assumed to emit only 58% of the GHG emissions of a non-vegetarian meal, according to the Nature Conservancy's online carbon footprint calculator.
[4] = metric ton = 1000 kg

Smith Fellows Program

Smith Fellows Air Travel

Name	Origin	Layover [1]	Destination	Round-trip?	Number of Trips	Leg 1 [2]	Leg 2	Leg 1 [3]	Leg 2	GHG Emissions [4]
				1=no, 2=yes		Miles	Miles	metric tons CO2e	metric tons CO2e	metric tons CO2e
Mike Dombeck	Stevens Point, WI	Milwaukee	Seattle	2	1	132	1689	0.10	0.81	1.82
Brett Dickson	Flagstaff, AZ	Los Angeles	Seattle	2	1	383	961	0.21	0.53	1.48
Holly Gibbs	San Francisco, CA		Seattle	2	1	680		0.37	0.00	0.75
Raina Plowright	Bozeman, MT		Seattle	2	1	551		0.30	0.00	0.61
Sarah Reed	San Francisco, CA		Seattle	2	1	680		0.37	0.00	0.75
Sarah Jacobi	Chicago, IL		Seattle	2	1	1735		0.83	0.00	1.66
Kiki Jenkins	Washington, DC	Chicago	Seattle	2	1	595	1735	0.33	0.83	2.31
Francis Pandolfi	Connecticut (NY)		Seattle	2	1	2405		1.15	0.00	2.30
J Nichols	LAX		Seattle	2	1	961		0.53	0.00	1.06
Dave Theobald	Denver, CO		Seattle	2	1	1021		0.49	0.00	0.98
Martin Hall	San Diego, CA		Seattle	2	1	1065		0.51	0.00	1.02
Louis Provencher	Reno, NV	Los Angeles	Santa Barbara	2	1	389	87	0.21	0.07	0.57
Janis Bush	San Antonio, TX	Denver	Santa Barbara	2	1	803	890	0.44	0.49	1.87
Ellen Hines	San Francisco, CA	Los Angeles	Santa Barbara	2	1	348	87	0.19	0.07	0.52
Guy McPherson	Arizona	Los Angeles	Santa Barbara	2	1	357	87	0.20	0.07	0.53
Finalist #1	Bozeman, MT	Denver	Santa Barbara	2	1	514	890	0.28	0.49	1.55
Finalist #2	Washington, DC	Denver	Santa Barbara	2	1	1491	890	0.71	0.49	2.40
Finalist #4	Chicago, IL	Denver	Santa Barbara	2	1	918	890	0.51	0.49	1.99
Tim/Teresa	Washington, DC	Denver	Santa Barbara	2	1	1491	890	0.71	0.49	2.40
Brett Dickson	Flagstaff, AZ	Los Angeles	Santa Barbara	2	1	383	87	0.21	0.07	0.56
Olaf Jensen	Seattle, WA	Los Angeles	Santa Barbara	2	1	961	87	0.53	0.07	1.20
Vickie Bakker	Arizona	Los Angeles	Santa Barbara	2	1	357	87	0.20	0.07	0.53
Julia Baum	San Diego, CA		Santa Barbara	2	1	188		0.15	0.00	0.29
Pete McIntyre	Detroit, MI	Denver	Santa Barbara	2	1	1155	890	0.55	0.49	2.08
Jedediah Brodie	Bozeman, MT	Denver	Santa Barbara	2	1	514	890	0.28	0.49	1.55
Helen Fox	Washington, DC	Denver	Santa Barbara	2	1	1491	890	0.71	0.49	2.40
Emily Goodwin	San Francisco, CA	Los Angeles	Santa Barbara	2	1	348	87	0.19	0.07	0.52
Keith Schneider	Detroit, MI	Denver	Santa Barbara	2	1	1155	890	0.55	0.49	2.08
Mike Dombeck	Stevens Point, WI	Phoenix	Flagstaff	2	1	1464	123	0.70	0.10	1.59

Louis Provencher	Reno, NV	Los Angeles	Flagstaff	2	1	389	383	0.21	0.21	0.85
Olaf Jensen	Seattle, WA	Los Angeles	Flagstaff	2	1	961	383	0.53	0.21	1.48
Anne Salomon	Vancouver, BC	Los Angeles	Flagstaff	2	1	1080	383	0.52	0.21	1.45
Holly Gibbs	San Francisco, CA	Los Angeles	Flagstaff	2	1	348	383	0.19	0.21	0.81
Kiki Jenkins	Seattle, WA	Los Angeles	Flagstaff	2	1	961	383	0.53	0.21	1.48
Sarah Jacobi	Chicago, IL	Phoenix	Flagstaff	2	1	1452	123	0.69	0.10	1.58
Sarah Reed	Denver, CO	Los Angeles	Flagstaff	2	1	831	383	0.46	0.21	1.34
Raina Plowright	Bozeman, MT	Phoenix	Flagstaff	2	1	848	123	0.47	0.10	1.13
Jackie Grant	College Station, PA	Phoenix	Flagstaff	2	1	2080	123	0.99	0.10	2.18
Alice Apley	Boston, MA	Phoenix	Flagstaff	2	1	2298	123	1.10	0.10	2.39
Ed Slattery	Boston, MA	Phoenix	Flagstaff	2	1	2298	123	1.10	0.10	2.39
Jennifer Smith	Washington, DC	Phoenix	Flagstaff	2	1	1980	123	0.95	0.10	2.08
Totals										**58.52**

[1] = Exact itineraries were not provided, so direct flight or single-stop itineraries were gathered from orbitz.com.
[2] = Flight leg distance determined using www.distance.to
[3] = Emissions factors for short, medium, and long (0.2897, 0.2028, 0.177 kg CO2/mile, respectively) are taken from the World Resources Institute GHG Protocol for Mobile Sources (http://www.ghgprotocol.org/). Short flights are up to 281 miles, medium flights are 281 to 994 miles, long flights are greater than 994 miles (single-leg distances).
[4] = We include a Radiative Forcing Index of 2.7 (IPCC 2007). 1000 kg equals 1 metric ton.

Smith Fellows Car Travel

Employee	Departure	Arrival	Distance [1]	Estimated MPG [2]	Gallons of Gasoline	GHG Emissions [3]
			(miles)			(metric tons CO2e)
Olaf Jensen	Seattle	Seattle	30	23	1.30	0.01
Anne Salomon	Vancouver	Seattle	286	23	12.43	0.14
Jim Sedell	Seattle	Seattle	30	23	1.30	0.01
Patrick Christie	Seattle	Seattle	30	23	1.30	0.01
Josh Lawler	Seattle	Seattle	30	23	1.30	0.01
Cara Nelson	Missoula	Seattle	952	23	41.39	0.46
Joel Clement	Seattle	Seattle	30	23	1.30	0.01
Julian Olden	Seattle	Seattle	30	23	1.30	0.01
Erica Fleishman	Santa Barbara	Santa Barbara	30	23	1.30	0.01
Myra Finkelstein	Santa Cruz	Santa Barbara	514	23	22.35	0.25
Finalist #3	San Francisco	Santa Barbara	650	23	28.26	0.32
Anne Salomon	Santa Barbara	Santa Barbara	30	23	1.30	0.01
Holly Gibbs	Madison, WI	Santa Barbara	4126	23	179.39	2.01
Ben Halpern	Santa Barbara	Santa Barbara	30	23	1.30	0.01
Juliann Aukema	Santa Barbara	Santa Barbara	30	23	1.30	0.01
Dave Theobald	Santa Barbara	Santa Barbara	30	23	1.30	0.01
Doug Bevington	San Francisco	Santa Barbara	650	23	28.26	0.32
Michael Fischer	San Francisco	Santa Barbara	650	23	28.26	0.32
Therese Cluck	San Francisco	Santa Barbara	650	23	28.26	0.32
Brett Dickson	Flagstaff	Flagstaff	30	23	1.30	0.01
Tom Sisk	Flagstaff	Flagstaff	30	23	1.30	0.01
Ethan Aumack	Flagstaff	Flagstaff	30	23	1.30	0.01
Jim Kenna	Flagstaff	Flagstaff	30	23	1.30	0.01
Scott Florence	Flagstaff	Flagstaff	30	23	1.30	0.01
Martha	Flagstaff	Flagstaff	30	23	1.30	0.01
Totals			**8958**			**4.36**

[1] = Driving distance estimated from Google.com.
[2] = MPG estimated to be 23 MPG on average.
[3] = Emissions factor for a gallon of gasoline is 24.692 lbs CO2e/gallon, which includes upstream and downstream emissions, reported in the (Argonne GREET Fleet Footprint Calculator 1.0) and (US EPA Climate Leaders by way of WRI GHG Protocol Spreadsheet for Mobile Sources (April 2003)). 2205 lbs equals 1 metric ton.

Smith Fellows Hotel Stays

Trip	Hotel-Nights	Emission Factor [1]	GHG Emissions [2]
		kg CO2/room-night	(metric tons CO2e)
Flagstaff	69	29.53	2.04
Seattle	68	29.53	2.01
Santa Barbara	69	29.53	2.04
Totals	**206.00**		**6.08**

[1] = Emissions associated with a one-night stay in a hotel are calculated at 29.53 kg CO2 per room per day for an average hotel. (Environmental Protection Agency). ClearSky assumes that Smith Fellows stayed in average hotel rooms.

[2] = 1000 kg equals 1 metric ton.

Smith Fellows Meals

Trip	Meals [1]	Snacks	% Vegetarian [2]	Estimated $ Spent [3]	Emission Factor [4]	GHG Emissions [5]
					kg CO2/$	(metric tons CO2e)
Flagstaff	255	170	40	4675	1.1953	4.65
Seattle	253	180	40	4695	1.1953	4.67
Santa Barbara	155	78	50	2715	1.1953	2.56
Totals	**663.00**	**428.00**				**11.88**

[1] = Estimated from meal menus and attendee lists for the various trips, or assumed where this information was unavailable.
[2] = Estimated from meal menus and attendee lists for the various trips, or assumed where this information was unavailable.
[3] = Assumed $15 for each meal, and $5 for each snack.
[4] = Emissions factor from the Cascadia Seattle Climate Partnership tool. Vegetarian meals are assumed to emit only 58% of the GHG emissions of a non-vegetarian meal, according to the Nature Conservancy's online carbon footprint calculator.
[5] = metric ton = 1000 kg

Smith Fellows Trips

Trip	Destination	Number of Vehicles	Trip Distance [1]	Vehicle	Total Distance	Estimated MPG [2]	Gallons of Gasoline	GHG Emissions [3]
			(miles/hrs)		(miles/hrs)			(metric tons CO2e)
Flagstaff	Grand Canyon	7	160	Van	1120	18	62.22	0.70
Seattle	Olympic Peninsula	7	100	Van	700	18	38.89	0.44
Santa Barbara	Channel Islands	1	2	Tour boat	2	60 gal/hr	120.00	1.34
Totals								**2.48**

[1] = Driving distance estimated from Google.com, boat trip length estimated from Ventura tour company.
[2] = MPG estimated to be 23 MPG on average, and boat gasoline consumption is estimated from experience.
[3] = Emissions factor for a gallon of gasoline is 24.692 lbs CO2e/gallon, which includes upstream and downstream emissions, reported in the (Argonne GREET Fleet Footprint Calculator 1.0) and (US EPA Climate Leaders by way of WRI GHG Protocol Spreadsheet for Mobile Sources (April 2003)). 2205 lbs equals 1 metric ton.

SCB Publications

Conservation Magazine	2009 Dollars	1997 Dollars [1]	Emission Factor [2]	GHG Emissions [3]	EIO-LCA Sector
			kg C02e/$	metric tons CO2e	
Printing and Reproduction	92,311.04	69,406.80	0.477	33.11	Commercial printing
Postage and Shipping	19,659.63		0.257	5.05	
Accounting, Legal, Editorial services	2,938.78	2,209.61	0.326	0.72	Accounting and bookkeeping
Office supplies	6,676.29		0.355	2.37	
Computers and hardware	412.27		0.282	0.12	
Telecommunications and internet	388.99	292.47	0.476	0.14	Telecommunications
Illustrations	9,693.97	7,288.70	0.398	2.90	Independent artists and writers
Building expenses	35,099.51	26,390.61	0.400	10.56	Sevices to buildings and dwellings
Books and publications	1,089.00		1.100	1.20	
Travel	2,648.84	1,991.61	1.330	2.65	Air travel
Advertising and marketing	1,151.33	865.66	0.548	0.47	Advertising and marketing
Misc	2,188.96	1,645.83	0.315	0.52	Misc professional and technical services
Total:				**59.80**	

[1] = When possible, we made use of the Cascadia Climate Partnership Tool, which uses an input in 2009 dollars. For those activities that require the EIO-LCA analysis, the EIO-LCA model that we use for Printing requires an input in 1997 dollars. We used the inflation calculator at www.dollartimes.com to convert from 2009 to 1997 dollars.
[2] = Emissions factors come from the Economic Input Output Life Cycle Analysis tool produced by the Green Design Institute at Carnegie Mellon University. Those activities not converted to 1997 dollars are calculated using the Cascadia Seattle Climate Partnership Tool. Specific EIO-LCA sectors are listed in the righthand column.
[3] = 1 metric ton = 1000 kg.

2009 Ecological Footprint

For the following sections, please refer to the following color codes:

	Data directly from SCB
	Assumptions
	Data directly from National Footprint Accounts (Global Footprint Network)
	Ecological Footprint in hectares or global hectares

The source for all of the following calculations is the Global Footprint Network, National Footprint Accounts, 2008 Edition. (Available at www.footprintnetwork.org)

Office space

Built-up area for office space	
3235	sq feet
0.00001	ha / sq ft
3	building floors
0.0100	ha built up area for office space
1.46	US YF cropland
2.64	EQF cropland
0.0386	global ha for office space

Food and Beverage

Cropland for meals

663	meals Smith Fellows
428	snacks Smith Fellows
42%	percent vegetarian
873	meals China meeting
1581	snacks China meeting
40%	percent vegetarian

908	total meals non-veg
628	total meals veg
2009	total snacks
0.75	kg food / meal non-veg
0.75	kg food / meal veg
0.2	kg food / snack
0.0005	ha / kg of meal
0.0002	ha / kg of meal veg
0.0003	ha / kg of boxed lunch

2.64	EQF cropland

Meal compositions assumed below

	meal non-veg	meal veg	snack	
chicken	0.1			
turkey	0.2		0.1	
bread	0.4	0.4	0.5	
wheat	0.2	0.2		
apple		0.2	0.4	
lettuce	0.1	0.2		
	ha / kg	gha / t		EQF crop
chicken	0.0010	2.64		2.64
turkey	0.0010	2.64		
bread	0.0003	0.81		
wheat	0.0004	0.93		
apple	0.0001	0.21		
lettuce	0.0000	0.12		

0.3391	ha world avg cropland for all meals non-veg
0.1027	ha world avg cropland for all meals veg
0.1146	ha world avg cropland for all snacks
0.8952	global ha for all meals non-veg
0.2711	global ha for all meals veg
0.3026	global ha for all snacks

Paper Use

30	reams paper SCB office			
2.265	kg / ream			
67.95	kg paper SCB office			
22,000	sheets of 25"x30" paper for SCB newsletter			
10.16	8.5"x11" sheets in one sheet 25"x30" paper			
223,520	equivalent number 8.5"x11" sheets of paper for SCB newsletter			
500	sheets in a ream			
447	equivalent number reams paper for SCB newsletter			
2.265	kg / ream			
1,013	kg paper SCB newsletter			
30,000	copies of Conservation Magazine printed			
0.23	kg/copy (estimated)			
6,900	kg paper Conservation Magazine			
25,000	copies of Conservation Biology printed			
0.7	kg/copy (estimated)			
17,500	kg paper Cons Bio			
25,480	total kg paper all sources			
0.004	m3 roundwood / kg paper			
2.3600	world avg forest yield (m3 roundwood / ha)			
43.19	ha world average forest			
1.33	EQF forest land			
		0.27%	% SCB office	
57.44	global ha, of which -->	3.97%	% SCB newsletter	
		27.08%	% Cons Magazine	
		68.68%	% Cons Bio	
30%	% recycled			
30.23	ha world avg forest with recycling credit			
40.21	global ha with recycling credit			

Carbon Sequestration

3,859	tonne fossil CO2 emitted from SCB operations
3.59	world-average forest absorption (tonnes CO2 / ha)
25.20%	% of emitted fossil carbon sunk by surface ocean
803	ha world-average forest for carbon absorption
1.33	EQF forest land
1,068	global ha for carbon absorption
0.2771	global ha per tonne fossil CO2 emitted