Greenhouse Gas Emissions Inventory Management Plan

for Internal Business Operations 2008

Authors: Monika Kumar, Adam Rubinfield, Sarah Raposa
Team Lead: Judith Moore, Senior Environmental Specialist
Design Editor: Maria Beatriz Garcia

Special thanks to Dan Sobrinski Senior Engineer at Econenergy International Corporation for his expert advice.

Images on the cover represent The World Bank Group's Offices in Chennai, India; Antananarivo, Madagascar; and Dhaka, The People's Republic of Bangladesh that follow Green Building certification Principles.

TABLE OF CONTENTS

Figures

Tables

Attachments

Master Location List
WBG HQ Emissions Summary

ACRONYMS

- CR: Corporate Responsibility Program
- CH_4: Methane
- CO_2: Carbon Dioxide
- CO_2eq: Carbon Dioxide Equivalent
- CESFP: IFC Footprint Program
- CFC: Chlorofluorocarbon
- CHRFM: IFC Facilities Management and Administration
- EIA: U.S. Energy Information Administration
- EPA: U.S. Environmental Protection Agency
- FTE: Full-time Employee
- GHG: Greenhouse Gas
- GSDCR: General Service Department Corporate Real Estate
- GSDFC: General Service Department Food and Conference Services
- GSDMS: General Service Department Mail and Shipping Services
- GSDPC: General Service Department Program Coordination
- GSDSO: General Service Department Corporate Security
- GSDTV: General Service Department Travel and Visa Services
- GWP: Global Warming Potential
- HFC: Hydrofluorocarbon
- HVAC: Heating, ventilation, and air conditioning
- IEA: International Energy Agency
- IFC: International Finance Corporation
- IMP: Inventory Management Plan
- IPCC: Intergovernmental Panel on Climate Change
- kWh: Kilowatt hour
- N_2O: Nitrous Oxide
- PFC: Perfluorocarbon
- SF_6: Sulfur hexafluoride
- WB: World Bank
- WBCSD: World Business Council for Sustainable Development
- WBG: World Bank Group, including the International Bank of Reconstruction and Development, International Development Association, International Finance Corp, Multilateral Investment Guarantee Agency, and the International Center for Settlement of Investment Disputes
- WRI: World Resources Institute

INTRODUCTION

This Greenhouse Gas Emissions Inventory Management Plan (IMP) provides a detailed foundation for the World Bank Group's (WBG) comprehensive effort to measure and manage greenhouse gas emissions from its internal global business operations. This document provides organization-wide information, including corporate overview and goals, boundary conditions of the inventory, emissions quantification methods, data management methods, base-year selection discussion, list of management tools, and auditing and verification processes.

The IMP sets forth the current scope and vision of WBG's commitment to inventory and manage greenhouse gases (GHG) for its internal global business operations and contains the WBG's greenhouse gas inventory methodology. It sets forth the WBG's intention to create a GHG inventory that is consistent with the principles and guidance of the World Resources Institute (WRI) and the World Business Council for Sustainable Development's (WBCSD) Greenhouse Gas Protocol Initiative ("*GHG Protocol*") for its internal corporate greenhouse gas accounting and reporting. The inventory methodology is designed to meet the most rigorous and complete accounting and reporting standards.

Compliance with the World Bank's participation in the EPA Climate Leader's program

This IMP includes information that applies to the offices located in the United States and complies by the World Bank's (WB) participation in the U.S. EPA's Climate Leaders program (IFC is currently not a participant). The WB reports to the EPA Climate Leaders program the inventory for its Washington DC area facilities using calendar year (CY) 2006 (Jan - Dec 2006) as the base-year inventory. The Washington, DC area facilities inventory is maintained on both a fiscal year and calendar year basis. Both domestic and international emissions are calculated using the same methodology to ensure consistency in the quantification process between all locations. Background on the US EPA Climate Leaders Program is found in Appendix G.

DEFINITION OF SCOPE IN GHG PROTOCOL

The World Bank Group segregates its emissions types by Scopes 1, 2, and 3, as defined by the *GHG Protocol*. The following are examples of office emissions sources from *GHG Protocol* Guidance, *Working 9 to 5 on Climate Change: an Office Guide*, by WRI, 2002.

Scope 1: Direct emissions sources	▪ Combustion of fuel in boilers or furnaces that are owned by the reporting organization ▪ Generation of electricity, steam, or heat in equipment that is owned by the reporting organization ▪ Business travel in vehicles that are owned by the reporting organization, such as company cars or corporate jets ▪ Employee commuting in company-owned vehicles, such as shuttles and company cars
Scope 2: Indirect emissions sources	▪ Generation of *purchased* electricity, steam, heat, or chilled water
Scope 3: Optional sources	▪ Business travel in non-company-owned vehicles such as rental cars, employee cars, trains, and commercial planes ▪ Combustion of fuel in boilers or furnaces not owned by the reporting organization ▪ Employee commuting ▪ Incineration of waste or decomposition in a landfill when the facilities are not owned by the reporting organization ▪ Outsourced activities such as shipping, courier services, and printing services

KEY CONTACTS

Organization Name:	The World Bank: IBRD/IDA
Corporate Address:	1818 H St. NW, Washington, DC, USA 20433
Inventory Manager:	Sr. Environmental Specialist, ENV, Judith Moore
Contact Information:	Phone: 202-458-9301 Email: jmoore1@worldbank.org
Organization Name:	International Finance Corporation (IFC)
Corporate Address:	2121 Pennsylvania Ave., NW, Washington, DC 20433
Inventory Manager:	Footprint Program Officer, Sarah Raposa
Contact information:	Phone: 202-458-7703 Email: sraposa@ifc.org

WBG BOUNDARY CONDITIONS

Boundary conditions serve as the foundation for the GHG inventory by defining both the inventory's breadth and depth. To provide a rigorous and complete GHG inventory, the WBG has defined both organizational and operational boundary conditions consistent with the *GHG Protocol* guidance.

ORGANIZATIONAL BOUNDARY

Organization boundary conditions define the breadth of the GHG inventory by identifying the locations where the WBG assumes responsibility for GHG emissions. According to the *GHG Protocol*, a company's organizational boundaries can either be defined by the amount of equity a company has in an operation ("Equity Approach") or based on a company's operational control over a location or facility ("Control Approach"). The *GHG Protocol* also requires that a company select the type of organizational boundary according to which method most accurately reflects the day-to-day practices of the business. That boundary approach should then be consistently applied to define the company's business and operations in a way that best constitutes the business' operations for the purpose of GHG emissions accounting and reporting.

The WBG has chosen to set its organizational boundaries for the GHG inventory according to the operational control approach. Consistent with this approach the WBG accounts for GHG emissions from its locations for which it has direct control over operations, and where it can influence decisions that impact GHG emissions. Locations where the WBG lacks operational control and is unable to obtain carbon emissions data, emissions are estimated and are included in Scope 3.

WB locations have been identified by the General Services Division's Corporate Real Estate office (GSDCR), while IFC locations are from their Real Estate Database managed by IFC's Facilities Management team. Since locations are subject to change as offices open, close, and move to new locations, a list of offices is available upon request.

Headquarters Specific: USA

In the US, the World Bank Group owns or leases facilities located in Washington, DC and Virginia. A list of facilities included under the Operational Control Approach is presented in Table 1.

Table 1: Fiscal Year 2006 List of WBG US Properties Included in Baseline Emissions Analysis

Building Name	Address	Status (Own/Lease)	Operational Control	Size (gross ft²)	In inventory
Archives	Pennsylvania, near Pittsburgh	Lease	WB Non-Operating	54,000	Scope 3
BCC	4120 Lafayette Center Dr. Chantilly, VA 20151	Lease	WB Operating	54,530	Scope 1,2
F	2121 Pennsylvania Ave, NW, Washington, DC 20433	Own	IFC Owned	1,138,000	Scope 1,2
G	1776 G St NW, Washington, DC	Lease	WB Non-Operating	89,248	Scope 3
H	600 19th St NW, Washington, DC 20433	Long-term lease	WB Operating	587,421	Scope 1,2
I	1850 I St NW, Washington, DC 20433	Own	WB Owned	601,446	Scope 1,2
J	701 18th St NW, Washington, DC 20433	Long-term lease	WB Operating	533,894	Scope 1,2
MC	1818 H St NW, Washington, DC , 20433	Own	WB Owned	2,065,507	Scope 1,2
P	900 19th Street NW, Washington, DC 20433	Lease	WB Non-Operating	10,935	Scope 3
U	1800 G St NW Washington, DC 20433	Lease	WB Non-Operating	140,214	Scope 3
UN Liaison Office	1 Dag Hammarskjold Plaza, 885 2nd Avenue, 26th Floor, New York, NY 10017	Lease	WB Non-Operating	4,825	Scope 3
VA Ware-house	Dulles Commerce Center, Bldg. 100, 23760 Pebble Run Drive, Sterling VA 20166	Lease	WB Operating	50,030	Scope1, 2

OPERATIONAL BOUNDARY AND SCOPE

Currently, the operational boundary of the WBG's carbon inventory includes all core direct (Scope 1) and indirect (Scope 2) emissions associated with facilities at Headquarters. Emissions from business air travel are included in Scope 3. As better data from country offices is compiled, the core direct and indirect emissions will be accounted for in Scope 1 and 2, respectively.

- **Direct Emissions** from sources that are owned or controlled by the WBG, including emissions from on-site fuel burning equipment (e.g., boilers, back-up generators), and fugitive emissions from process equipment (e.g. refrigerant from refrigeration and HVAC equipment). Mobile emissions from combustion of fuel in WBG are owned and leased vehicles are also included.
- **Indirect Emissions** from electricity purchased by WBG.
- **Other Indirect Emissions:** from WBG employee business air travel.

GHG LIST

The WBG carbon inventory includes emissions from 5 of the 6 major GHG gases (There are no known emissions from SF_6): CO_2, CH_4, N_2O, HFC's, PFC's.

In addition, the US inventory includes emissions from CFC, and HCFC, both of which are optional for inventory and reporting purposes.

WBG BOUNDARY CONDITION ASSUMPTIONS

Global Inventory

- Where there is shared World Bank and IFC office space, emissions are apportioned by percentage of total square footage.
- Data for WB and IFC GHG inventories are collected and compiled separately using the same methodology and aggregated within the same WBG inventory document. In the future, an electronic database will be utilized by the WBG to centralize the collection and reporting process.
- For business travel, only air travel data is collected and included since the majority of WBG's business travel impacts are associated with plane travel.
- Steam, heat, and chilled water data are not included in the global inventory since they are believed to be small and will be difficult to obtain.
- If a WBG office houses 5 or fewer employees, it is assumed that activity data is difficult to obtain. To estimate emissions, assumptions about electricity usage are made based on square footage. Refrigerant emissions and air travel emissions are estimated based on the technique described below. Due to lack of access to information, estimates are not made for on-site fuel and mobiles sources.
- In FY07, employee number estimates are based on numbers for staff and extended term consultants and extended term temporaries provided by Human Resources Analytics Department (HRSAN). In FY08, WBG requested that country offices provide data on all employees located in their offices, detailing the number of contractors, consultants and staff working from the office as of the close of the FY in June. Total staff was assumed to be the number of full-time staff including extended term consultants (ETCs) as well as on-site contractors plus 2/3 the number of short term consultants (STCs) on site.

Homes owned by the World Bank Group in developing countries are not included in the inventory since the WBG does not control the operations of these buildings and activity data is difficult to obtain.

Headquarters Specific: USA

- IFC and WB share warehouse space leased by the World Bank. Since the World Bank manages the lease, the WB reports 100% of these emissions, including the Business Continuity Center (BCC located in Chantilly, VA).
- Emissions are estimated from buildings where the WBG lacks operational control. To estimate emissions, assumptions about electricity usage are made based on square footage. Refrigerant emissions are estimated based on the technique described below. Due to lack of access to information, estimates are not made for on-site fuel.
- There are mail vans and shuttle vans in Washington, DC leased by WB and used by both WB and IFC employees. The WB accounts for 100% of these emissions since they control the van leases and employ the van drivers.
- Steam, heat, and chilled water data were not included in the US emissions, as none are purchased. IFC uses number of workstations to report total employees in each building. The assumption is the number of workstations meets the demand of number of people working from the building. Total workstation figures are more accurate that staffing numbers in the DC offices given the large fluctuations in consultants, contractors and visitors throughout the year. WB is looking to adopt the same methodology.

EMISSIONS QUANTIFICATION

The following sections explain the GHG emissions quantification approach for each of the WBG's emissions sources contained within the boundaries of the fiscal year 2007 (FY2007) GHG inventory. The same approach is applied for Climate Leader's inventory based on Calendar Year (CY2006-7).

All methodologies are based on guidance from the *GHG Protocol* with emission factors taken from governmental and international organizations' sources such as the Intergovernmental Panel on Climate Change (IPCC), US Environmental Protection Agency (EPA), and the International Energy Agency (IEA). All sources are noted in the appendices.

Emissions for both country offices and Headquarters are calculated using similar equations. WBG locations in the Master Location List should be surveyed annually to collect activity data for the purpose of calculating the WBG GHG inventory for internal global business operations. See Appendix F for the full FY2007 survey. When activity data is unavailable, emissions estimates are made for electricity, refrigerants and air travel based on square footage and number of employees. Data gaps still exist in this inventory that will be addressed along with data quality issues as additional and more accurate data become available over time. The primary data gaps are in country offices. For a summary of emissions from the headquarters FY2007 inventory see the attached excel document.

The following methods are used to quantify GHG emissions from the various emissions sources from the WBG's operations:

SCOPE 1 – DIRECT EMISSIONS

ON-SITE (STATIONARY) COMBUSTION

On-site combustion of fossil fuels for the generation of electricity, heat, or steam is one source of direct emissions.

Quantifying Emissions from On-site (Stationary) Combustion

To calculate the GHG emissions from on-site fuel combustion, WBG collects the annual quantity of fuel purchased. To be conservative, the WBG assumes that all fuel purchased is also combusted in on-site operations. An appropriate emissions factor for each fuel type used is applied. Fuels used at WBG locations include diesel, gasoline, natural gas, propane, LPG, and kerosene.

Emissions are determined for each fuel source by multiplying the total annual fuel quantity purchased by the appropriate emissions factors for CO_2, CH_4, and N_2O. Totals for CH_4, and N_2O are multiplied by their Global Warming Potentials (GWPs) to calculate CO_2 equivalent emissions. See Appendix A for a table detailing stationary fuel emissions factors. CO_2 and CO_2 equivalent emissions for all fuels combusted are summed to obtain the total CO_2 equivalent (CO_2eq) emissions for the year. Figure 1 below shows the calculation used when data is provided.

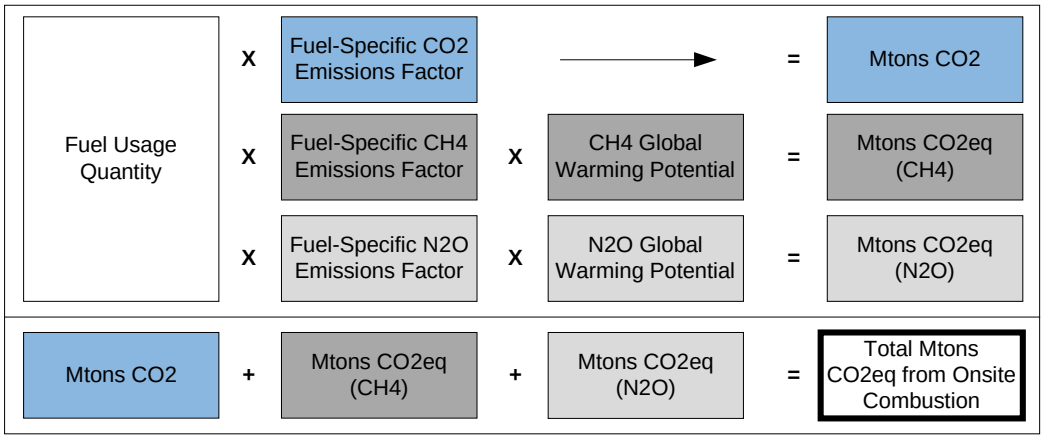


Figure 1: On-site Fuel Combustion Emissions Calculation

There is no credible methodology to estimate emissions for missing on-site fuel data. In the FY2007 inventory, where no data was provided, no emissions were calculated. This data gap will improve in years to come through an improved survey process and more experience gathering the data.

REFRIGERANTS

Refrigeration, freezer, and air conditioning equipment leak refrigerants. GHGs from HVAC operations, refrigeration, and freezer units are not intentionally released, but escape into the atmosphere as fugitive emissions through varying means, including but not limited to: maintenance, installation, disposal, and operational leakage. Each refrigerant CO_2eq is calculated by multiplying the mass of refrigerant by its global warming potential (GWP).

Two methods to calculate GHG emissions of refrigerants are explained in the *GHG Protocol*. The first (preferred) method requires the annual amount of each type of refrigerant purchased for each location (quantity-purchased method). The second method, relating to capacity and leakage characteristics by equipment type, requires the total capacity for refrigerants in each type of equipment used at a location, the corresponding manufacturer's leakage rate for each type of equipment, and the type of refrigerant used in each type of equipment. Equipment types are distinguished by whether the equipment is a heating, ventilation, or air conditioning (HVAC) unit, a freezer, or a refrigeration unit.

Quantifying Emissions from Refrigerants

Refrigerant CO_2 equivalents are calculated by multiplying the weight of escaped refrigerant by the corresponding GWP. GWPs for refrigerants reported in the inventory are gathered from the International Panel on Climate Change (IPCC) or from sources referencing the IPCC. See Appendix C for details on GWPs of refrigerants and sources. See Figure 2 for the preferred calculation methodology, and Figure 3 for the calculation method used in cases where refrigerant data are not available.

Figure 2: Refrigerant Emissions Calculation (preferred)

In the case where activity data (refrigerant purchases) is not available for use, emissions are estimated based on one GHG emission rate (ton refrigerant/ft^2) calculated from occupied WB/IFC building area.

The method used to calculate the intensity is laid out in the table below. In this method, the estimated area per ton of cooling (500 sq ft/ton cooling is commonly used in the US) is multiplied by a conversion factor of one ton of cooling per one kg of refrigerant charge and then by an assumed leakage rate of ten percent. The resulting kilogram of refrigerant per square foot factor is multiplied by the square footage of the location that did not provide refrigeration data. This results in the number of kilograms of refrigerant used in the space.

Table 2: Assumptions used to create intensity rate for refrigerant

Step	Amount assumed	Source
Estimated area per ton cooling (ft^2/ton)	500	HVAC rule of thumb
Refrigerant charge per cooling ton (kg/ton)	1	Climate Leaders – Direct HFC and PFC Emissions from Use of Refrigeration and Air Conditioning Equipment
Annual operating loss factor	10%	Climate Leaders – Direct HFC and PFC Emissions from Use of Refrigeration and Air Conditioning Equipment Table 2 Type of Equipment – Residential and Commercial A/C
Emission Rate (ton refrigerant per ft^2-year)	0.0000002	

The emissions rate used (0.0000002 ton refrigerant per ft^2-year) is then multiplied with the refrigerant type specified. If the refrigerant type is unknown, WB/IFC conservatively assumes the refrigerant type to be HFC-R134a. This number is then multiplied by the GWP and converted to metric tons to calculate the total metric tons of CO_2equivalent emitted.

Refrigerant data is often one of the hardest pieces of information for offices to collect. These estimates are included for completeness but represent a small portion of the WBG's emissions source since its operations do not require a high intensity of refrigeration. As the GHG inventory process becomes incorporated into normal business practices, the quality and completeness of refrigerant data collected will increase.

Quantifying Refrigerant Emissions from Vehicles

Refrigerants, utilized in vehicles for air conditioning, are a minute part of the WBG's GHG emissions from internal business operations. Due to lack of data on refrigerants from vehicles in country offices, these emissions are not included in the global inventory.

At Headquarters, the number of vehicles, grouped by each type, is multiplied by the standard refrigerant charge per unit as outlined by EPA. For example, all passenger cars are assumed to have R-134a and a charge per unit of 0.8, thus 8 passenger cars will have total charge of 6.4kg of refrigerant. The total charge is then multiplied by the standard operating loss factor (20%) to arrive at the annual refrigerant loss in kg. The annual refrigerant lost is multiplied by the global warming potential of that refrigerant (most A/Cs are R-134a) to obtain the total metric tons of CO_2–equivalent emitted.

Mobile Sources

Mobile GHG emissions result from the combustion of fuel from an organization's owned and leased vehicles. In accordance with the "operational control approach" for organizational boundaries, the WBG reports data for fleet vehicles that it owns and leases. All mobile emissions, regardless of location, are calculated using the same methodology to ensure consistency in the quantification process between all locations of mobile fleets owned and operated by WBG.

Quantifying Emissions from Mobile Source

The majority of the offices report fuel use from driver logs or invoices. Direct emissions from owned mobile combustion sources are calculated based on fuel purchase records, where available. Many vehicles have fuel consumption logs to track their purchases.

All transport fuel emissions factors are listed in Appendix D. The preferred approach to calculate mobile sources is shown in Figure 3.

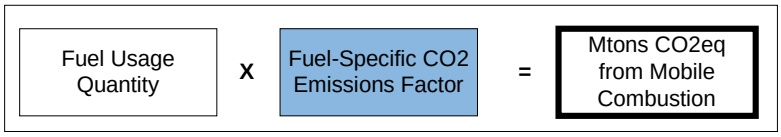


Figure 3: Mobile Fuel Emissions Calculation (preferred)

When no transport fuel data is provided, the WBG makes estimates based on miles driven and fuel economy of the vehicle type. If mileage and vehicle type information is not available, emissions estimates can be made based on fuel costs, if the average cost per gallon or liter is known. The emissions calculations using miles driven and cost are below in Figures 5 & 6 respectively.

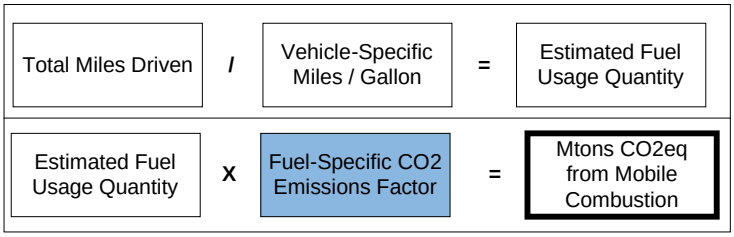


Figure 4: Mobile Fuel Emissions Calculation (vehicle type and mileage)

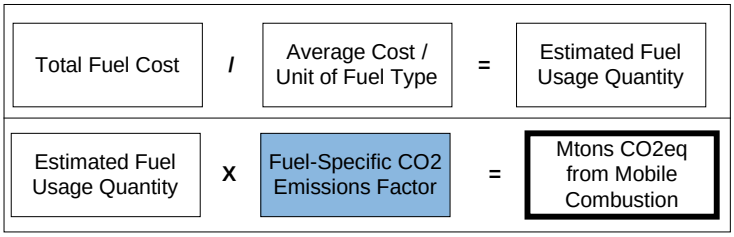


Figure 5: Mobile Fuel Emissions Calculation (fuel cost)

Not all offices report mobile fuel use because some do not have any owned or leased vehicles. In FY2007, there are a few cases where some data about vehicle use are provided (such as fuel cost) but the fuel combusted cannot be estimated. This occurs when a fuel cost-per-gallon rate cannot be provided, or no fuel economy for a vehicle can be assumed. In these cases the emissions are not included.

At headquarters, to derive CH_4 and N_2O emissions, fuel usage quantity is multiplied by fuel emission factors for the respective vehicle type. The CO_2, CH_4 and N_2O emissions are then added to quantify CO_2eq. Since collecting precise car models from all country offices is a difficult task, country office emissions calculations use one set of CH_4 and N_2O factors for each fuel type (gasoline, diesel, and LPG). These standards have been set in place until more accurate data is available.

SCOPE 2 – INDIRECT EMISSIONS

ELECTRICITY PURCHASES

The second scope of emissions under the *GHG Protocol* is indirect emissions from purchased electricity. These emissions are classified as indirect because the emissions do not occur at the facility, but rather at the plant where the electricity or steam is generated from fuel. These emissions are a consequence of the activities of the organization because although the organization does not own or control the sources, its actions require the generation of electricity. Organizations report emissions from the generation of purchased electricity that is used by equipment or operations

controlled by them. For many organizations, purchased electricity represents one of the largest sources of GHG emissions and is the area where the most opportunities for reductions in GHG emissions exist.

Electricity activity data for each WB/IFC office was established using one of three methods. The order of priority for the three methods was to use Method 1, if not available then use Method 2, and as a last resort use Method 3.

1. Where possible, metered electricity usage (kWh) is obtained from electricity invoices via a questionnaire sent to each WBG office.
2. Offices with leased space without separate meters are asked to prorate the electricity usage based on the portion of WBG occupied area in the entire building, and the electricity use invoiced for the entire building. For this estimation, the questionnaire asked for electricity invoice data for the entire building, total area of the building, and area of WBG occupied space in the building.
3. For offices that did not provide any data, estimates were based on regional electricity intensity (kWh/ft2) established from actual data provided from Method 1. This method is explained below in detail.

Quantifying Emissions from Electricity

GHG emissions from the generation of electricity include CO_2, CH_4 and N_2O. GHG emissions are calculated based on the amount of kWh purchased multiplied by the power plant emissions factor. WBG offices often did not have enough information about the specific plants or power pools that provide them with power and electricity. Therefore, for the WBG's facilities, GHG emissions from electricity usage are calculated based on the amount (kWh) of electricity purchased and then multiplied by the region or country-specific emissions factor for CO_2, CH_4 and N_2O.

For electricity purchased in the United States, each year emissions factors are taken from the most recent EPA eGRID to calculate GHG emissions. In accordance with EPA guidelines, previous years' inventories are not retroactively updated with the most recent emission factors. The WBG uses region or country-specific emissions factors from IEA for all other locations. All emissions factors are listed in Appendix E. Figure 7 shows the GHG emissions calculation for WBG locations where energy use amounts are provided.

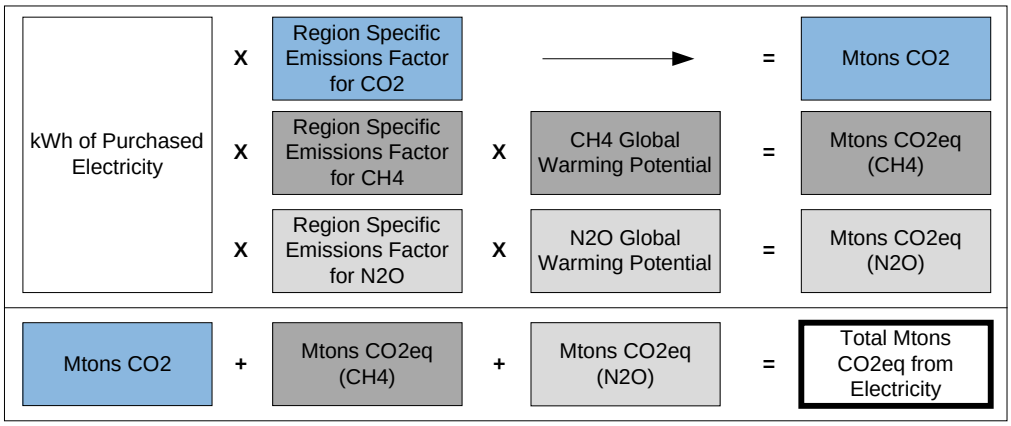


Figure 6: Purchased Electricity Emissions Calculation (preferred)

Methodology for Estimating Electricity Use

For offices with less than five people, the WBG does not collect energy usage data (including electricity). Some WBG offices are unable to obtain electricity data, in such cases electricity usage is estimated based on square footage (Figure 7).

Estimates within the WBG global FY2007 inventory were created by calculating an average kWh/ ft^2 for each region using data on occupied area received via a questionnaire sent to each WB/IFC office. It is instructive to note that no data was available for the WB from "Middle East and North Africa (MNA)" and "Other" regions. The electric intensity used for the MNA region was 13.4 kWh per ft^2 obtained from the non-US average for the WB and the "Other" region used 22.9 kWh per ft^2 obtained from the US average for the WB.

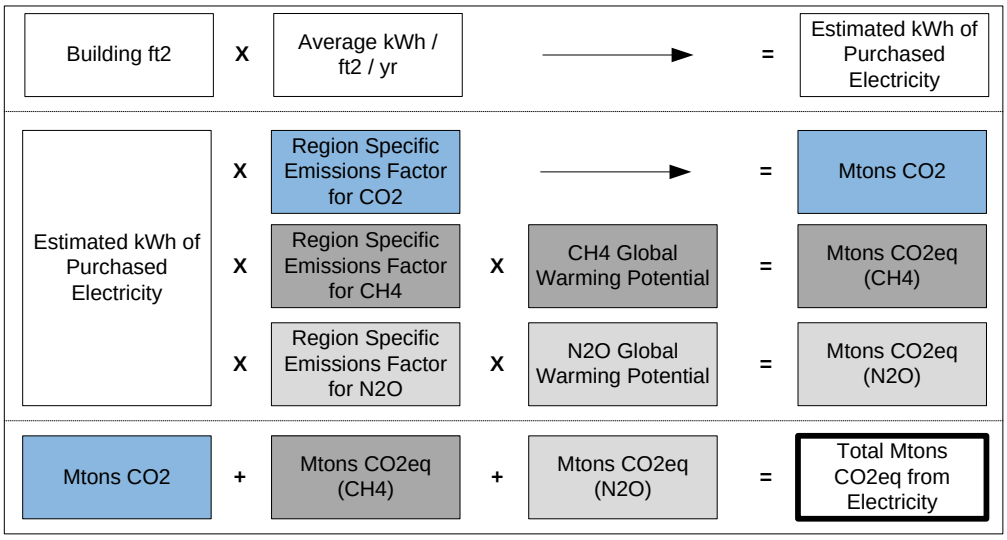


Figure 7: Purchased Electricity Emissions Estimation (building square footage)

The averages calculated are below. These numbers may change in the future as more comprehensive data is collected.

Table 3: Electricity Averages for WB Regions (based on FY08 data)

WB Region	Average based on the following Countries	kWh/ft2
East Asia and the Pacific (EAP) Average	Australia, Cambodia, China, Indonesia (Jakarta), Laos, Thailand, Timor-Leste, Vietnam (Hanoi)	11.1
Europe and Central Asia (ECA) Average	Albania, Armenia, Belarus, Georgia, Kazakhstan (Almaty), Kosovo, Kyrgyz, Macedonia, Poland, Romania, Serbia, Tajikistan, Turkey, Ukraine	14.8
Latin America and the Caribbean (LAC) Average	Argentina, Bolivia, Colombia, Dominican Republic, Ecuador, Guatemala, Haití, Honduras, Jamaica, Perú	15.2
Middle East and North Africa (MNA) Average	Egypt	15.1
South Asia (SAR) Average	India (New Delhi – 70 Lodhi, 53 Lodhi Estate, Golf Links, Polish Embassy), Pakistan	18.2
Sub-Saharan (AFR) Average	Benin, Burkina Faso, Eritrea, Ethiopia, Gabon, Ghana, Malawi, Niger, Rwanda, Senegal, Zimbabwe	10.8
United States/ Other	United States	23.0

Table 4: Electricity Averages for IFC Regions (based on FY08 data)

IFC Region	IFC Country Offices' Data Used to Calculate Regional Intensity Average	Regional Average kWh/ft2
Central & Eastern Europe (CEU) Average	Georgia,), Ukraine (Kiev, Vinnytsia)	13.2
East Asia & the Pacific (CEA) Average	Australia, China (Chengdu, Hong Kong, Beijing), Indonesia (Aceh, Jakarta), Lao P.D.R., Philippines (Manila), Vietnam (Hanoi, Ho Chi Minh City)	8.6
Latin America & the Caribbean (CLA) Average	Argentina, Bolivia, Brazil (Rio, Sao Paulo), Colombia, Mexico, Perú	9.0
Middle East & North Africa (CME) Average	Egypt, Morocco	10.6
South Asia (CSA) Average	BangladeshSri Lanka	20.1
Southern Europe & Central Asia (CSE) Average	Albania, Macedonia, Serbia / Montenegro, Turkey, Kazakhstan, Kyrgyz Republic	9.3
Sub-Saharan Africa (CAF) Average	Nigeria, Senegal, South Africa, Cameroon	9.0
Part 1 Countries	United Kingdom	34
US	US Facilities with operational-control (F)	21.6

Several country offices did not provide occupied area and therefore required an estimate of the occupied area in order for electric consumption to be estimated on the basis of occupied area. The method chosen was to estimate occupied area on the basis of employees assigned to the office location. An IFC/WB average occupied area per employee was established from known data to be 358 ft^2 per person.

Purchased Heat, Steam, and Chilled Water

Data on purchased heat, steam, and chilled water was not collected in the FY2007 survey. At Headquarters, heat, steam, and chilled water are not purchased and it is assumed from past data collection efforts that the number of global offices that purchase heat and steam are limited. Efforts to collect data and/or estimate data for heat, steam and chilled water emissions may be made in the future.

Quantifying Emissions from Steam

Three default estimates are used in the calculation unless site specific data is available regarding the steam supplier. The three site level activity data.

Table 5: Assumptions for calculating emissions from steam

Category	Assumption
Fuel Type	Natural Gas
Fuel to Steam Conversion Efficiency	80%
Steam Heat Content (Btu/lb)	1200

Quantifying Emissions from Chilled Water

The activity data used to calculate emissions resulting from purchases of chilled water are ton-hours and the electric grid country/regional factor. One default estimate is used in the calculation unless site specific data is available regarding the chilled water supplier. A chiller efficiency of .75 kW per ton of cooling is assumed as the default, which was obtained from the 2006 Building Energy Data Book, 2003 stock efficiency for centrifugal chillers.

SCOPE 3 – OTHER INDIRECT EMISSIONS

BUSINESS TRAVEL EMISSIONS

Business air travel is representative of the WBG's core activities and a significant emissions source. Therefore, air travel is included as a voluntary Scope 3 emissions source in the inventory. Due to difficulty in obtaining data for train and car rental, it is excluded from the inventory. This data may be included in future inventories.

Quantifying Emissions from Air Travel

The methodology for collecting air travel data is different for WBG's HQ operations and WBG country offices based on the quality of the data available (described below). However, emission factors are the same for all WBG air travel, and are from the revised Guidelines to DEFRA's GHG Conversion Factors, Annexes updated April 2008.

Headquarters Specific: USA

For WBG's Headquarters operations, air travel data includes air travel for all WBG employees with an identification number (UPI) - this includes contractors, consultants, and full time staff. For all air travel booked through the WBG Headquarters' travel agent, air travel data is broken down by distance into three categories for each flight (short-haul, medium-haul, and long-haul). The definitions used are from the revised 2008 Climate Leaders Greenhouse Gas Inventory Protocol Optional Module Guidance (short-haul air flight is less than 300 miles, medium-haul is less than 700 miles and long-haul is more than or equal to 700 miles). No estimations on miles traveled are used for WBG's Headquarters operations given the accuracy of data from the travel agent. Emissions from business air travel will not be included in reporting for the U.S. EPA Climate Leaders Program.

To calculate air travel emissions for each flight category, the distance traveled and the GHG emission factor is applied to obtain the emissions due to air travel (Figure 10). For a list of emissions factors, see Appendix F.

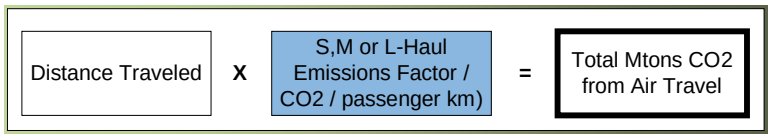


Figure 8: Air Travel Emissions Calculation (preferred)

Note on integration of the radiative forcing index for medium and long-haul flights

Radiative Forcing is the change in radiation received at the surface of the earth due to the emission of greenhouse gasses. High-flying aircraft spur radiative changes through three types of processes: direct emission of radiatively active substances, such as CO_2 and water vapor; emission of chemicals that produce or destroy radiatively active substances, such as NOx; and emission of substances that generate aerosols or lead to changes in natural clouds (e.g., contrails). The Radiative Forcing Index (RFI) is a measure of the importance of these aircraft emissions on the atmosphere. The current, generally accepted, RFI factor is 2.7.

Neither the US EPA nor WRI factor the radiative forcing index (RFI) into air travel emissions calculations despite the recommendation of the UNFCCC. Therefore, the WBG does not currently integrate RFI into its GHG inventory for air travel. Both WRI and EPA are reviewing this issue and may decide to integrate RFI into air travel emissions calculations. If international consensus is reached on the appropriate application of RFI, future WBG inventories may integrate it into air travel emissions inventory calculations.

Country Office Specific

For WBG's country office operations, air travel data must be provided by each country office because there are no central travel agents for our country office operations. Each country office is asked to provide air travel for all employees, broken down by distance into three categories for each flight – short-haul, medium-haul, and long-haul. Since the FY2007 global country office survey collection process was completed prior to June 2008, the new revised 2008 Climate Leaders definitions could not be adopted for the FY2007 inventory calculations. Consequently, the FY2007 Global inventory is based on the distance definitions from U.K. DEFRA (2005). In the future, distance definitions will be based on the most up-to-date international guidance and is noted in Appendix E.

In cases where country offices cannot provide exact short, medium, and long haul miles, country offices are asked to provide the total round-trip flights purchased, broken down by distance traveled (kilometers flown) for all employees, and an estimated percentage of short, medium and long-haul flights..

Methodology for Estimating Air Travel

Since air travel emissions are a large percentage of the WBG's GHG footprint, there is a need for complete data. To fill the data gaps and get a more accurate picture of the WBG's GHG impacts, air travel emissions are estimated for country offices that do not provide any activity data or provide the total round-trip flights purchased, broken down by short, medium and long-haul flights.

To estimate emissions from round-trip flights purchased an average distance for short, medium and long-haul flights is used to determine the total distance traveled (multiplying the average distance by number of flights purchased for each flight type).

The average distances are Short: 300 miles; Medium: 700 miles; Long: varies based on region (see chart below). Both short and medium haul flight averages are based on the upper cusp of DEFRA's definitions to avoid under-estimations. The average long haul flight distance has been determined for each region based on the flight distance between the WBG hub-office and the Washington DC office. This assumes most long-haul flights are used to travel to Headquarters offices in DC since the WBG has been decentralizing and shifting travel needs to within regions. The short, medium or long-haul designation of a round-trip flight purchased is based on start and end destination, and does not account for the multiple legs that may be a part of each flight purchased.

IFC/WB Region	Hub office	Round trip flight distance in miles
CLA/LAC	Rio De Janeiro	9,592
CME/MNA	Cairo	11,684
CAF/AFR	Johannesburg	16,268
CEA/EAP	Hong Kong	16,306
CSA/SAR	New Delhi	15,012
CEU	Moscow	9,764
CSE/ECA	Istanbul	10,482
Part 1/Other	Paris	7,712

It is intended that this option for reporting air travel is temporary as WBG continues its research on how to collect business travel from offices that do not have centralized travel agents. However, the assumption is that this methodology is more accurate than the intensity averages applied (methodology explained in next section) when an office submits no data on air travel.

To estimate air travel, 'miles traveled per employee (intensity averages were calculated.. To calculate the intensity averages, WBG included data provided by US and country offices (number of employees, and total short, medium and long haul miles traveled). Offices that provided estimated data were excluded from creating the intensity averages. The intensity averages used to estimate air travel when no data is provided are below. As better data is collected, the regional estimates will be revisited.

Table 6: Averages for air travel (based on FY08 data)

Agency	Miles Per Employee Short	Miles Per Employee Medium	Miles Per Employee Long
IFC	801	2,625	21,813
WB	467	2,685	40,834

DATA MANAGEMENT

ACTIVITY DATA & DATA MANAGEMENT

WBG Data Collection

In the absence of a web-based data management system to collect emissions data, information collection surveys are sent to all WBG offices to update information on office description, and data is collected on energy use, refrigerant purchases, and business travel. Data is also collected on recycling habits, volunteer hours, waste, and financial donations. These surveys will be superseded by a web-based emissions database collection system in the future.

Offices with 5 employees or less are not asked to report on electricity, vehicle information, onsite fuel and refrigerants data assuming the difficulty in obtaining this data, probable inaccuracy, and the insignificant percentage it represents of the WBGs' overall carbon inventory. In these instances, data on size of office space is used as a default to estimate emissions for electricity, onsite fuel and refrigerants.

Headquarters Specific: USA

To collect GHG emissions at WBG facilities in Washington DC, engineers, building managers, real estate experts, travel management officers, and HR analytics officers identified in "Management Tools" section are asked to submit their respective data sets for the Fiscal Year. WBG is currently assessing a central data collection system which will usurp the current process for both Headquarters and country offices.

Data Sources

Scope 1 direct emissions data from on-site fuel use typically comes from fuel-purchase receipts or records maintained by facility managers of owned buildings and from building managers or landlords for leased buildings.

Scope 1 emissions data for mobile sources typically come from fuel-purchase receipts. Where fuel purchase data is not available, typically driver log information on fuel purchases or mileage is used.

Scope 2 emissions from electricity usage typically come from landlords for leased buildings and from monthly electric utility bills for owned buildings.

Scope 3 optional emissions data for business travel initiated from Washington DC is reported through the WBG's Travel Office which uses a travel management contractor, currently American Express. American Express creates itineraries for each traveler's trip and data is recorded in SAP. This data is combined and summarized and reported at all organizational levels- from our Vice President's Units (VPUs) down to the individual traveler.

Country offices do not use American Express, or have a dedicated travel agent, and therefore report business travel data from their own records including receipts and travel logs. Data is collected in total distance traveled for short, medium, and long hauls. When this data is not available, offices estimate travel distances for short, medium, and long haul trips.

Headquarter Specific: USA

At the WB, the CR team coordinates the assignment of roles and responsibilities for GHG inventory data management, collects relevant data from assigned staff, and then calculates the GHG inventory.

At the IFC, the Footprint Program Officer coordinates the assignment of roles and responsibilities for GHG inventory data management, collects the relevant data from assigned staff, and then calculates the GHG inventory.

Scope 1 emissions data for all tracked emission sources are as follows:

Table 7: Data Origins for Scope 1 Emission Sources

Source	Data Tracked	Data Origin	Vendor Source	Record Responsibility
Boilers and generators	Quantity of fuel consumed	Purchasing records	Washington Gas	GSDCR CHRFM
Air conditioning	Quantity of refrigerant replaced, removed	Service Records	Combustioneer	GSDCR CHRFM
Mobile Combustion Sources	Fuel Purchased	Departmental fuel logs, purchasing card records	NA	GSDSO, GSDCR CHRFM

The building management companies of our leased facilities report (as requested) the usage of fuels for boilers, electricity consumption, and chillers refrigerant loss.

Scope 2 emissions from electricity usage at WBG-owned buildings are assessed through electric utility bills (kWh) consumption records. There has been a historic challenge of having bill data that does not match metered consumption data as the utility will estimate use and later correct the bills according to actual meter readings. Therefore, usage for each month will be checked regularly against new bills and adjustments made as needed.

Scope 3 optional emissions data for business travel initiated from Washington DC is captured through the WBG's travel database. The Travel Agent creates itineraries for each traveler's trip. This data is recorded in SAP and reported through Business Warehouse to WB CR for the inventory calculation. Only itineraries that are booked through the Travel Agent will be included in the total. Therefore, if a traveler books travel outside of the Travel Agent (although this is strongly discouraged), that trip will not be captured. Thus, most travel booked by country offices is not included. The travel data only includes air travel and not car trips, train, or any other mode. Air travel data is collected in total distance traveled for short, medium, and long hauls.

NORMALIZATION FACTOR

The WBG does not yet have any normalized reduction goals for the organization. The inventory data for building space is evaluated on a kWh per square foot and kWh per employee basis.

QUALITY ASSURANCE

The data collection process is reviewed annually by the WBG staff during the inventory development process to improve accuracy and fill data gaps.

To provide a level of quality assurance with the country office activity data, all office surveys are reviewed in detail and clarifying questions are sent to key contacts. When clarifying information is not received, data is taken out of

the inventory if it has a large potential for error and will skew inventory results. In these cases an estimate is made when possible.

The global FY2007 inventory was the first year in which the inventory process was facilitated by importing activity data into a database that is pre-populated with emissions factors and calculation methodologies. To provide some level of quality assurance, random data was selected from the inventory database and manually re-calculated.

Currently, data gaps exist for all emissions sources. The biggest gaps are for on-site fuel and refrigerant leakage data from developing country offices, however both of these represent a very small percentage of the overall WBG GHG inventory (estimated less than 5%). The most significant data gap is air travel given the large percentage that air travel is for the overall WBG inventory (estimated over 50%). As the inventory process becomes routine for country offices, processes will be put into place to collect needed activity data.

Headquarters Specific: USA

At WBG's Headquarters in Washington DC, the following actions are undertaken to prevent errors:

- GSDCR and CR will assess the list of WB management controlled properties to ensure that the inventory includes all leased and owned facilities as well as to confirm the square footage of all existing space. CHRFM and the CESFP will assess the list of IFC management controlled properties to ensure that the inventory includes all leased and owned facilities as well as to confirm the square footage of all existing space.
- GSDCR and CR will inventory each WB management controlled facility for stationary fuel sources, including generators, boilers, and chillers. CHRFM and the CESFP will inventory each IFC management controlled facility for stationary fuel sources including generators, boilers, and chillers.
- GSDCR and CR will review all WB fuel records for the year to ensure that logs and invoices are consistent with reality. CHRFM and the CESFP will review all IFC fuel records for the year to ensure that logs and invoices are consistent with reality.
- GSDCR and CHRFM will review utility bills provided by the utility company to ensure that the patterns are consistent with use. Upon changes to the bills, GSDCR will notify CR, and CHRFM will notify the CESFP, to update the inventory.
- GSD Travel Office will provide and review the business travel figures for each year for all WBG travel originating at headquarters.
- All "owners" of WBG vehicles will be responsible for their own fuel logs and reporting. This includes: GSDCR, GSDSO, GSDMS, and CHRFM.
- As part of the World Bank's voluntary participation in the EPA Climate Leaders' Program, the EPA can request to conduct a periodic review of the World Bank's Headquarter GHG Inventory and identify any areas that appear to be in error.

DATA SECURITY

Information compiled for the purpose of the WBG GHG inventory will be maintained by WB CR and CESFP. Both teams have file backup protection standard to the WBG's data backup system.

INTEGRATED TOOLS

The WBG is working with consultants to develop an integrated tool for use with future inventories. WBG is piloting a web-based data collection tool that simplifies surveys, acts as an auditing tool, automates data calculations when possible, and is capable of long-term analysis of trends and reporting.

CORPORATE REPORTING FREQUENCY

Facility data will be reported on an annual basis in time for annual inventory reporting, generally by the end of the first quarter of the fiscal year.

BASE YEAR

The WBG completed its' first global GHG inventory in FY2007. The inventories in FY2007 and FY2008 are for learning and educational purposes—teaching country offices about carbon inventory data collection and identifying data gaps. It is expected that by FY2009 the WBG inventory will have more complete data with a high level of quality and this inventory will serve as the base-year inventory.

Headquarters Specific: USA

The WBG conducted a GHG inventory in 2006 and 2007 at its Headquarter offices in Washington DC. For the World Bank's Climate Leaders commitment, the base year is Calendar Year 2006, whereas for internal reporting and progress measurement, the World Bank's base year is measured in Fiscal Year 2006 (July 2005 to June 2006).

ADJUSTMENTS TO BASE YEAR EMISSIONS – STRUCTURAL & METHODOLOGY CHANGES

Structural changes include mergers, acquisitions, and divestments and/or outsource or insourcing of GHG emitting activities. Also, changes in the status of leased assets are considered structural changes.

Methodology changes include changes in activity data accuracy, changes in emission factors, and/or changes to the methodology used to calculate GHG emissions.

Discovery of significant errors in Base Year emissions calculations may necessitate a change in the Base Year emissions inventory. Significant structural or methodology changes in future years may necessitate an adjustment to the Base Year emissions to ensure that data are consistent and historically relevant. A "Significant Threshold" requiring a change in the Base Year emissions would be a 1% change in the total corporate-wide GHG emission inventory over or under the previous calculation (if no change were made).

Changes due to New Emission Factors

If there is a change to published emission factor(s), the emission factors will be changed for each of the previous years as well as the current year provided they meet the 1% Significance Threshold. By changing the emission factors for each of the previous reporting years, the emission calculations remain historically consistent and relevant since the same factors are used throughout.

Changes due to Errors

Arithmetic and data entry mistakes can occur while recording and reporting emissions data. If errors are identified during subsequent year inventory reporting that trigger the Significance Threshold, corrections to the previous inventories will be made.

Changes due to Data Accuracy and Availability

If new data are available on source emissions that were not previously available or if new methodologies result in obtaining more accurate data on source emissions, an adjustment to previous year may be required. In such cases the Significance Threshold will be evaluated to determine if adjustments to the past years' inventories are warranted.

MANAGEMENT TOOLS

ROLES AND RESPONSIBILITIES

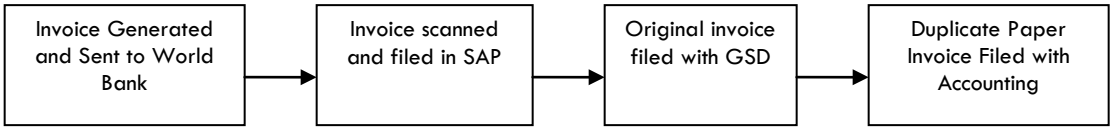
Each WBG office is encouraged to have a chart to track roles and responsibilities. As of FY2007, this IMP includes a chart of roles and responsibilities for our Headquarters only.

Table 8: Roles and Responsibilities for Data Reporting

Emission Source	Location	Department Responsible	Persons Responsible
Electricity Boilers, Generators, Refrigeration	Owned WB buildings	GSDCR	Robert Sensenig, Sr. Project Manager, GSDCR Geetha Srinivasan, Resource Management Officer, GSDPC

Records are maintained in the following fashion:

All utility records from electricity and natural gas consumption from owned buildings are kept in two forms: paper and electronic (in the World Bank's accounting system, SAP). The paper form is filed twice within GSD. The process for electricity bills and for natural gas and diesel purchases for boilers and generators is as follows:



Diesel purchases for generators are recorded by the generator servicing company, Griffiths as well as the engineer of the building containing the generator that was refilled. Griffiths sends a paper bill which is filed with GSDCR as a hard copy. The hard copy of the bill is maintained by the World Bank.
Refrigerant replacement and replenishment is recorded by the servicing company, Emcor. Emcor will submit an electronic report to the World Bank Contract Manager of each service instance with the quantity of refrigerant replaced or replenished. A hard copy of the report will be maintained by Emcor in their World Bank office. The engineer for the building containing the chiller that was serviced will also maintain a copy of the file. The World Bank will maintain these records for three years as required by the EPA.

Electricity, Boilers, generators, refrigeration	Leased WB Buildings	GSDCR	Hisao Kimura, Senior Project Manager, GSDCR

For leased buildings, records are maintained in the following fashion:

The World Bank, as a leased building tenant, does not have direct access to utility bills from our leased buildings. Landlords are contacted on an as needed basis (at least annually for purposes of the carbon inventory) to seek the information. In line with standard industry practice, the utility data is provided to the World Bank on a pro-rated scale by square footage. This information is received by email and retained indefinitely. In the absence of concrete data, estimations are made based on intensity rates (kWh/sq ft).

Electricity, Boilers, generators, refrigeration	Owned IFC Buildings	CHRFM	Christopher Potkay, Contractor, Brandywine Realty Trust Robert Pearlman, Senior Facilities and Administration Officer, CHRFM

Records are maintained in the following fashion:

All utility records from electricity and natural gas consumption from the IFC F building are kept in two forms: paper and electronic. The paper form is filed by the IFC Chief Engineer, part of the Facilities Management team, housed in his office. The paper form is scanned, and electronic copies are stored in the shared network drive, and in the accounting software system, Avid, managed by Brandywine—IFC's facilities management servicing company. Monthly, data is manually entered into spreadsheets organized by utility type and stored on IFC's shared network drive. Monthly, this data is then imported into one footprint summary spreadsheet stored on IFC's shared network drive. All these records are kept indefinitely.

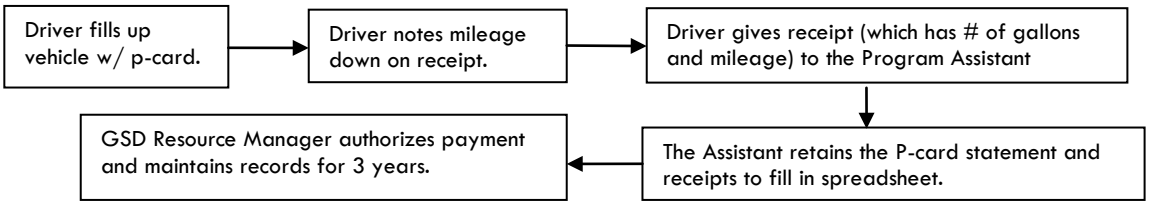
Refrigerant replacement and replenishment is recorded by the servicing company, Brandywine. Brandywine will submit an electronic report to the IFC Facilities Management team with the quantity of refrigerant replaced or replenished. A hard copy of the report will be maintained by Brandywine. The engineer for the building containing the chiller that was serviced will also maintain a copy of the file.

Mobile Combustion Sources	Owned WB vehicles	GSDSO GSDCR GSDMS	Poh Hoi Herley, Resource Management Officer, GSDPC Brent Hartlove, Customer Service

Emission Source	Location	Department Responsible	Persons Responsible
		GSDFC	Representative, GSDCR Ben Moss, Project Manager, GSDMS Marissa Barrera, Contract Coordinator, GSDFC

Fuel usage records are maintained in the following fashion:

Fuel usage for vehicles is maintained and reported by individual units. For the majority of vehicles, which are owned by Security, the fuel usage is tracked by as follows:



The employee shuttle gas purchasing receipts are used to gather the data for fuel consumption. This information is kept in hard copy and then logged electronically for invoice payment. Records are maintained for four years.

Business travel	Travel booked through American Express	GSDTV	Angeline Attena, Travel Specialist, GSDTV Roman Neumeister, Travel Specialist, GSDTV

Records are maintained in the following fashion:

This data is recorded in SAP and reported through Business Warehouse to CR for the inventory calculation.

TRAINING

The purpose of the WBG's training procedure is to ensure that training that pertains to the World Bank's CR Program, IFC's CESFP, and to the GHG inventory is maintained. Each WBG office will outline their training procedure and update the IMP as necessary.

Headquarter Specific: USA

At the WBG's Headquarters in Washington DC, the task of maintaining the inventory is limited to WB's CR, GSDCR and IFC's CESFP, thus, currently, training will be targeted to the specific needs of individual CR and CESFP staff and may entail the following:

- Attend Climate Leaders conferences, as available,
- Review Climate Leaders "Design Principles" documents annually, and
- Maintain on-going discussions with Climate Leaders and consultants.
- Attend various trainings with outside groups, such as the GHG Institute e-learning, US Green Building Council, the Environmental Protection Agency, and US Department of Energy.

DOCUMENT RETENTION AND CONTROL POLICY

The WBG is currently piloting an integrated data management and retention tool. Further information will be provided when the tool is launched.

Headquarter Specific: USA

See "Roles and Responsibilities" section for Headquarters process.

AUDITING & VERIFICATION

INTERNAL AUDITING

The WBG will conduct a desktop review of the corporate GHG inventory each year. Based on this review, any office triggering a Significance Threshold will in turn trigger the need for an internal verification review of that site.

EXTERNAL AUDITING

The WBG will periodically hire a third-party, outside reviewer of the Inventory Management Plan and the corporate GHG Inventory. Should an external audit be warranted, the WBG will contract a third-party audit. ERT-Winrock conducted a verification of the WBG FY2007 inventory and IMP in FY 2008.

MANAGEMENT REVIEW

Annually, upon completion of the GHG inventory, the GHG management team, comprised of members of ENV, GSD, CHRFM, CES, and CESFP of the WBG will meet to discuss the outcomes of the inventory.

CORRECTIVE ACTION

Corrective actions will be implemented at the direction of the WB CR and IFC CESFP in response to a desktop review and/or an internal or external audit identifying a Significance Threshold criteria item or other significant structural or methodological issue that warrants corrective action. Such corrective actions will be documented by changes to the IMP and/or the GHG Inventories. Changes to document, inventories, plans etc. are subject to the IMP Document Retention and Control Policy.

APPENDIX A: STATIONARY EMISSION FACTORS

Stationary Emissions Factors							
Fuel Type	CO_2 (kg/MMBtu)	CH_4 (kg/MMBtu)	N_2O (kg/MMBtu)	CO_2-equiv.	Unit	Heat Content	
Natural Gas	53.3	0.00475	0.00009	53.406	kg CO2eq / MMBtu	988	Btu/cubic ft HHV
				5.34	kg CO2eq / therm		
				50.62	kg CO2eq / GJ		
				1.86	kg CO2eq / m3		
				2.70	kg CO2eq / kg		
Distillate Fuel Oil (#1, 2, 4)	74.2	0.01002	0.00060	74.644	kg CO2eq / MMBtu	0.136	MMBtu/gal HHV
				2.690	kg CO2eq / L		
				10.181	kg CO2eq / gal		
Residual Fuel Oil (#5 & 6)	77.6	0.01002	0.01002	77.952	kg CO2eq / MMBtu	0.143	MMBtu/gal HHV
Gasoline	74.2	0.01002	0.01002	74.644	kg CO2eq / MMBtu	0.124	MMBtu/gal HHV
				2.385	kg CO2eq / L		
LPG/Propane	59.9	0.00501	0.00010	60.029	kg CO2eq / MMBtu	0.084	MMBtu/gal HHV
				60.029	kg CO2eq / MMBtu		
Kerosene	72.0	0.01002	0.00060	72.439	kg CO2eq / MMBtu	0.132	MMBtu/gal HHV
				9.585	kg CO2eq / gal		
				2.53	kg CO2eq / L		
				2.026	kg CO2eq / kg		

Source: WRI - Calculation Tool for Direct Emissions from Stationary Combustion. Calculation worksheets. December 2007. Version 3.1

APPENDIX B: REFRIGERANT EMISSIONS

Global Warming Potentials		
GHG Type	**GWP**	**Source**
CO_2	1	Intergovernmental Panel on Climate Change, Second Assessment Report http://www.ipcc.ch/ipccreports/assessments-reports.htm
CH_4	21	
N_2O	310	
SF_6	23,900	
Refrigerants		
HCFC Type	**GWP**	**Source**
R-11	4600	*Only used to measure supplemental emissions GWPs drawn from Intergovernmental Panel on Climate Change, Second Assessment Report http://www.ipcc.ch/ipccreports/assessments-reports.htm
R-22	1700	
HFC Type	**GWP**	**Source**
R-23	11,700	Calculating HFC and PFC Emissions from the Manufacturing, Servicing, and/or Disposal of Refrigeration and Air-Conditioning Equipment. Calculation Worksheets (Version 1.0). GWPs draw from Intergovernmental Panel on Climate Change, Second Assessment Report http://www.ipcc.ch/ipccreports/assessments-reports.htm
R-41	150	
R-123	120	
R-125	2,800	
R-134	1,000	
R-134a	1,300	
R-143	300	
R-143a	3,800	
R-152a	140	
R-227ea	2,900	
R-236fa	6,300	
R-245ca	560	
R-R407c	1,526	
HFC-4310mee	1300	
R-410a	1,725	
R-227ea	3,500	
PFC Type	**GWP**	**Source**
PFC-14	6,500	Calculating HFC and PFC Emissions from the Manufacturing, Servicing, and/or Disposal of Refrigeration and Air-Conditioning Equipment. Calculation Worksheets (Version 1.0). GWPs draw from Intergovernmental Panel on Climate Change, Second Assessment Report http://www.ipcc.ch/ipccreports/assessments-reports.htm
PFC-116	9,200	
PFC-218	7,000	
PFC-3-1-10	7,000	
PFC-c318	8,700	
PFC-4-1-12	7,500	
PFC-5-1-14	7,400	

Vehicle Refrigerant Charge Factors		
Vehicle Type	**Charge factor (Kg)**	**Source**
Passenger car	0.8	EPA Refrigerant Guidance, 2004, Table 2
Light Truck	1.2	
Aircraft	6.4	
Cooling Factor		
Region	**Ft^2 per cooling ton**	**Source**
USA	500	Cooling intensity for region per Dan Sobrinski, Econergy

APPENDIX C: MOBILE FUEL EMISSION FACTORS

CO2 Emission Factors			
Fuel type	**CO2**	**Units**	**Source**
Gasoline	0.002400777	tCO_2e / L	WRI - CO2 Emissions from Business Travel. Version 2.0. http://www.eia.doe.gov/oiaf/1605/techassist.html
Gasoline	0.00908694	t CO_2e / gal	
Diesel	0.002684395	t CO_2e / L	
Diesel	0.010160433	t CO_2e / gal	
LPG	0.00165981	t CO_2e / L	
LPG	0.005815399	t CO_2e / gal	

N_2O, CH_4 Emission Factors – used for country offices							
Fuel type	**CH_4**	**N_2O**	**CH_4**	**N_2O**	**CH_4**	**N_2O**	**Vehicle type**
	g/mi	**g/mi**	**kg/gal**	**kg/gal**	**kg/liter**	**kg/liter**	
Gasoline	0.1696	0.0197	0.0037312	0.0004334	0.000986	0.000114505	Table A-1 - "Non-Catalyst"
Diesel	0.0005	0.001	0.000011	0.000022	2.90621E-06	5.81242E-06	Table A-1 - "Passenger Cars & moderate control"
LPG	0.037	0.067	0.000814	0.001474	0.000215059	0.000389432	Table A-7 - "light Duty Vehicles"
Source: "Climate Leaders - Direct Emissions From Mobile Combustion Sources - May 2008" Note: N2O, CH4 were calculated using average vehicle fuel economy. WB/IFC only has volume (gallons or liters) of fuel consumption and the CH_4 and N_2O factors are per distance (mi or km) traveled. As a result, a corporate average fuel economy was assumed to be 22 mpg.							

N_2O, CH_4 Emission Factors – used in US only			
Vehicle type	**Fuel type**	**N_2O**	**CH_4**
Passenger Cars	Gasoline	***g/mi***	***g/mi***
1984 -1993		0.0647	0.0704
1994		0.056	0.0531
1995		0.0473	0.058
1996		0.0426	0.0272
1997		0.0422	0.0268
1998		0.0393	0.0249
1999		0.0337	0.0216
2000		0.0273	0.0178
2001		0.0158	0.011
2002		0.0153	0.0107
2003		0.0135	0.0114
2004		0.0083	0.0145
2005		0.0079	0.0147
Vans, Pickups, SUVs	Gasoline	***g/mi***	***g/mi***
1987 -1993		0.1035	0.0813
1994		0.0982	0.0646
1995		0.0908	0.0517

N_2O, CH_4 Emission Factors – used in US only			
Vehicle type	**Fuel type**	**N_2O**	**CH_4**
1996		0.0871	0.0452
1997		0.0871	0.0452
1998		0.0728	0.0391
1999		0.0564	0.0321
2000		0.0621	0.0346
2001		0.0164	0.0151
2002		0.0228	0.0178
2003		0.0114	0.0155
2004		0.0132	0.0152
2005		0.0101	0.0157
Heavy-Duty Vehicles		***g/mi***	***g/mi***
1985-1986		0.0515	0.409
1987		0.0849	0.3675
1988-1989		0.0933	0.3492
1990-1995		0.1142	0.3246
1996		0.168	0.1278
1997		0.1726	0.0924
1998	Gasoline	0.1693	0.0641
1999		0.1435	0.0578
2000		0.1092	0.0493
2001		0.1235	0.0528
2002		0.1307	0.0546
2003		0.124	0.0533
2004		0.0285	0.0341
2005		0.0177	0.0326
Other Non-highway		***g/gal***	***g/gal***
Small Utility	Gasoline	0.22	0.5
Large Utility	Diesel	0.26	0.58
Passenger Cars		***g/mi***	***g/mi***
1960-1982		0.0012	0.0006
1983-1995		0.001	0.0005
1996-2004		0.001	0.0005
Light Trucks		***g/mi***	***g/mi***
1960-1982		0.0017	0.0011
1983-1995	Diesel	0.0014	0.0009
1996-2004		0.0015	0.001
Heavy-Duty Vehicles		***g/mi***	***g/mi***
1960-1982		0.0048	0.0051
1983-1995		0.0048	0.0051
1996-2004		0.0048	0.0051
Source: "Climate Leaders - Direct Emissions From Mobile Combustion Sources - May 2008"			

APPENDIX D: PURCHASED ELECTRICITY

United States of America					
Country / eGRID Subregion	tCO2e / kWh	lb CO_2/ MWh	lb CH_4/ MWh	lb N_2O/ MWh	Source
United StatesAKGD	0.0005714	1257.19	0.0266	0.0064	eGRID 2007, YEAR 2005 DATA http://www.epa.gov/cleanenergy/energy-resources/egrid/index.html
United StatesAKMS	0.0002186	480.10	0.0238	0.0044	
United StatesAZNM	0.0005711	1254.02	0.0175	0.0148	
United StatesCAMX	0.0004001	878.71	0.0366	0.0085	
United StatesERCT	0.0006466	1420.56	0.0214	0.0148	
United StatesFRCC	0.0006048	1327.66	0.0528	0.0150	
United StatesHIMS	0.0006640	1456.17	0.0999	0.0182	
United StatesHIOA	0.0007877	1728.12	0.0911	0.0212	
United StatesMROE	0.0008475	1858.72	0.0314	0.0289	
United StatesMROW	0.0008270	1813.81	0.0264	0.0287	
United StatesNEWE	0.0004152	908.90	0.0795	0.0152	
United StatesNWPP	0.0004200	921.10	0.0217	0.0140	
United StatesNYCW	0.0004195	922.22	0.0384	0.0060	
United StatesNYLI	0.0006429	1412.20	0.0684	0.0117	
United StatesNYUP	0.0003736	819.68	0.0242	0.0114	
United StatesRFCE	0.0004995	1095.53	0.0244	0.0168	
United StatesRFCM	0.0007484	1641.41	0.0340	0.0253	
United StatesRFCW	0.0007096	1556.39	0.0196	0.0244	
United StatesRMPA	0.0009279	2035.81	0.0241	0.0302	
United StatesSPNO	0.0008987	1971.42	0.0236	0.0303	
United StatesSPSO	0.0008024	1761.14	0.0301	0.0230	
United StatesSRMV	0.0005173	1135.46	0.0413	0.0132	
United StatesSRMW	0.0008408	1844.34	0.0214	0.0288	
United StatesSRSO	0.0006799	1490.37	0.0388	0.0248	
United StatesSRTV	0.0006816	1494.89	0.0233	0.0237	
United StatesSRVC	0.0005230	1146.39	0.0291	0.0191	

Country based emission factors					
Electric Subregion	*tCO2e / kWh*	*lb CO_2/ MWh*	*lb CH_4/ MWh*	*lb N_2O/ MWh*	Source
Albania	*0.0000346*	*75.94*	*0.0055*	*0.0011*	*CO2: International Energy Agency, as cited in GHG Protocol purchased electricity tool, 2004 data* *International Energy Agency, as cited by EIA for 1605b. http://www.eia.doe.gov/oiaf/1605/techassist.html* *CH4/N2O: International Electricity Emission Factors by Country, 1999-2002.xls.*
Algeria	*0.0006718*	*1479.43*	*0.0333*	*0.0035*	
Angola	*0.0003439*	*755.76*	*0.0295*	*0.006*	
Argentina	*0.0003069*	*675.72*	*0.0126*	*0.0022*	
Armenia	*0.0001388*	*305.02*	*0.0209*	*0.0022*	
Aruba	*0.0007164*	*1572.93*	*0.082*	*0.0163*	
Australia	*0.0008972*	*1969.07*	*0.0223*	*0.0284*	
Austria	*0.0002256*	*495.84*	*0.0084*	*0.0046*	

Electric Subregion	tCO2e / kWh	lb CO_2/ MWh	lb CH_4/ MWh	lb N_2O/ MWh	Source
Azerbaijan	0.0005079	1113.2	0.0869	0.0157	
Bahamas	0.0007164	1572.93	0.082	0.0163	
Bahrain	0.0008907	1962.68	0.0256	0.0026	
Bangladesh	0.0005582	1227.92	0.0518	0.006	
Barbados	0.0007164	1572.93	0.082	0.0163	
Belarus	0.0003004	658.93	0.0538	0.0073	
Belgium	0.0002689	590.85	0.0093	0.006	
Benin	0.0007131	1565.41	0.0216	0.0212	
Bermuda	0.0007164	1572.93	0.082	0.0163	
Bolivia	0.0004819	1061.38	0.0161	0.0026	
Bosnia-Herzegovina	0.0006236	1364.12	0.0236	0.034	
Botswana	0.0018509	4074.17	0.0216	0.0212	
Brazil	0.0000846	185.7	0.0055	0.0024	
Brunei	0.0007899	1739.37	0.0461	0.0046	
Bulgaria	0.0004524	987.85	0.024	0.0298	
Cambodia	0.0012084	2659.08	0.0485	0.0146	
Cameroon	0.0000392	86.21	0.0018	0.0004	
Canada - Alberta	0.0008832	1944.81	0.0086	0.0077	
Canada - British Columbia	0.0000182	37.49	0.0086	0.0077	
Canada - Manitoba	0.0000152	30.87	0.0086	0.0077	
Canada - New Brunswick	0.0003952	868.77	0.0086	0.0077	
Canada - Newfoundland and Labrador	0.0000322	68.36	0.0086	0.0077	
Canada - Northwest Territories	0.0000312	66.15	0.0086	0.0077	
Canada - Nova Scotia	0.0007722	1700.06	0.0086	0.0077	
Canada - Nunavut	0.0000312	66.15	0.0086	0.0077	
Canada - Ontario	0.0002212	485.1	0.0086	0.0077	
Canada - Prince Edward Island	0.0002532	555.66	0.0086	0.0077	
Canada - Quebec	0.0000103	20.07	0.0086	0.0077	
Canada - Saskatchewan	0.0008232	1812.51	0.0086	0.0077	

Electric Subregion	tCO2e / kWh	lb CO_2/ MWh	lb CH_4/ MWh	lb N_2O/ MWh	Source
Canada - Yukon	0.0000312	66.15	0.0086	0.0077	
Cayman Islands	0.0007164	1572.93	0.082	0.0163	
Chile	0.0003589	788.23	0.013	0.0093	
China	0.0007939	1737.25	0.0322	0.0406	
China (including Hong Kong)	0.0007941	1737.83	0.0322	0.0406	
Colombia	0.0001638	359.84	0.0062	0.0042	
Congo	0.0000032	0	0.0216	0.0212	
Costa Rica	0.0000269	59.3	0.0013	0.0002	
Côte d'Ivoire	0.0005186	1142.46	0.0216	0.0022	
Croatia	0.0003157	686.47	0.0287	0.0289	
Cuba	0.0009907	2177.31	0.0873	0.0174	
Cyprus	0.0007955	1747.07	0.0842	0.0168	
Czech Republic	0.0005191	1136.84	0.0172	0.0236	
Democratic Republic of Congo	0.000003	6.52	0.0002	0	
Denmark	0.0002864	625.3	0.026	0.0183	
Dominican Republic	0.0005781	1265.65	0.0983	0.0225	
Ecuador	0.0003703	813.85	0.0335	0.0066	
Egypt	0.0004723	1039.53	0.03	0.004	
El Salvador	0.0002649	580.82	0.0388	0.0077	
Eritrea	0.0006994	1535.05	0.0847	0.017	
Estonia	0.0006741	1466.12	0.0461	0.062	
Ethiopia	0.0000067	14.64	0.0009	0.0002	
Finland	0.0001947	426.78	0.0088	0.0077	
France	0.0000912	200.34	0.0031	0.002	
Gabon	0.0003691	812.18	0.0223	0.004	
Georgia	0.0000895	196.75	0.0086	0.0011	
Germany	0.0003518	770.06	0.0141	0.0172	
Ghana	0.0002043	449.3	0.0152	0.0031	
Gibraltar	0.0007474	1638.51	0.114	0.0227	
Greece	0.0007803	1712.17	0.032	0.0251	
Guam	0.0007164	1572.93	0.082	0.0163	
Guatemala	0.000386	846.19	0.0456	0.013	
Haiti	0.0003102	677.72	0.0754	0.015	

Electric Subregion	tCO2e / kWh	lb CO_2/ MWh	lb CH_4/ MWh	lb N_2O/ MWh	Source
Honduras	0.0004121	905.62	0.0366	0.0073	
Hong Kong	0.0008158	1785.57	0.0322	0.0406	
Hungary	0.0003406	746.84	0.0223	0.0119	
Iceland	0.0000006	1.36	0	0	
India	0.0009498	2080.11	0.0366	0.0432	
Indonesia	0.0007738	1699.48	0.045	0.019	
Iran	0.000535	1176.95	0.0412	0.0062	
Iraq	0.0007039	1545.06	0.084	0.0168	
Ireland	0.0005869	1288.1	0.0357	0.017	
West Bank and Gaza	0.0007719	1692.29	0.039	0.0291	
Italy	0.0004073	893.89	0.039	0.0106	
Jamaica	0.0007164	1572.93	0.082	0.0163	
Japan	0.0004302	944.93	0.0185	0.0104	
Jordan	0.000663	1455.05	0.0836	0.0165	
Kazakhstan	0.0011439	2506.75	0.0417	0.0474	
Kenya	0.0003079	676.43	0.0295	0.006	
Kuwait	0.0008101	1780.51	0.0734	0.0139	
Kyrgyzstan	0.0000822	179.99	0.0046	0.0037	
Latvia	0.0001664	357.28	0.0287	0.0289	
Lebanon	0.0006707	1471.49	0.0884	0.0176	
Libya	0.0009023	1983.12	0.0816	0.0154	
Lithuania	0.00013	285.77	0.0139	0.0022	
Luxembourg	0.0003295	722.7	0.0152	0.0112	
Macau	0.0007939	1737.25	0.0322	0.0406	
Macedonia	0.0006528	1421.76	0.0399	0.054	
Malaysia	0.0005586	1228.21	0.0437	0.0082	
Malta	0.0008969	1966.62	0.1319	0.0265	
Mexico	0.0005165	1136.61	0.037	0.0051	
Moldova	0.0005201	1137.17	0.0287	0.0289	
Monaco	0.0000912	200.34	0.0031	0.002	
Mongolia	0.0005357	1175.74	0.0485	0.0146	
Morocco	0.0007825	1714.39	0.0412	0.0324	
Mozambique	0.0000045	2.95	0.0216	0.0212	
Myanmar	0.0003663	804.39	0.0516	0.0071	
Namibia	0.0000295	58.13	0.0216	0.0212	
Nepal	0.0000015	3.1	0.002	0.0004	

Electric Subregion	tCO2e / kWh	lb CO_2/ MWh	lb CH_4/ MWh	lb N_2O/ MWh	Source
Netherlands	0.0003884	852.6	0.0221	0.0108	
Netherlands Antilles	0.0007212	1582.81	0.0902	0.0181	
New Zealand	0.0002757	607.31	0.0068	0.0018	
Nicaragua	0.0005423	1187.99	0.0931	0.0185	
Nigeria	0.0004039	888.53	0.0318	0.0042	
North Korea	0.0005234	1148.7	0.0161	0.0165	
Norway	0.0000055	12.13	0	0	
Oman	0.0008557	1884.26	0.0401	0.0057	
Pakistan	0.0003819	836.95	0.0695	0.0121	
Panama	0.0002782	610.42	0.0364	0.0073	
Papua New Guinea	0.0007738	1699.48	0.045	0.019	
Paraguay	0	0	0	0	
Peru	0.0001984	436.23	0.0117	0.0029	
Philippines	0.0004979	1091.8	0.0342	0.0172	
Poland	0.0006639	1452.87	0.0238	0.0337	
Portugal	0.0005007	1098.58	0.0322	0.0157	
Puerto Rico	0.0007164	1572.93	0.082	0.0163	
Qatar	0.0006186	1362.62	0.0256	0.0026	
Romania	0.0003979	869.07	0.0318	0.0249	
Russia	0.0003403	745.2	0.0304	0.0148	
Saipan	0.0007164	1572.93	0.082	0.0163	
Saudi Arabia	0.0007497	1648.48	0.0591	0.0108	
Senegal	0.0006373	1398.25	0.0836	0.0168	
Serbia	0.0007539	1649.17	0.0284	0.0404	
Singapore	0.0005471	1199.36	0.0882	0.0163	
Slovakia	0.0002331	511.7	0.0079	0.0071	
Slovenia	0.0003313	723.88	0.0148	0.0203	
South Africa	0.0008536	1870.63	0.0238	0.0359	
South Korea	0.0004204	922.1	0.0168	0.0148	
Spain	0.0003964	869.43	0.0203	0.0139	
Sri Lanka	0.0003999	876.78	0.06	0.0119	
Sudan	0.0008497	1869.92	0.0432	0.0086	
Sweden	0.0000447	98.2	0.002	0.0011	
Switzerland	0.0000262	57.84	0.0007	0	
Syria	0.0005899	1295.43	0.069	0.0123	

Electric Subregion	tCO2e / kWh	lb CO_2/ MWh	lb CH_4/ MWh	lb N_2O/ MWh	Source
Taiwan	0.0006347	1392.86	0.0304	0.0194	
Tajikistan	0.0000274	60.44	0.0009	0	
Tanzania	0.000607	1337.47	0.0055	0.0024	
Thailand	0.0005333	1171.6	0.0434	0.0108	
Togo	0.0004773	1045.32	0.0216	0.0212	
Trinidad and Tobago	0.0007094	1563.41	0.0176	0.0018	
Tunisia	0.0004825	1061.91	0.0346	0.0044	
Turkey	0.000435	954.42	0.0249	0.0139	
Turkmenistan	0.0007962	1753.25	0.043	0.0044	
UAE	0.0008443	1860.17	0.0265	0.0029	
Uganda	0.000607	1337.47	0.0055	0.0024	
Ukraine	0.0003176	693.07	0.0227	0.0221	
United Kingdom	0.0004744	1041.89	0.0174	0.0121	
Uruguay	0.000103	226.54	0.0062	0.0013	
Uzbekistan	0.0004446	976.9	0.0437	0.0082	
Venezuela	0.0002257	496.62	0.0139	0.0024	
Vietnam	0.0004071	894.34	0.0287	0.0086	
Yemen	0.0008497	1864.27	0.1136	0.0227	
Zambia	0.0000069	15.08	0.0004	0.0002	
Zimbabwe	0.0005755	1262	0.0216	0.0212	

APPENDIX E: AIR TRAVEL EMISSIONS FACTORS

Air Travel Emission Factors *						
Trip Type	**Flight length***	**gCO2/ passenger-mile**	**gCH4/ passenger-mile**	**gN2O/ passenger-mile**	**g CO2eq / Passenger-mile**	**Source**
Short Haul	<300 miles	307	0.0087	0.0100	310	Guidelines to Defra's GHG Conversion Factors. Annexes updated April 2008
Medium Haul	300>700	172	0.0028	0.0353	174	
Long Haul	>700	195	0.0031	0.0353	0.196	

*Flight length determined from: U.S. Environmental Protection Agency Climate Leaders Greenhouse Gas Inventory Protocol Optional Module Guidance "Optional Emissions from Employee Commuting, Business travel and Product Transport" US EPA February 2008. Emissions factors drawn from U.K DEFRA 2007.

APPENDIX F: BACKGROUND ON US EPA CLIMATE LEADERS

Launched in 2002, Climate Leaders is a US industry-government voluntary partnership that works with companies to develop long-term comprehensive climate change strategies. The partners set a corporate-wide greenhouse gas reduction goal and measure their emissions to track progress. By reporting this data to EPA, the partners create a lasting record of their accomplishments.

Partners of the Program are required to:

- Develop a corporate-wide inventory of the six major greenhouse gases (CO2, CH4, N2O, HFCs, PFCs, SF6) using the Climate Leaders GHG Inventory Guidance. Partners report their direct emissions from energy use, electricity, mobile sources, HVAC/refrigerator (Companies have the option of increasing their reductions by including optional sources, such as international operations, business travel, employee commuting, renewable energy, and offsets)
- Create and maintain an Inventory Management Plan (this document) to institutionalize the process of collecting, calculating, and maintaining a high-quality, corporate-wide inventory
- Set corporate-wide GHG emissions reduction goals to be achieved over 5 to 10 years **(In March 2007, the World Bank pledged to reduce its greenhouse gas emissions by 7% over the next 5 years from a fiscal year 2006 baseline. The commitment included emissions from only Scope 1 and 2).**
- Report inventory data annually (on a calendar year basis).

WORLD BANK GROUP	
Organization Name:	The World Bank: IBRD/IDA
Corporate Address:	1818 H St. NW, Washington, DC, USA 20433
Inventory Manager:	Sr. Environmental Specialist, ENV, Judith Moore
Contact Information:	Address: 1818 H St, Washington, DC 20003 Phone: 202-458-9301 Email: jmoore1@worldbank.org
Organization Name:	International Finance Corporation (IFC)
Corporate Address:	2121 Pennsylvania Ave., NW, Washington, DC 20433
Inventory Manager:	Footprint Program Officer, Sarah Raposa
Contact information:	Phone: 202-458-7703 Email: sraposa@ifc.org