

Estimating CO2 Emissions From Stanford University Air Travel

3/23/09

Estimating CO₂ Emissions From Air Travel

What we had

- Dollars spent by Stanford University on air travel reimbursements
- Sample of cost per passenger mile for University flights

What we wanted

- An estimate of CO₂ emissions created by University air travel to use as a baseline for future analysis

The Process

Dollars to Miles

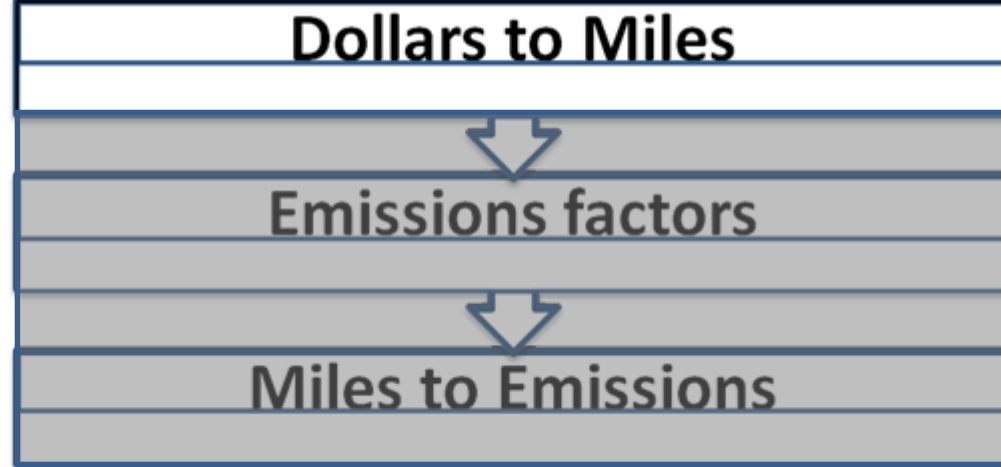


Emissions factors

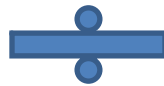


Miles to Emissions

Dollars to Miles



Dollars spent
on air travel

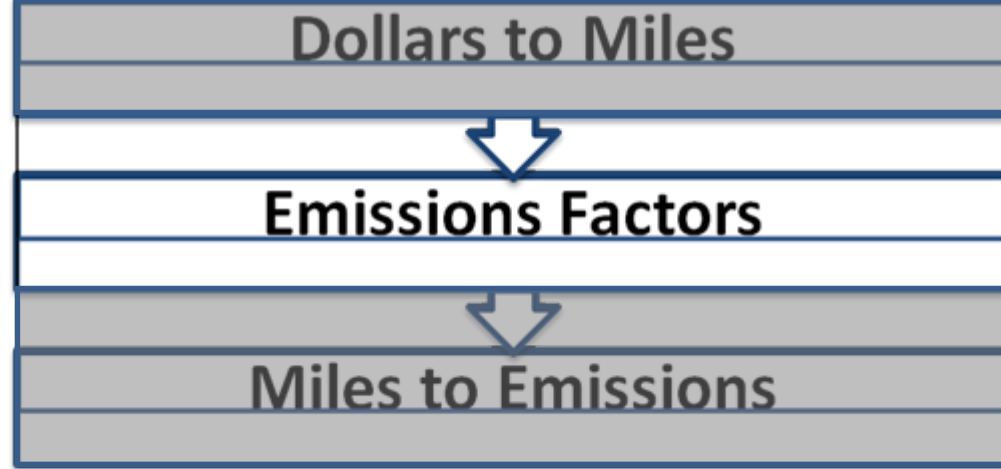


Weighted average cost
per passenger mile

- Dollars spent came from the Controller's Office records of reimbursed travel

- Cost per passenger mile came from the Alliance Carrier Airline Network

Emissions Factors



Btu per
passenger mile

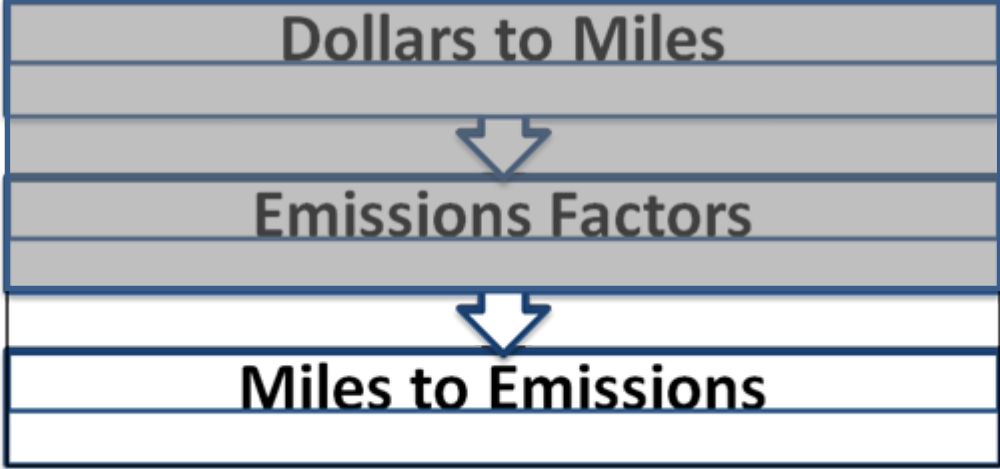


CO₂ per Btu

- Btu (British thermal unit) per passenger mile was supplied by Research and Innovative Technology Administration

- CO₂ per Btu was supplied by California Climate Action Registry General Reporting Protocol

Miles to Emissions



Passenger
air miles



Btu per
passenger
mile



CO₂ per
Btu



Total CO₂
emissions

Results

University Air Travel Emissions in Metric Tons of CO2

FY 2007

FY 2008

25,969.95

30,513.70

Equation and Conversion Factors

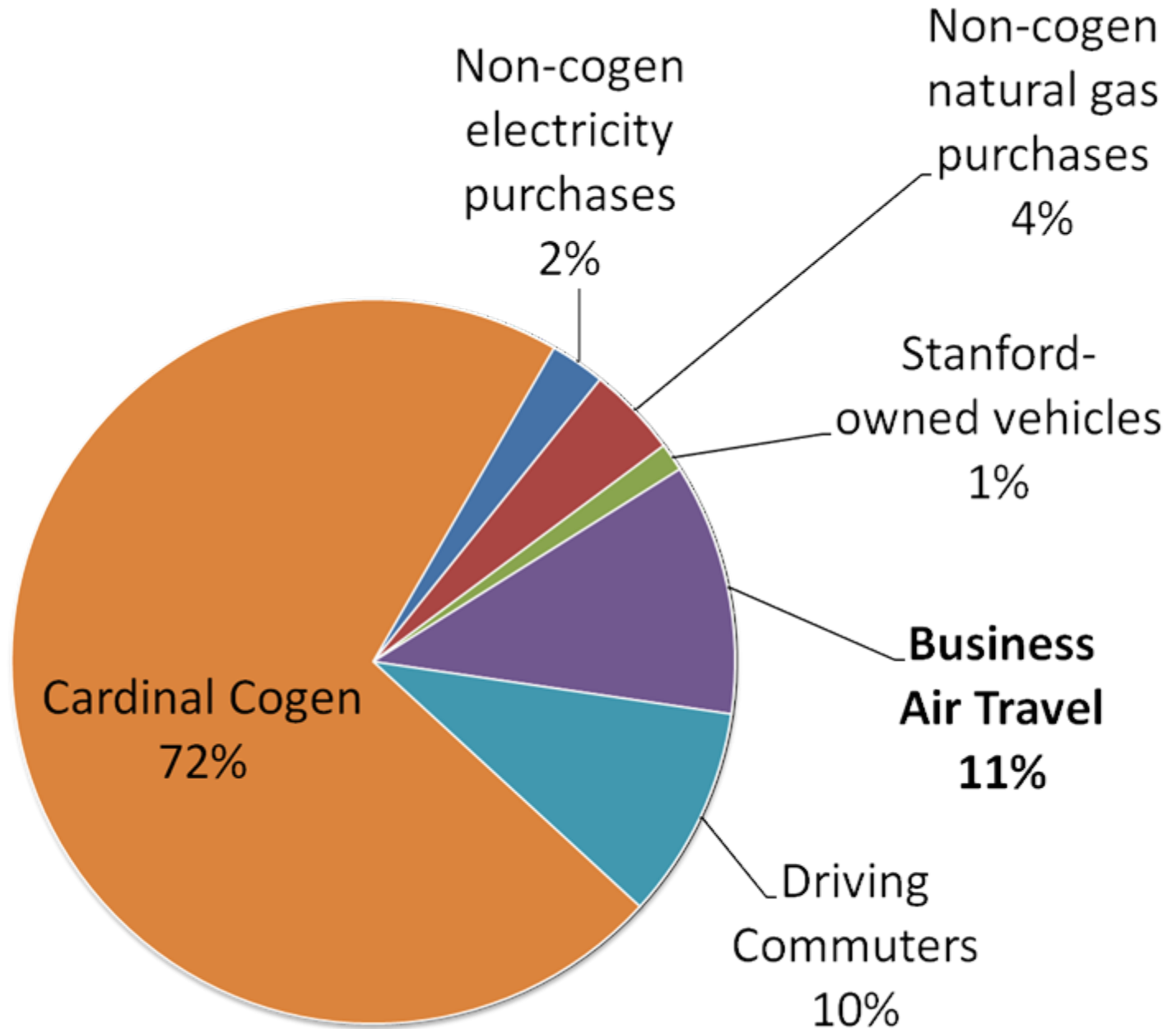
Air Travel CO2 Emissions = $\{[(\text{passenger air miles} \times \text{Btu/passenger mile})/1,000,000] \times \text{Kg CO2/Mbtu}\}/1000$

Btu/passenger mile **3206.66**

Kg CO2/Mbtu of jet fuel **70.88**

Cost per passenger mile **\$0.155**

Stanford University Carbon Emissions Sources



Future Emissions Reporting

New, more accurate data

- **Information on each trip segment for all travel purchases**
- **Exact GPS coordinates for all airports**

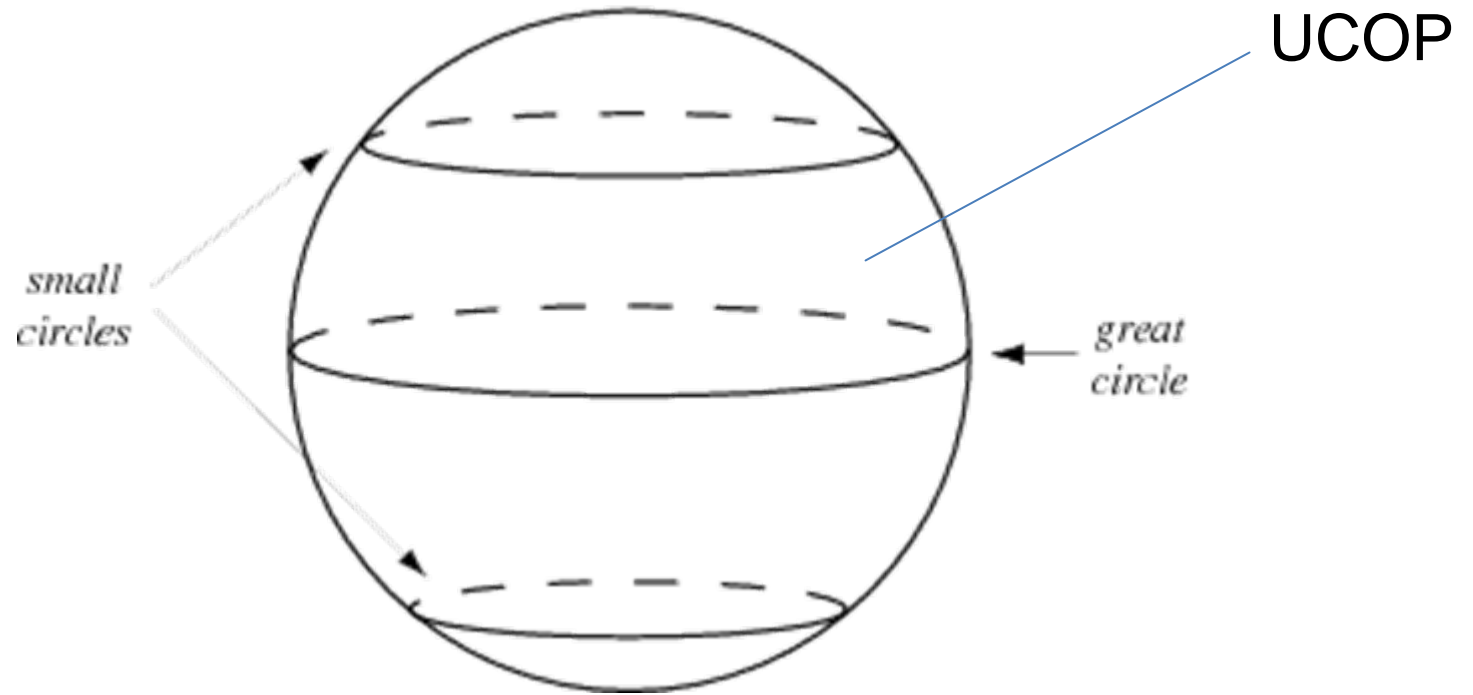
New equations

- **Airport to airport mileage calculation**
- **Differing emissions factor based on flight distance**

New, More Accurate Data

- **New University travel card reports on each leg of flight purchases**
- **This level of information is also being required for travel reimbursements**

New Equations



Pasted from <<http://mathworld.wolfram.com/GreatCircle.html>>

Ideas to Reduce Travel Emissions Impacts

- **Discourage unnecessary travel**
 - Education
 - Budget conditions will help
- **Encourage teleconferences/telepresence**
- **Commercial and internal off-set programs**
 - University subsidy/reimbursement
 - Individual subsidy
- **Ideas from other campuses**

RAMSES MADOU

650 721-6994

madou@stanford.edu