# Experience of UN agencies in preparing their GHG inventory: UNFCCC experience

Florin Vladu
Adaptation, Technology and Science
UNFCCC secretariat

June 2008

Bonn, Germany

# Outline of the presentation

- Climate change
- Climate neutrality
  - What is the objective?
  - What is the approach?
  - Work done by UNFCCC
- Estimating the greenhouse gas emissions of UNFCCC
- Take measures to reduce their emissions
- Purchase carbon offsets and relevant criteria for offsetting schemes
- Final considerations

# Climate change | What could happen?

- Intergovernmental Panel on Climate Change:
  - Stronger evidence of the human footprint on the global climate
  - Ever more disturbing scenarios of temperature increases and resulting adverse effects
  - Dramatic vulnerability of the people, communities and countries least able to cope with these external shocks that are not of their making
- Climate change is an inevitable 'creeping catastrophe' and affects our lives. Thus, adaptation to climate change must become the aim of all countries

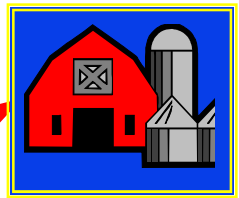
# Climate change | What could happen?

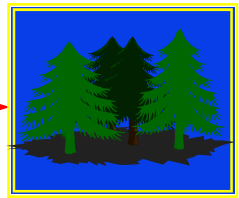
## Climate Changes

**Temperature**

**Precipitation**

**Sea Level Rise**





## Agriculture impacts

Crop yields
Irrigation demands

## Water resource impacts

Changes in water supply
Water quality
Increased competition for water

## Forest impacts

Change in forest composition
Shift geographic range of forests
Forest health and productivity

## Impacts on coastal areas

Erosion of beaches
Inundate coastal lands
Costs to defend coastal communities

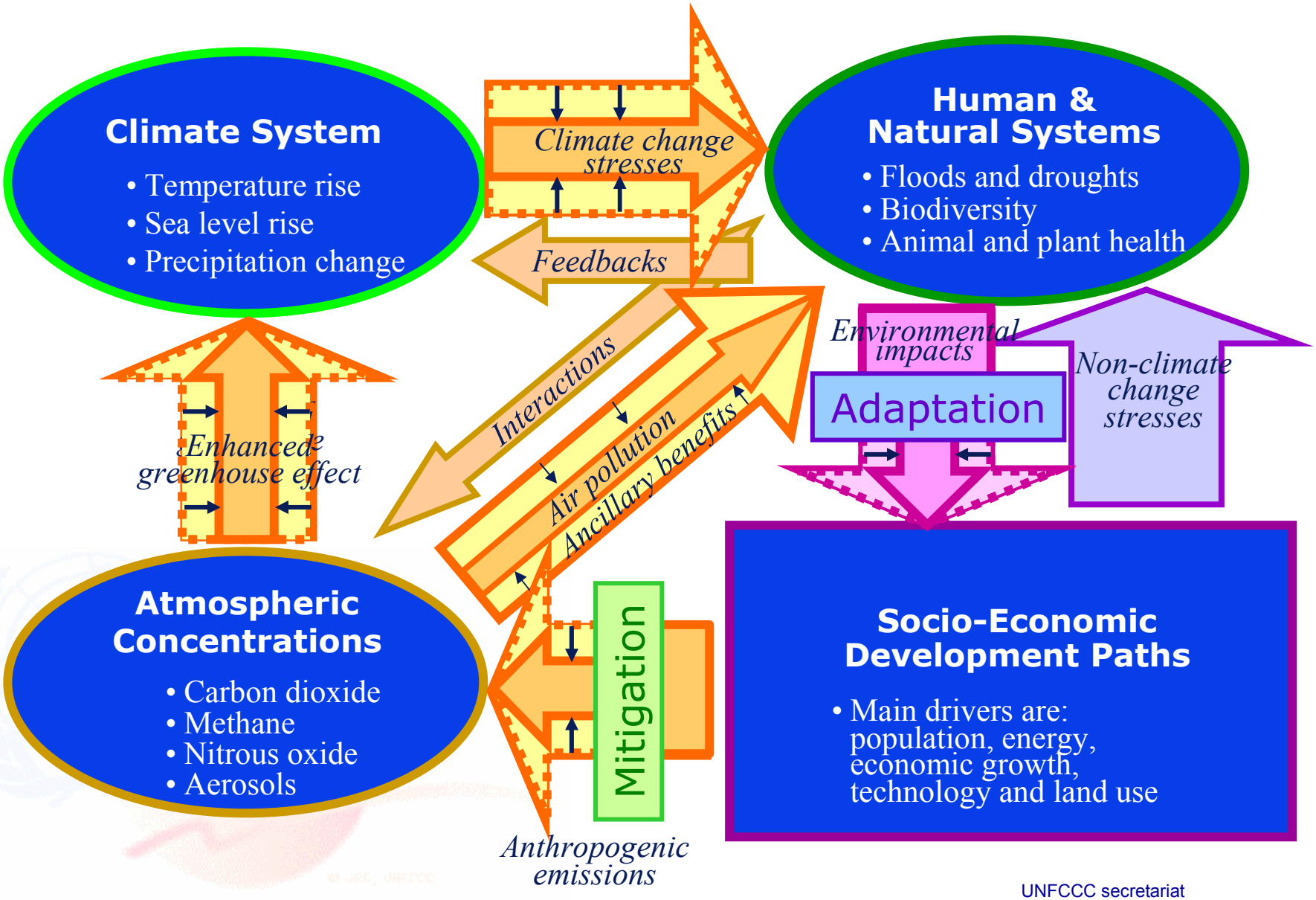
## Health impacts

Weather-related mortality
Infectious diseases
Air quality-respiratory illnesses

## Species and natural areas

Shift in ecological zones
Loss of habitat and species

# Climate change | What can we do?



# Climate neutrality | What is the objective?

- To ”neutralize” the emissions of greenhouse gases (GHGs) associated with business operations, meetings, conferences and events through climate change mitigation measures elsewhere

# Climate neutrality

## What is the approach to climate neutrality?

### Step 1

Estimate and report in the public domain greenhouse gas emissions associated with the sports event

### Step 2

Take measures to reduce these emissions

### Step 3

Purchase carbon offsets to neutralize the emissions that remain

- **Crosscutting**
  Let others know – communicate and develop awareness materials (e.g. event climate neutral label, certificates, pins)

# Climate neutrality | Work done by UNFCCC (1)

- In 2004 the UNFCCC secretariat accelerated its work on climate neutrality, building on previous work of the various internal committees (e.g. the Green Office Committee and the Sustainable Office Committee)
- A strategy paper was endorsed by the management in April 2005
- A document on Climate Neutral UNFCCC meetings was prepared for consideration by SBI 22 (FCCC/SBI/2005/9)

# Climate neutrality | Work done by UNFCCC (2)

- Specialized tools were developed to estimate the climate footprint of the secretariat
- The first GHG inventory of the secretariat (2004-2005) was prepared and was posted on the Internet
- The GHG emissions of COP 9, COP 11 and COP 13 were estimated and offset
- Since 2007 the secretariat and the other UN organizations in Bonn are using “green electricity”

# Climate neutrality | Work done by UNFCCC (3)

- The UN Secretary-General has stated the high priority he is giving to the issue of making the UN system climate-neutral and to the growing urgency for the UN to lead by example by reducing its greenhouse gas emissions

- As the climate change secretariat, the UNFCCC is in the forefront of these activities. UNFCCC endorsed the Joint Statement by the Secretary-General of the UN and the Heads of UN agencies that committed ourselves to moving our respective organizations towards climate neutrality

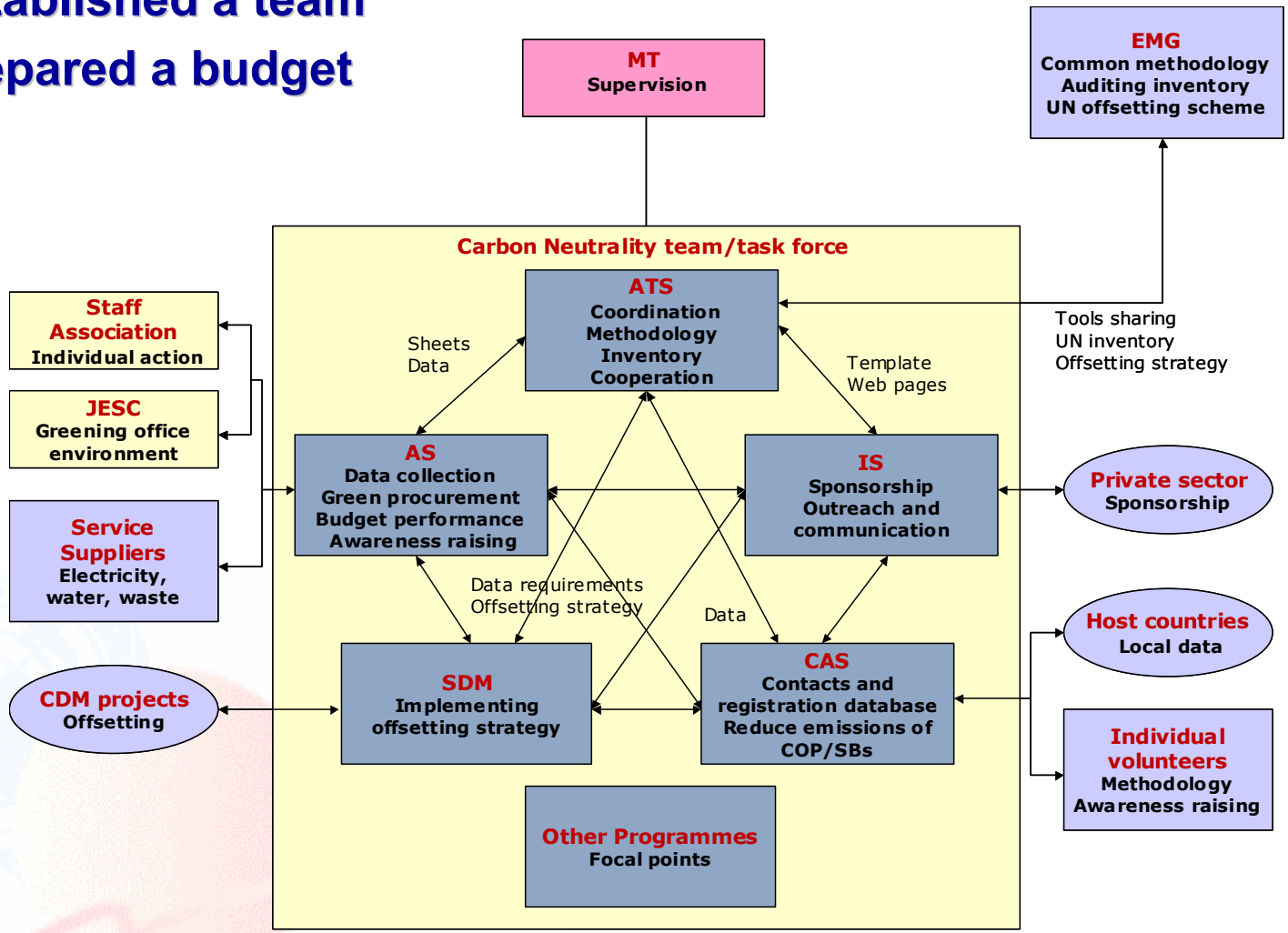
# Climate neutrality | Work done by UNFCCC (4)

- **To make our facilities operations and travel increasingly climate friendly we agreed to:**
  - **Estimate our greenhouse gas emissions in a manner consistent with accepted international standards;**
  - **Undertake efforts to reduce our greenhouse gas emissions to the greatest extent that we can and set criteria for assessing our progress over time;**
  - **Analyze the cost implications and budgetary modalities of purchasing carbon offsets to eventually reach climate neutrality;**
  - **Estimate and report in the public domain our greenhouse gas inventories, on an annual basis and according to internationally accepted standards;**
  - **Offset the remaining greenhouse gas emissions arising from our facilities operations and travel through the purchase of offsets that meet high international standards of additionality, transparency and verification.**

# How are we organized (planning)?

## UNFCCC Climate Neutrality Team

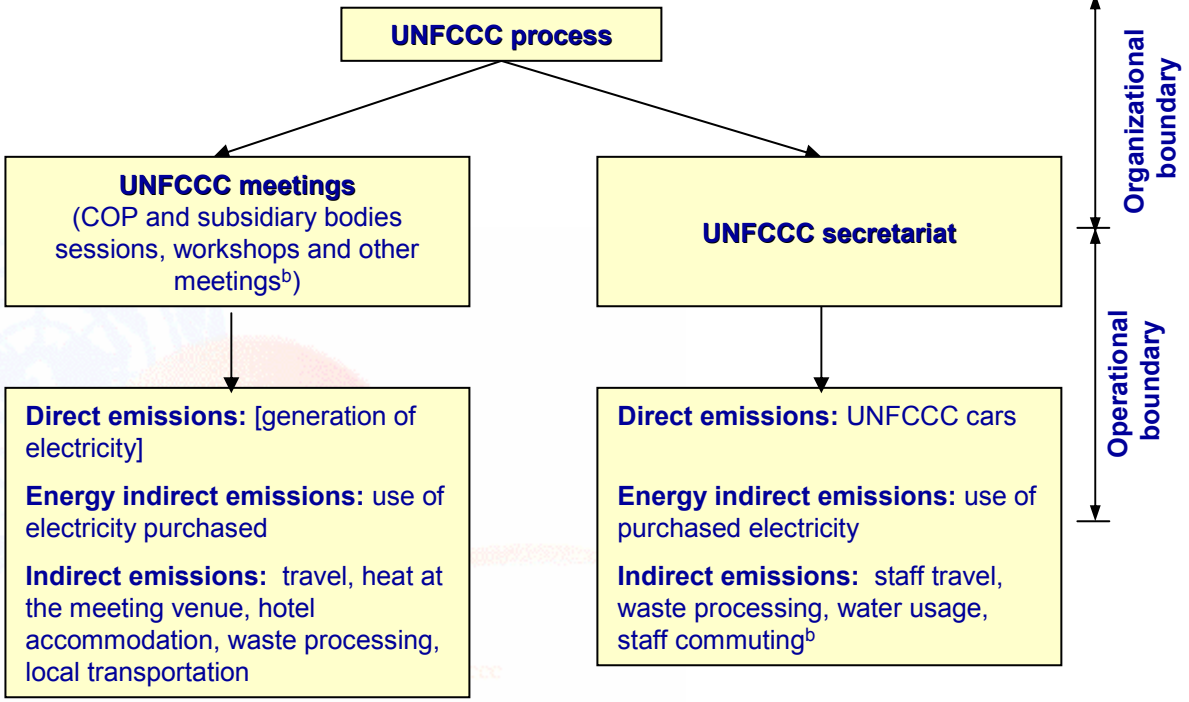
- Secured management support
- Established a team
- Prepared a budget



# Step 1 – Estimate GHG emissions

## What are the boundaries of the analysis? (1)

- For the UNFCCC such GHG emissions will be resulting from operation of the secretariat, travel and accommodation of negotiators and experts, IGOs, civil society and media and representatives. For example, GHG emissions can occur during the COP/SB session as well as during the preparation of the event and post the event
- Example: organizational boundaries (operational control, 3 scopes)




*Notes:*

[a] These boundaries are consistent with reporting provisions from ISO 14064 on *Specifications with guidance at the organization level for quantification and reporting of greenhouse gas emissions and removals* and the *Greenhouse Gas Protocol - A corporate accounting and reporting standard* (WBCSD/WRI).

[b] Other meetings and staff commuting are not included in the present inventory (workshops were estimated for 2005)

# Step 1 – Estimate GHG emissions |

## Key considerations - Carbon or climate neutral?

- Climate neutrality allows a more comprehensive approach. While carbon dioxide is the greatest contributor to global warming, there are several reasons for opting to include the six gases covered by the Kyoto Protocol, namely $CO_2$, $CH_4$, $N_2O$, HFCs, PFCs, and $SF_6$.

- Such coverage corresponds more closely to the approach being taken in the international climate change process under the UNFCCC and the Kyoto Protocol

- A climate-neutral approach also provides a more environmentally credible perspective. A practical example is the case of air travel where the full greenhouse effects of aircraft emissions are significantly higher than those from $CO_2$ alone, according to the IPCC (we used a RFI of 2.7, we do not distinguish between business and economy class travels)

# Step 1 – Estimate GHG emissions

## Key considerations (2)

- Base year: 2004/2005 inventory. Change base year when moving to a new campus
- Start by focusing on major sources of emissions. Include all sources of direct emissions as well as indirect emissions (electricity, others)
- Although we focus on all travels for which the organization is purchasing the tickets, we consider all the emissions of large meetings (e.g. COP, SBs, AWGs)
- We will consider staff commuting at a later stage (developing an individual emissions calculator)
- We do not consider emissions associated with the preparation of an event and post the event
- Offsetting: balance between mitigation and adaptation

# Step 1 – Estimate GHG emissions

## Key considerations (3)

- Data availability and what is practical and manageable
  - Aim to cover large emissions sources first, and to refine and improve the inventory and boundary over time
  - An overly ambitious coverage could become unmanageable in terms of data collection and the staff resources required
- Emissions which can be influenced by management-level decisions of organizers or of the secretariat
- Emissions associated with decisions for which participants and delegations are responsible but for which organizers could have an active policy of reducing them
- GHG protocol – a corporate accounting and reporting standard: relevance, completeness, transparency, consistency, and accuracy

# Step 1 – Estimate GHG emissions

## Example - emissions from UNFCCC meetings

| Activity | SB 20 | COP 10 | SB 22 | COP 11 | COP 13 | COP 14 |
|---|---|---|---|---|---|---|
| | $tCO_2$ eq | $tCO_2$ eq | $tCO_2$ eq | $tCO_2$ eq | $tCO_2$ eq | $tCO_2$ eq |
| **Travel** | **3,232** | **24,169** | **3,728** | **24,203** | **46,053** | **24,836** |
| **Others (incl. venue hotels, local transportation, waste)** | **171** | **1,065** | **192** | **1,216** | **N/A** | **N/A** |
| **Total GHG emissions** | **3,403** | **25,234** | **3,920** | **25,418** | **46,053** | **24,836** |
| **Number of participants[c]** | **1,351** | **6,193** | **1,589** | **9,437** | **11,601** | **7,632*** |
| **GHG emissions per participant** | **2.51** | **4.07** | **2.46** | **2.69** | **3.97** | **3.25** |

*: The number of participants is estimated from COP 13 excluding local staff.

- **Before, during and post event estimations**
- **Trends**

# Step 1 – Estimate GHG emissions

## Example - Emissions from operation of the secretariat

| Activity | | 2004 | | 2005 | | Total | |
|---|---|---|---|---|---|---|---|
| **Travel of staff** | | Distances | | Distances | | Distances | |
| Non-UNFCCC vehicles | | (km) | GHG emissions (tonnes $CO_2$ eq) | (km) | GHG emissions (tonnes $CO_2$ eq) | (km) | GHG emissions (tonnes $CO_2$ eq) |
| | Short haul | 29 186 | 5 | 14 590 | 3 | 43 776 | 8 |
| | Medium haul | 146 060 | 18 | 144 726 | 18 | 290 786 | 36 |
| Air | Long haul | 2 126 909 | 632 | 2 239 694 | 665 | 4 366 603 | 1 297 |
| Car | | 24 520 | 4 | 21 591 | 4 | 46 111 | 8 |
| Train | | 22 250 | 1 | 7 991 | 1 | 30 241 | 2 |
| **Subtotal travel** | | 2 348 925 | **660** | 2 428 592 | **691** | 4 777 517 | **1 351** |
| Number of travels | | 361 | | 302 | | **663** | |
| UNFCCC vehicles | | 21 516 | **3.7** | 12 410 | **2.18** | 33 926 | **5.88** |
| **Energy consumption**[b] | | (MWh) | GHG emissions (tonnes $CO_2$ eq) | (MWh) | GHG emissions (tonnes $CO_2$ eq) | (MWh) | GHG emissions (tonnes $CO_2$ eq) |
| HC electricity | | 406 | 260 | 406 | 260 | 463 | 390 |
| HC heating | | 460 | 295 | 460 | 295 | 690 | 442.5 |
| OBS electricity | | 121 | **77** | 121 | 77 | 181 | 115.5 |
| OBS heating | | n.a | 185[c] | n.a | 185 | n.a | 277.5 |
| **Subtotal energy** | | 987 | **817** | 493 | **817** | 1 334 | **1 226** |
| **Waste generated** | | ($m^3$) | GHG emissions (tonnes $CO_2$ eq) | ($m^3$) | GHG emissions (tonnes $CO_2$ eq) | ($m^3$) | GHG emissions (tonnes $CO_2$ eq) |
| HC | | 161 | **49.8**[d] | 161 | **49.8** | 322 | **74.7** |
| OBS | | n.a | n.a | n.a | n.a | n.a | |
| **Water usage** | | ($m^3$) | GHG emissions (tonnes $CO_2$ eq) | | GHG emissions (tonnes $CO_2$ eq) | ($m^3$) | GHG emissions (tonnes $CO_2$ eq) |
| HC | | 1 211 | **83.6** | 1213 | **83.71** | 2424 | **167.31** |
| OBS | | n.a | n.a | n.a | n.a | n.a | |
| **Total GHG emissions** | | | **1 614.1** | | **846.6** | | **2 460.7** |

[a] Until 31 December 2006.

[b] 0.638 kg$CO_2$/kWh (Germany, electricity mix D). Estimated based on occupied space at the two office buildings (HC and OBS) and staffing ratio. For HC the estimate includes the share for common areas, building technologies and canteen. For OBS does not include emissions for building technologies and common areas. The values for 2005 were estimated as 50 per cent of 2004 values.

[c] Estimated based on the surface occupied by UNFCCC using HC as reference.

[d] Municipal solid waste incineration, 40 per cent carbon content of waste, 95 per cent efficiency of combustion (IPCC default) and 208 kg/$m^3$ specific weight of the waste. Includes biogenic and fossil $CO_2$. Using the *2006 IPCC Guidelines for National Greenhouse Gas Inventories* this value is about 39.3 tonnes of $CO_2$ equivalent per year (6.1 tonnes of fossil $CO_2$ equivalent per year).

[e] 0.003 t $CH_4$/t waste water (FCCC/WEB/SAI/2005, page 158, table 6.1, emission factors for Germany considering domestic/commercial waste water handling).

# Step 1 – Estimate GHG emissions

## Example – emissions from waste

| | A | B | C | D E | F | G | H | I | J | K | L | M | N | O | P |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | **Variable/Parameter** | Means data entry cell | **Units** | **Comments** | **Waste Category** | **Specific Weight kg/m3** | | | | **UNFCCC (%WS)** | **Weighted Specific Weight** | | **dm fraction (%)** | **carbon fraction (%)** | **fossil carbon fraction (%) of total carbon** |
| 2 | Waste Generation per year | 163 | m3 | Florin's numb | Food Waste | 490 | lb/yd3 | 290.7 | kg/m3 | 0.27 | | | 0.35 | 0.43 | 0 |
| 3 | Population (UNFCCC) | 180 | persons | From phone | Paper/cardboard | 150 | lb/yd3 | 89.0 | kg/m3 | 0.5 | | | 0.9 | 0.46 | 0.01 |
| 4 | waste/person | 0.9 | m3 of waste/person/year | [WG/popn] | Yard Waste | 170 | lb/yd3 | 100.9 | kg/m3 | | | | | | |
| 5 | | | | | Plastics | 110 | lb/yd3 | 65.3 | kg/m3 | 0.061 | | | 0.85 | 0.75 | 0.99 |
| 6 | Specific Weight | 208.2 | kg/m3 | Weighted av | Aluminum | 270 | lb/yd3 | 160.2 | kg/m3 | | | | 1 | 0.04 | 0.5 |
| 7 | | | | | Textiles | | | | | | | | 0.8 | 0.5 | 0.4 |
| 8 | MSW Net Calorific Value | 10.2 | MJ/tonne | IPCC 2006 G | Fine fraction | | | | | | | | 0.65 | 0.4 | 0.01 |
| 9 | | | | | Middle fraction | | | | | | | | 0.45 | 0.4 | 0.3 |
| 10 | Waste Generation (WG) per year | 33.9 | tonne | [m3*(kg/m3 | Other | 810 | lb/yd3 | 480.5 | kg/m3 | 0.169 | | | 0.63 | 0.43 | 0.24 |
| 11 | | 0.03 | Gg/year | 1 Gg = 10^3 | Total | | | | | | 208.2 | kg/m3 | 0.70 | | |
| 12 | CO2 emission | | | | | | | | | | | | | | |
| 13 | calculated (biogenic + fossil) | 49.8 | t/year | Simple method: assumes 40% | | | | | | | | | | | |
| 14 | fossil | 19.9 | t/year | Simple method: assumes 40% | | | | | | | | | | | |
| 15 | calculated | 39.3 | t/year | Tier-1 method (using IPCC 2006 GL and limiting assumptions for (i) averaging of Other; and (ii) all MSW is incinerated) | | | | | | | | | | | |
| 16 | fossil | 6.1 | t/year | Tier-1 method (using IPCC 2006 GL and limiting assumptions for (i) averaging of Other; and (ii) all MSW is incinerated) | | | | | | | | | | | |
| 17 | CH4 emission | | | | | | | | | | | | | | |
| 18 | EF(1) | 0.0001 | kg/tonne of MSW | Assumes continuous incineration; EF is 0.1 g/tonne of MSW (IPCC 2006 GL). | | | | | | | | | | | |
| 19 | EF(2) | 0.06 | kg/tonne of MSW | Assumes batch and semi-continuous incineration; EF is 60 g/tonne of MSW (IPCC 2006 GL). | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | | | |
| 21 | Emission (1) | 2.4E-09 | t CH4 | MSW x FractionDryMatter x EF (Not in CO2 equivalents) | | | | | | | | | | | |
| 22 | Emission (2) | 1.4E-06 | t CH4 | MSW x FractionDryMatter x EF (Not in CO2 equivalents) | | | | | | | | | | | |
| 23 | | | | | | | | | | | | | | | |
| 24 | Emission (CO2-equivalents) (1) | 5.0E-08 | t CO2-e | GWP of 21 (not 23) | | | | | | | | | | | |
| 25 | Emission (CO2-equivalents) (2) | 3.0E-05 | t CO2-e | GWP of 21 (not 23) | | | | | | | | | | | |
| 26 | N2O emission | | | | | | | | | | | | | | |
| 27 | EF | 0.008 | kg/tonne of MSW | EF is 8 g/tonne of MSW (IPCC 2006 GL). | | | | | | | | | | | |
| 28 | | | | | | | | | | | | | | | |
| 29 | Emission | 1.9E-07 | t N2O | MSW x FractionDryMatter x EF (Not in CO2 equivalents) | | | | | | | | | | | |
| 30 | | | | | | | | | | | | | | | |
| 31 | Emission (CO2-equivalents) | 0.0001 | t CO2-e | GWP of 310 (not 296) | | | | | | | | | | | |
| 32 | Net CO2-e emission | | | | | | | | | | | | | | |
| 33 | | | | **DEFAULT METHOD** | | | | | | | | | | | |
| 34 | calculated (biogenic + fossil) | 49.8 | tonnes | [CO2-e (calculated) + CH4 (CO2-e) + N2O (CO2-e) | | | | | | | | | | | |
| 35 | **fossil** | **19.9** | **tonnes** | [CO2-e (fossil) + CH4 (CO2-e) + N2O (CO2-e) | | | | | | | | | | | |
| 36 | | | | | | | | | | | | | | | |
| 37 | | | | **IPCC 2006 GL Tier-1 (no energy recovery and includes all biogenic and fossil carbon)** | | | | | | | | | | | |
| 38 | calculated (biogenic + fossil) | 39.3 | tonnes | [CO2-e (calculated) + CH4 (CO2-e) + N2O (CO2-e) | | | | | | | | | | | |
| 39 | **fossil** | **6.1** | **tonnes** | [CO2-e (fossil) + CH4 (CO2-e) + N2O (CO2-e) | | | | | | | | | | | |

# Step 1 – Estimate GHG emissions

## Example - GHG inventory for 2004-2005

| Category of emissions | 2004 | 2005 | Total |
|---|---|---|---|
| Direct emissions and removals | | | |
| UNFCCC cars | 3.7 | 2.2 | **5.9** |
| Energy indirect emissions | | | |
| Electricity | 817 | 817 | **1,634** |
| Indirect emissions | | | |
| Travel | 28,061 | 24,894 | 52,955 |
| Conference venue | 1,236 | 1,216 | 2,452 |
| Waste | 49.8 | 49.8 | 99.6 |
| Water | 83.6 | 83.7 | 167 |
| **Subtotal** | **29,430** | **26,244** | **55,674** |
| **Total emissions** | **30,251** | **27,063** | **57,314** |

- **Normalized and absolute values. Need to reduce absolute values**

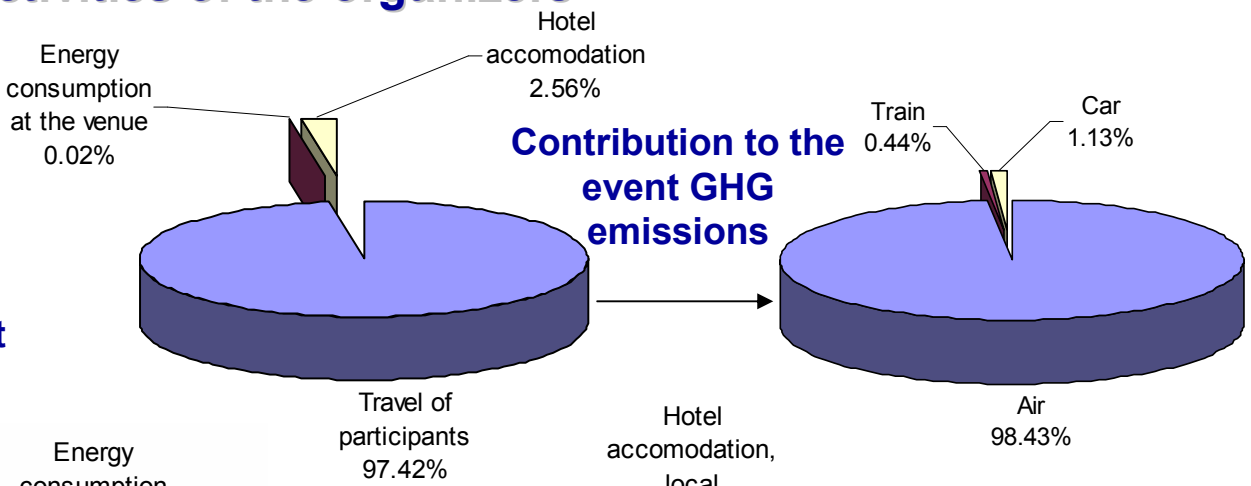
# Step 1 – Estimate GHG emissions

## What are the main contributors?

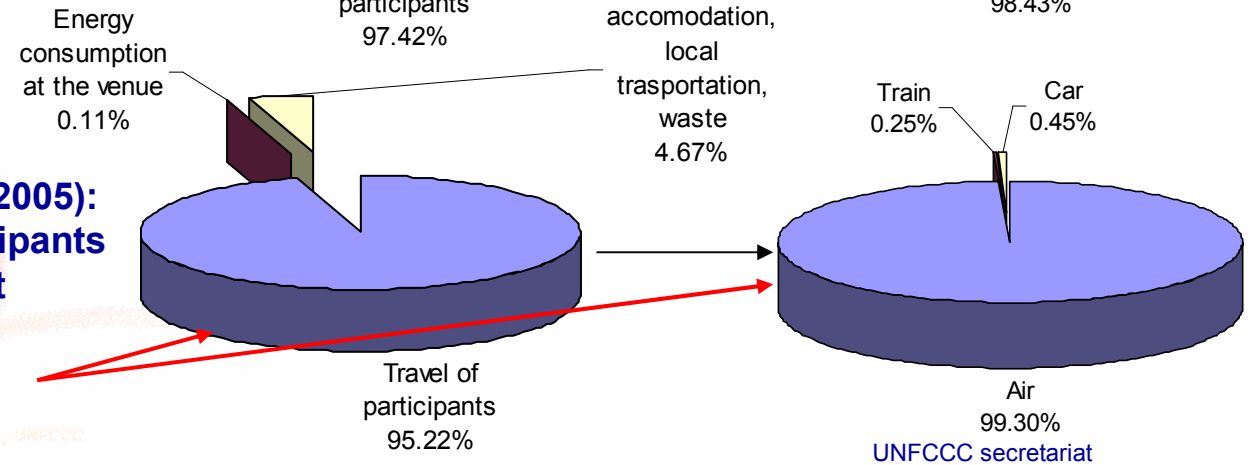
- **Methodologies take into account carbon emissions from:**
  - Travel of participants by air, train, and car
  - Energy consumed and waste generated at the conference venue
  - Hotel accommodation and local transportation
  - Pre and post activities of the organizers

- **Examples:**

**Renewables 2004 Conference:**
**Bonn, 4 days, 2,000 participants**
**1.4 tones $CO_2$ eq. per participant**




**11th Conference of the Parties (2005):**
**Montreal, 2 weeks, 12,000 participants**
**2.7 tones $CO_2$ eq. per participant**




**Travel by air is the main contributor!!!**

# Step 1 – Estimate GHG emissions |

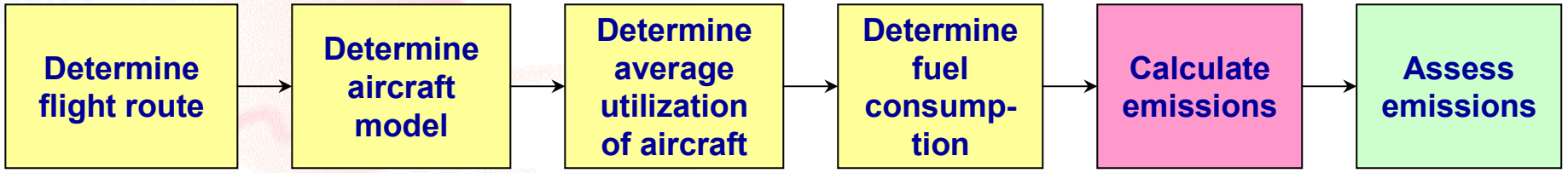
## What are the GHG emissions from air travel?

- **Top-down methodologies: use average emission factors and clusters the flights in groups based on the flight distance (e.g., short, medium and long haul)**
- **Example:**
  - **$CO_2$ emissions per passenger mile was estimated as 200 grams of $CO_2$ per passenger mile**
  - **Calculate emissions per revenue passenger miles (this is a more conservative approach because it means that emissions from empty seats and non fare-paying passengers are incorporated in the calculation)**
  - **Most passenger aircraft also carry cargo (not associated with the passengers) and, emissions per passenger should be reduced to reflect this. This impact of cargo varies by aircraft type and route, and for the purpose of this calculation, a figure of 15% is used**

# Step 1 – Estimate GHG emissions |

## What are the GHG emissions from air travel?

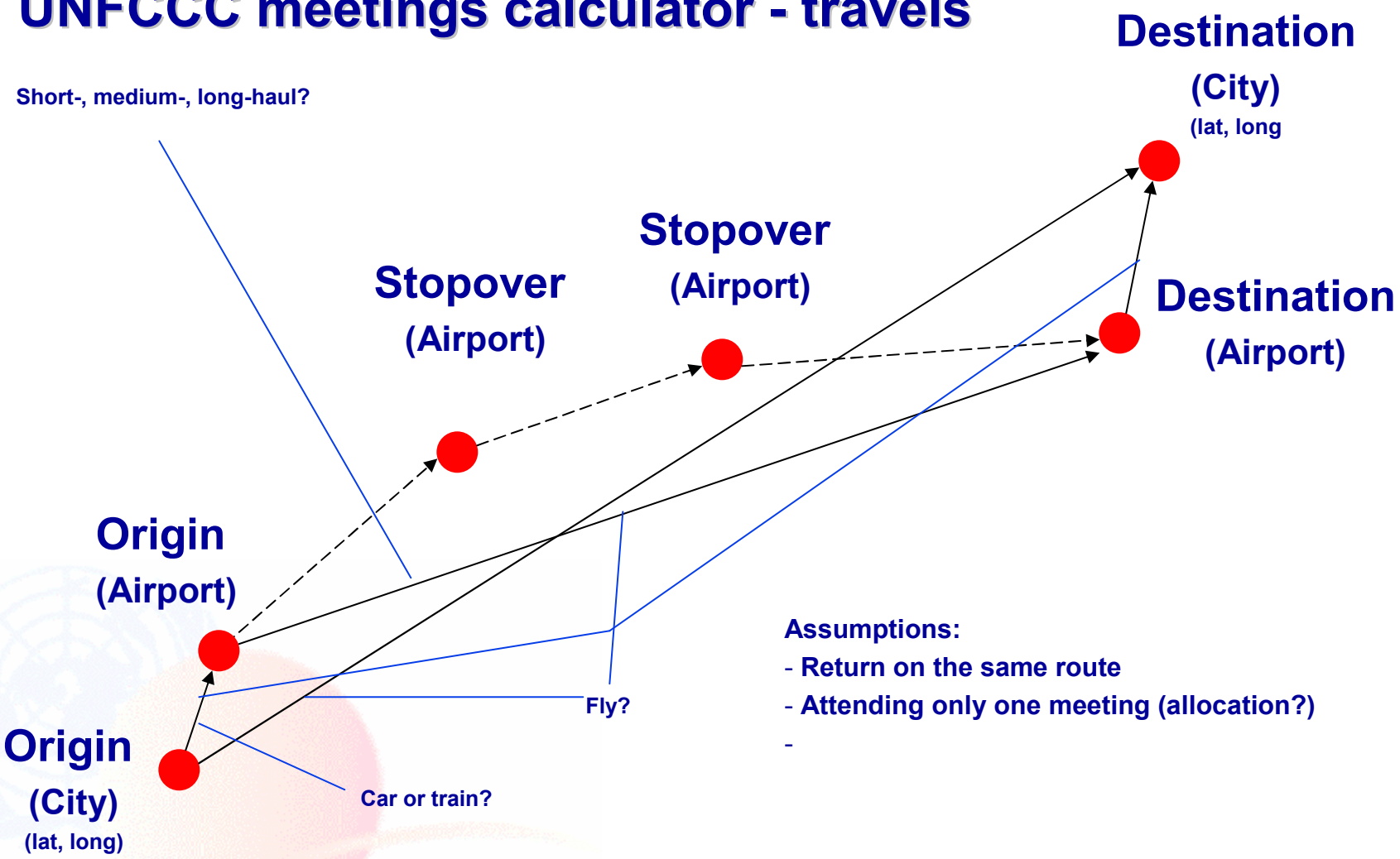
- **Bottom-up methodologies**: uses different emission factors based on: "real" types of planes; occupation of flights; flight altitudes; and stopovers
  - Flight route: identify airports (start and termination of the flight, consideration of stopovers) and distance between airports
  - Aircraft model: type and version (e.g., B-747-100/400), engine version, number of seats
  - Average utilization of aircrafts: intercontinental - 80%, continental – 60%
  - Fuel consumption: depends on the flight distance and phase (taxi, take-off, climb, cruise, descent, landing)
  - Calculate emissions: 3.155 kg $CO_2$ per kg kerosene



# Step 1 – Estimate GHG emissions

## How we estimate emissions from travels?

- **UNFCCC meetings calculator - travels**



# Step 1 – Estimate GHG emissions

## What could be potential issues?

- **Lack of information about travels**
  - **Registered participants → use information to estimate travel itinerary (e.g. delegations, media)**
  - **Conduct surveys during the event to validate this information**

- **Selection of the methodology to make the estimation (bottom-up versus top-down) and development/use of tools for making the estimations**

- **Complexity associated with estimations for a large number of participants**

- **Collection of local data (e.g. energy, heat and fuel consumptions, hotel accommodation, waste generated, local transportation)**

# Step 2 – Take measures to reduce emissions

## Examples

- Purchase green energy: hydro and wind since 2007
- Bicycles, transportation policy, office tickets
- Efficient use of energy: efficient lighting (LED, advanced lighting control systems), night heating system, thermal insulation of doors, windows and walls (we are not using air conditioning)
- What else could be done?
  - Establish and use an Environmental Management System for the secretariat
  - Measures can be also taken by individual staff members and delegations attending the conferences
  - Green concepts applied to the new UNFCCC building
  - X % of each travel?

# Final considerations

- We welcome the efforts of UN agencies, national governments and organizations to make their operations climate neutral and to set an example for others through sustainable management practices

- We encourage them to:
  - Estimate their greenhouse gas emissions in a manner consistent with accepted international standard
  - Undertake efforts to reduce these greenhouse gas emissions to the greatest extent that they can
  - Purchase carbon offsets of very high standards of reliability, overall credibility, environmental benefits, sustainable development benefits to eventually reach climate neutrality

# Thank you!