UNITED NATIONS

GHG INVENTORY ESTIMATE

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1.0 Introduction

The United Nations (UN) is exploring a climate neutral commitment and as an initial step would like to calculate the amount of greenhouse gas (GHG) emissions that would need to be offset to meet this goal. In order to explore a climate neutral commitment, the UN has chosen to complete a quick GHG inventory estimate to get an understanding of the organization's GHG impact. All UN organizations were invited to participate in the inventory exercise, but due to the tight schedule, not all organizations submitted data. The UN intends to initiate a more comprehensive GHG inventory effort, with full participation, later next year.

The inventory was completed over approximately a two month period. Key data holders within each participating UN organization filled out a GHG data questionnaire supplied to them or submitted data in any existing format. Given the very short time frame for UN organizations to gather data, this GHG inventory is considered only a preliminary effort and the inventory will be become more accurate and complete as the UN has more time to work on the effort over the next year.

The UN GHG inventory is consistent with the World Resources Institute's and World Business Council for Sustainable Development's GHG Inventory Protocol which complies with ISO Standard 14064, a corporate standard for measuring, reporting, and verifying GHG emissions. Below is a description of the inventory approach, the methodologies used to calculate the GHG emissions, a summary of the findings, and recommendations for improving the quality of the inventory over time.

2.0 Defining Boundary Conditions

Organizational Boundaries

The UN uses the "management control" approach for the inventory. The UN defines management control as all agencies and staff and associated office space including regional offices and field offices. All UN owned and leased facilities and fleets are included. Emissions related to UN consultants within UN owned and leased space is included.

Projects funded by the UN and executed by their entities do not fit within the boundary conditions and are not included in the inventory.

Operational Boundaries

The UN includes direct (Scope 1), indirect (Scope 2), and business travel (Scope 3) emissions for this estimate[1]. All business travel of staff and consultants paid for by the UN is within the boundaries of the inventory.

Direct emissions found within the UN include fuel use for vehicles and on-site generation of energy. Direct emissions also include fugitive emissions from the leakage of refrigerants for air conditioning.

[1] Scope 1,2,3 WRI methods

Indirect emissions include purchased electricity and steam. Business travel emissions include various modes of transportation.

3.0 Calculation Methodology

Given the shortage of time, the data was submitted by the UN agencies with varying levels of detail. A few organizations have previously completed a GHG inventory and were able to provide detailed activity data beyond what was needed for an estimate. Other organizations were only able to provide information on number of employees and area of office space and extrapolations were used to calculate GHG emissions. Sections 3.1-3.6 detail the calculation approaches and assumptions are made when necessary for each different emissions source category.

3.1 Purchased Electricity Calculations

Organizations were asked to provide exact kWh. In cases where this was possible, an accurate representation of emissions is calculated for the purchased electricity component. The emissions are calculated using the CO2eq emissions factor for the facility location. Where the exact kWh is not provided, an estimate was created based on the kWh consumption by employee or by the area (in square meters) of the facility. The average CO2eq emissions per employee and per square meter are calculated using the average of all organizations that provided data.

Calculations are done for each building within an organization when data is available. For building campuses such as New York and Vienna, where multiple organizations reside, emissions are calculated by building cluster rather than by organization.

Electricity Calculations

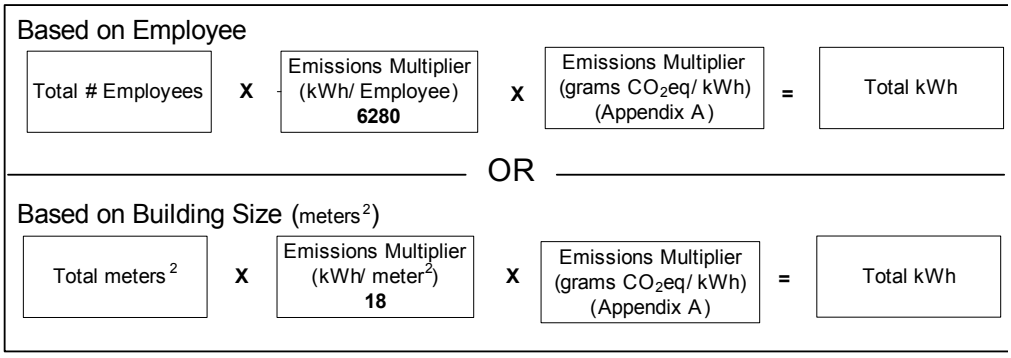
The best means of understanding the GHG emissions from purchased electricity is to understand electricity usage and apply country-specific or region-specific CO_2 emissions factors. Consistent with US EPA Climate Leaders guidance, the Emissions & Generation Resource Integrated Database (EGRID) managed by the US EPA, and the WRI Indirect CO_2 Emissions tool to obtain the indirect CO_2 emissions factors (See Appendix A) .

Purchased kWh of Electricity	X	County/Region-Specific CO_2 Emissions Factor	=	Lbs CO_2

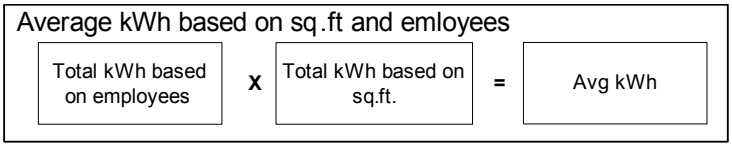
Electricity Emissions Based on (Employees/Building Size)

Electricity emissions are calculated for agencies that did not provide total kilowatt-hours. These calculations are based on the total employees in a specific office, or by total square meters per office. When both square meters and total employees are given, the average of the two total kilowatt-hours (from each measurement) is calculated. The total kWh is then multiplied by the country or region-specific emissions multiplier to find total CO_2 equivalent emissions.

Calculating emissions based on either total employees OR meters²



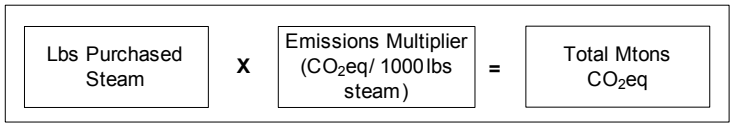
Calculating emissions if both employee number and meters² are given



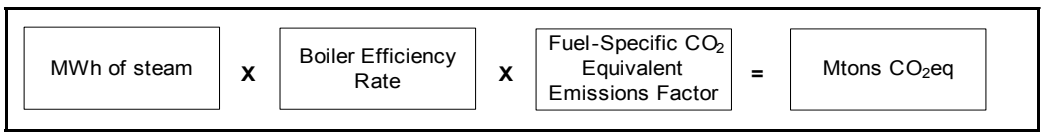
3.2 Purchased Steam Calculations

Some UN buildings use steam for heating purposes. To determine steam emissions information on the amount of steam purchase, the efficiency of the boiler, the fuel source, and the emissions factors is needed. In the case of the New York Headquarters buildings, an emissions factor was provided by the utility that incorporates the fuel mix and the efficiency rate of the boilers. The only other building with steam use is the UNESCO building in France. For this building the annual MWh usage was provided, a default factor of 80% boiler efficiency was used, and it it assumed that natural gas is the fuel source.

New York Building Campus Steam Emissions



UNESCO Steam Emissions



3.3 Onsite Fuel Combustion

The combustion of on-site fuels creates GHG emissions for CO_2 as well as smaller amounts of CH_4, and N_2O. To understand GHG emissions from on-site fuel combustion, UN organizations submitted fuel use data by type (e.g. natural gas). Then, an US EPA fuel-specific emissions factors is used to calculate GHG emissions.

Onsite Fuel Emissions Formula

Purchased Fuel (mmBtu)	X	Fuel Specific Emissions Multiplier (Mtons CO_2eq/ mmBtu) (Appendix B)	=	Total Mtons CO_2eq

3.4 Mobile Sources

Many UN organizations have fleets of owned or leased vehicles that are captured in this analysis. When possible, vehicle emissions are based on actual fuel consumed. If fuel data was not available, emissions are estimated based on kilometers traveled per car per year.

Based on Fuel Consumption

Total Liters (by fuel type)	X	Emissions Multiplier (Mtons CO2eq / liter) (Appendix C)	=	Total Mtons CO2eq

OR

Based on Kilometers Traveled

Total # Vehicles (by type)	X	Average kilometers per vehicle	=	Total Kilometers per Vehicle type
Total Kilometers per Vehicle type	X	Emissions Multiplier (kg CO2eq / km) (Appendix C)	=	Total Mtons CO2eq

3.5 Business Travel

Business travel is calculated based on distance and mode of transportation (i.e. air, train, bus or car.). Emissions are calculated using the methodologies from the WRI Business Travel Calculation Tool. Depending on the length of travel and the mode of transportation, there are different emissions factors (see Appendix C).

Kilometers traveled by mode of transportation	X	Emissions Multiplier (kg CO2eq / km)	=	Total Mtons CO_2eq

3.6 Refrigerants

Buildings that use air conditioning emit GHGs from leakage of the refrigerants used in the air conditioning systems. Due to the short timeframe of this estimate, it was assumed that refrigerant recharge data would be difficult for organizations to obtain and refrigerants typically do not comprise a significant amount of a building's overall GHG emissions.

Organizations were asked if they used air conditioning and the responses revealed that the majority of buildings have air conditioning systems in place. The World Bank did not recharge their air conditioning systems in 2006, so it is assumed that there was no leakage of refrigerants in that year. For all other cases, it is estimated that 2% of emissions from operations (scope 1 plus scope 2) are due to leaking refrigerants.

4.0 Summary of Findings and Recommendations

Key Findings

Completeness

Due to the fast turnaround of this effort, the GHG inventory is not complete. Approximately half of the UNs 35 organizations have some data included in the inventory. A few large UN organizations, were not able yet to submit the data as so it is difficult to estimate the total emissions for the UN. It is also unclear for many organizations if the inventory data submitted is complete and what information has been omitted. Little on site fuel information was submitted while many buildings likely use fuel for back-up generators. There are also likely many field offices that organizations left out of their inventory submission.

Range of Uncertainty

The accuracy of the UN's GHG inventory varies greatly by organization. For example, the World Bank submitted a complete inventory with activity data for all emissions sources while the UNDP submitted a total inventory GHG emissions number based on data from a few offices and then extrapolated that information across the agency. Some organizations did provide activity data for electricity use and business travel which allows for more accurate emissions calculations. Other organizations without electricity use information submitted number of employees and/or building space from which electricity use emissions was estimated. There is potentially a wide range of uncertainty in the calculations of electricity use emissions with this methodology.

Consistency

There are a number of examples where data consistency can be improved:

- Some UN organizations were able to obtain activity data while emissions had to be estimated for other organizations.
- UNDP uses the Atmosfair tool for business travel emissions and the rest of the business travel emissions were calculated using the WRI Business Travel Calculation Tool
- Some data is organized by agency while some was data is organized by building campus
- It appears that a few organizations included business travel air miles for participants of UN meetings while most organizations only included UN staff travel. It is unclear if consultant travel was included for any organization.

Recommendations

The following is a list of recommended next steps to improve the data quality of the UN GHG inventory over time.

- Clarify and document the UN inventory boundary conditions and distribute it to key contacts at each UN agency
- Agree on calculation tools and emissions factor sources to be used by all agencies for each emissions source category
- Work with building campus facility managers to make energy use data by UN organization available
- Train key UN staff within each agency to complete a GHG inventory consistent with the WRI/WBCSD GHG Protocol
- Explore development of a GHG data management tool: review data needs, anticipate reporting uses, and identify opportunities to connect existing data systems

APPENDIX A

Summary of Findings

Summary Emissions for Preliminary 2006 UN GHG Inventory Estimate:
Electricity, Steam, Fuel Combustion, Mobile Sources & Business Travel

Total Metric Tons CO2eq:	268,883

	Metric Tons (Mtons) CO2eq					
Organization	Electricity, Heat & Steam	Onsite Fuel Combustion	Mobile Sources	Business Travel	[D]Refrigerants	**Totals**
IFAD (Rome)	1,665	180	159	1,361	40	3,404
ILO	3,966		486		89	4,541
RAMSAR	4			44	0	48
UNCTAD			2	1,639	0	1,641
UNEP	856	8	3	2,281	17	3,165
Other UNEP[A]						1,429
UNESCAP	5,741		16		115	5,872
UNIDO HQ			8	966	0	974
UNIDO Field Offices	437		41		10	488
UNIDO world-wide	VIC			1,642		1,642
UNIDO- Vienna	VIC		7		0	7
UNOG	7,080	3			142	7,225
UNICEF HQs	1,599		5	1,997	32	3,634
NY HQs	38,906	12	209	10,233	783	50,143
Vienna Int'l Center (VIC)	6,046	27	0		121	6,195
UNDP[B]						70,000
UNFCCC[C]	817		2	691	16	1,527
World Bank	41,943	997	61	56,675		99,676
IAEA	281		29	3,432	6	3,749
UNESCO	1,394	3	32	2,068	29	3,526
Totals:	110,736	1,230	1,060	83,029	1,400	268,883

Notes

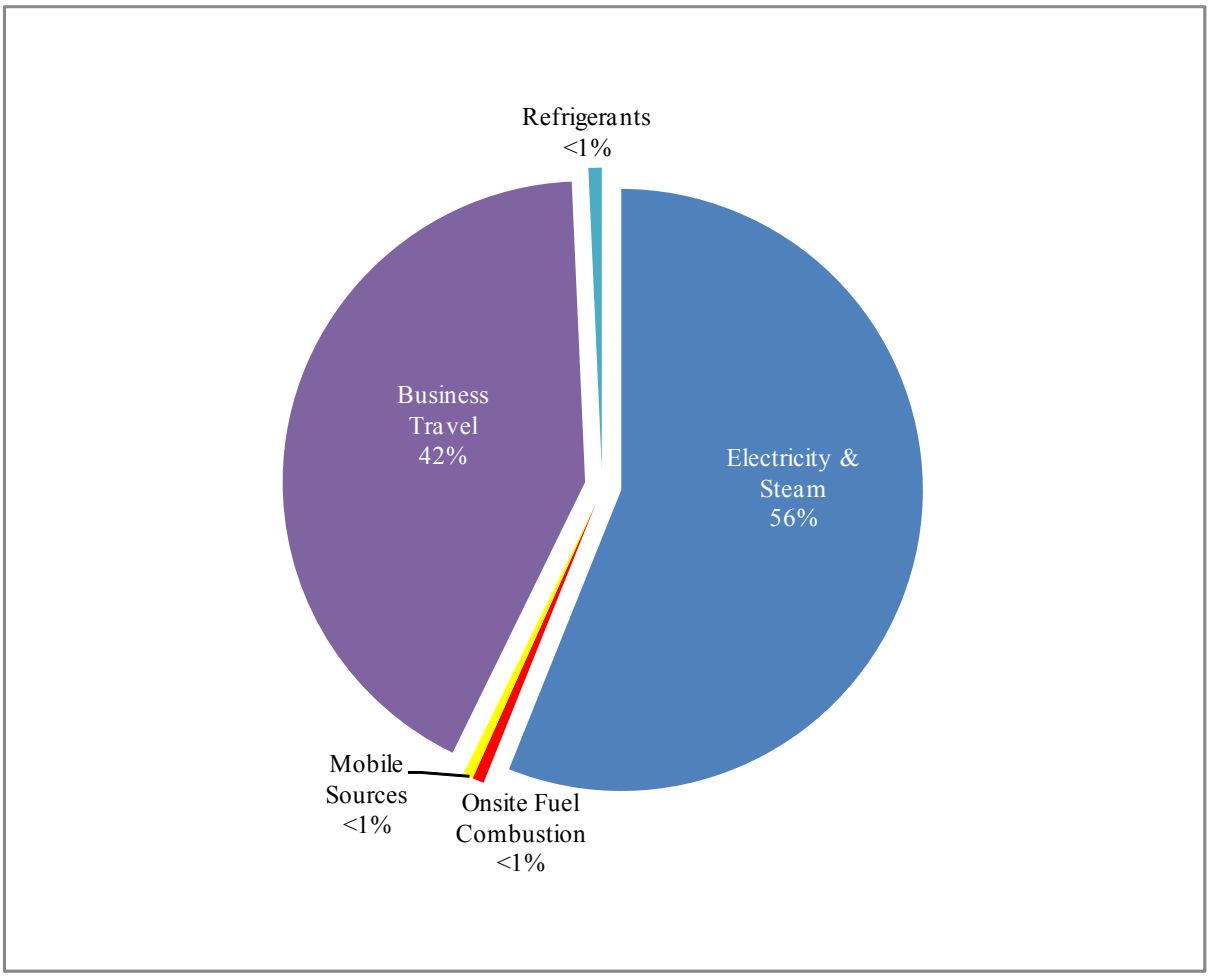
[A]Data provided was not broken down by emissions source for these locations. Includes data from these organizations:UNEP-DTIE, ROWA, ROAP,ROLAC, RONA, Beijing, The Hauge.

[A]UNDP provided total CO2eq emissions numbers based on their own estimates

[B]UNFCCC 2005 inventory data from UNFCCC website

[C]Assumes leakage of refigerants equals 2% of building emissions

United Nations GHG Inventory Estimate



Data Received by Organizations

Organization	Electricity	Steam	Onsite Fuel	Mobile Sources	Business Trave
IFAD (Rome)	x		x	x	x
ILO	x			x	
RAMSAR	x				x
UNCTAD				x	x
UNEP	x		x	x	x
UNESCAP	x			x	
UNIDO HQ				x	x
UNIDO Field Offices	x			x	
UNIDO world-wide	inclu. VIC				x
UNIDO- Vienna	inclu. VIC			x	
UNOG	x		x		
UNICEF HQs	x			x	x
NY HQs	x	x	x	x	x
Vienna Int'l Center (VIC)	x		x		
IFL - Vienna				x	
UNDP					
UNFCCC	x			x	x
World Bank	x		x	x	x
IAEA	x			x	x

UNITED NATIONS GHG EMISSIONS FACTS

UN Total GHG Emissions

- The total 2006 emissions estimate of the UN is 268,883 metric tons of CO_2 equivalent emissions. By comparison, those emissions are:
  - Slightly more than the total emissions of Sun Microsystems, a Fortune 500 company providing computer infrastructure solutions, but slightly less than the bank United Bank of Scotland (UBS)
  - Approximately equal to consuming over 30 million gallons of gas (19.3lbs CO2 released/gal of gas)
  - Approximately equal to the annual sequestration of 45 million trees (13 lbs absorbed per tree per year)
- The largest UN emitting organizations are the World Bank, the United Nations Development Program (UNDP) and the NY building campus
- U.S. emissions make up approximately 48% of the total UN emissions (NY Campus, UNICEF, UNDP's U.S. estimate, and World Bank)
- Electricity and steam purchases make up about 56% of the total CO_2 equivalent emissions (excludes UNDP emissions)
- Business travel represents about 42% of the total CO_2 equivalent emissions (excludes UNDP emissions)
- Onsite fuel combustion, mobile sources and refrigerants make up approximately 2% of the total CO_2 equivalent emissions (excludes UNDP emissions)
- The World Bank accounts for about 68% of the business travel emissions (excludes UNDP emissions)

Electricity and Steam (facts exclude UNDP emissions)

- The total UN electricity and steam emissions is equivalent to 5,785 American households average CO_2 equivalent emissions (19mtons/household)
- The NY campus, UNICEF, and the World Bank make up approximately 75% of the total electricity and steam emissions
- The Bangkok office has the highest emissions factor(538 g/kWh), being twice that of the Geneva Office (221 g/kWh)

Business Travel (facts exclude UNDP emissions)

- The total air business travel emissions is 97% of the total business travel emissions
- The total air travel is equal to using over 9 million gallons of fuel

APPENDIX B

Onsite Fuel Combustion Emissions Factors

Fuel Type	Emissions Multiplier (Mtons CO2eq/mmBtu)
Natural Gas	0.0529274
Diesel	0.0736079
Distillate Fuel Oil	0.0728279
Source: EPA Climate Leaders GHG Inventory Protocol Core Module Guidance, October 2004 & IPCC Third Assessment Report, 2001.	

APPENDIX C

Mobile Fuel Combustion Emissions Factors for Ground Couriers
Source: EPA Climate Leaders GHG Inventory Protocol Core Module Guidance, October 2004.

Fuel Type	Metric Tons CO2eq / Gallon	Metric Tons CO2eq / Liter
Gasoline	0.00879	0.00232
Diesel	0.01008	0.00027

Mobile Fuel Combustion Emission Factors for Air, Train, Bus & Car
Source: WRI-WBCSD's Mobile Combustion CO2 Emissions Calculation Tool, Version 1.2, June 2003.

Aircraft Distance	kg CO2eq / passenger land km
Short Flights (<452 km)	0.18
Medium Flights (452km - 1600km)	0.126
Long Flights (>1600km)	0.11

Train Distance	kg CO2eq / passenger km
Intercity (e.g., Amtrak)	0.0893
Intracity (e.g. subway, local tram)	0.0997
UK Rail	0.06

Bus Distance	kg CO2eq / passenger km
Diesel long-distance	0.0485
Diesel urban	0.1862

Car Distance	kg CO2eq / passenger km
Small Gas Auto	0.1073
Medium Gas Auto	0.1353
Large Gas Auto	0.1638
Diesel Auto	0.1495
Diesel Light Truck	0.2392

APPENDIX D

Electricity Emissions Factors

U.S.A Emission Factors

City	Country/ eGRID subregion	Emissions Factor (g CO2eq / kWh)
New York	NYCW- NPCC NYC/Westchester	418
Washington D.C.	RFCE-RFC East	497
US Source: North American Electric Reliability Council (NERC), eGRID2004 Database.		

Country Emission Factors (excluding U.S.A.)

City	Country/ eGRID subregion	Emissions Factor (g CO2eq / kWh)
Rome	Italy	455
Geneva	Switzerland	472
Moscow	Russia	325
Brussels	Belgium	281
Vienna and Seibersdorf	Austria	221
Gigiri	Nairobi	262
Montreal and Toronto	Canada	209
Bangkok	Thailand	538
Monaco	France	87
Kabul*	Afghanistan	693
Perth	Australia	841
Dhaka	Bangladesh	628
Brasilia	Brazil	85
Brazzaville	Republique democratic du Congo	3
Bujumbura *	Burundi	420
Phnom Penh*	Cambodia	726
Yaounde	Cameroun	28
Santago	Chile	341
Beijing	China	849
San Jose	Costa Rica	14
Havana	Cuba	1014
Quito	Ecuador	295
Cairo	Egypt	473
Addis Ababa	Ethiopie	6
Moscow	Russia	325
Paris	France	87
Libreville	Gabon	322

Accra	Ghana	84
Guatemala	Guatemala	434
Port-Au-Prince	Haiti	301
New Delhi	India	942
Jakarta	Indonesia	752
Tehran*	Iran	693
Venice	Italy	455
kingston	Jamaica	785
Amman	Jordan	683
Baghdad	Jordan	683
Almaty	Kazakhstan	1070
Nairobi	Kenya	262
Peer-Nairobi	Kenya	262
Khartoum	Sudan	828
Beirut	Lebanon	564
Bamako*	Mali	420
Rabat	Morocco	749
Mexico	Mexico	522
Maputu	Mozambique	3
Windhoek	Namibia	27
Kathmandu	Nepal	1
Abuja	Nigeria	353
Islamabad	Pakistan	397
Lima	Peru	206
Doha	Qatar	649
Ramallah*	Ramallah	693
Kinshasa	Republique democratic du Congo	3
Apia*	samoa	457
Dakar	Senegal	780
Juba	Southern Sudan	828
Geneva	Suisse	24
Dar-Es-Salam	Tanzania	420
Bangkok	Thailand	538
Montevideo	Uruguay	150
New York	Usa	418
Tashkent	Uzbekistan	481
Hanoi	Viet Nam	407
Harare	Zimbabwe	572

Notes

Country	**Emissions Factor Used**
Mali and Burundi	Other Africa emissions factor
Cambodia	Asia (excluding China)
Afganistan	Middle east
Iran	Middle east

Palestine	Middle East
Samoa	OECD
Geneva Switzerland	Provided by UNEP
Other Countries Source: Indirect CO2 Emissions from Purchased Electricity. Version 2.1. December 2006. World Resources Institute.	