The Yale Climate Initiative: GHG emissions from transportation

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Presentation Overview

- Study background
  - Yale Climate Initiative (YCI)
  - Yale's Inventory
- GHGs from transportation
  - Boundaries and methodology
  - Emissions calculations approaches
- Conclusions

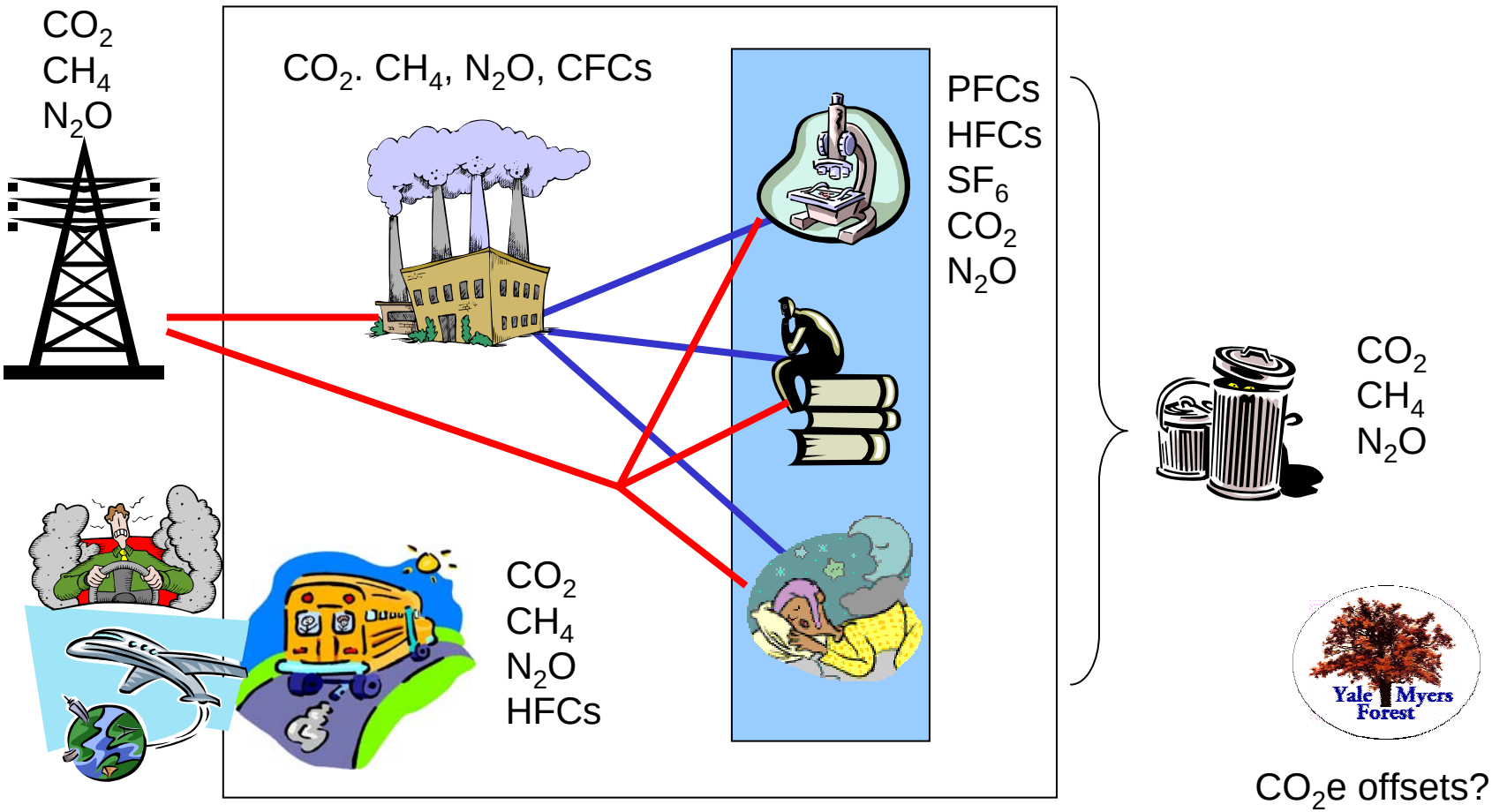
YCI Overview: Purpose

Student-initiated study to:

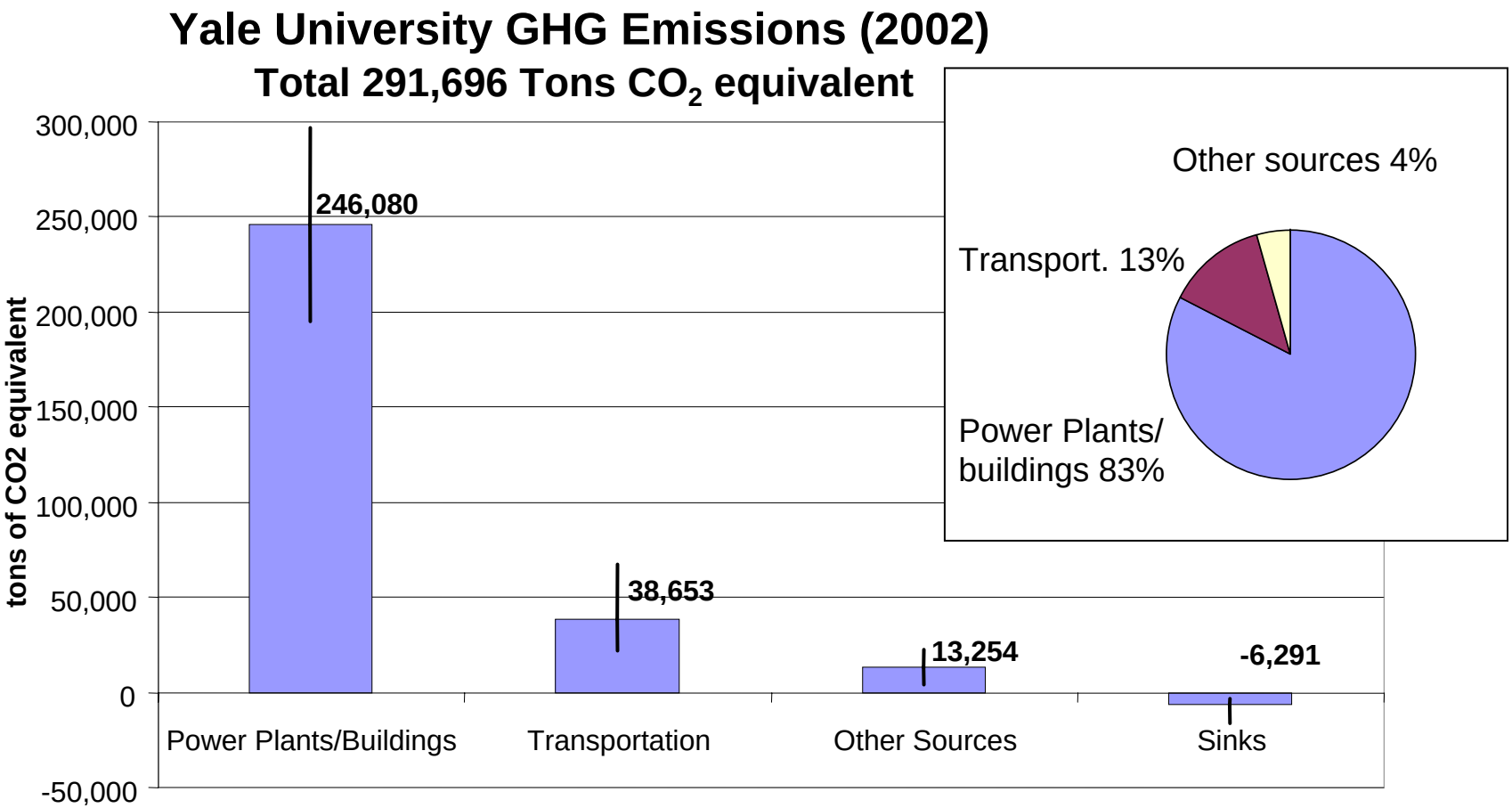
- Understand Yale's greenhouse gas (GHG) emissions drivers
- Develop a GHG emissions inventory for Yale
- Analyze approaches to make the University more climate friendly

An opportunity to reflect on existing inventory methodologies and tools

Greenhouse Gases at Yale



Yale's GHG Emissions: Year 2002



Transportation: System boundaries

- Institutional (WRI Scope 1)
  - Yale-owned vehicles
- Work-related (WRI Scope 3)
  - Conferences, meetings, research trips (flights, train, ground transportation)
- Commuters (WRI Scope 3)
  - Daily (faculty, students)
  - Travel home (students)

Yale owns 366 vehicles, over half of which are trucks or vans

Yale spends about $20 million in travel each year

Yale commuters travel over 57 million miles per year

System boundaries chosen to:

- Understand Yale's total footprint
- Explore methodologies for quantifying more than the usual direct fleet emissions

Uncertainty

Importance of uncertainty

- General need to understand range of potential values
- Very large for transportation emissions
- Several assumptions needed to calculate emissions

Our approach

- Develop calculation tool
- Estimate the variability deriving from single variables
- Evaluate total uncertainty
- Identify most significant variables and assumptions

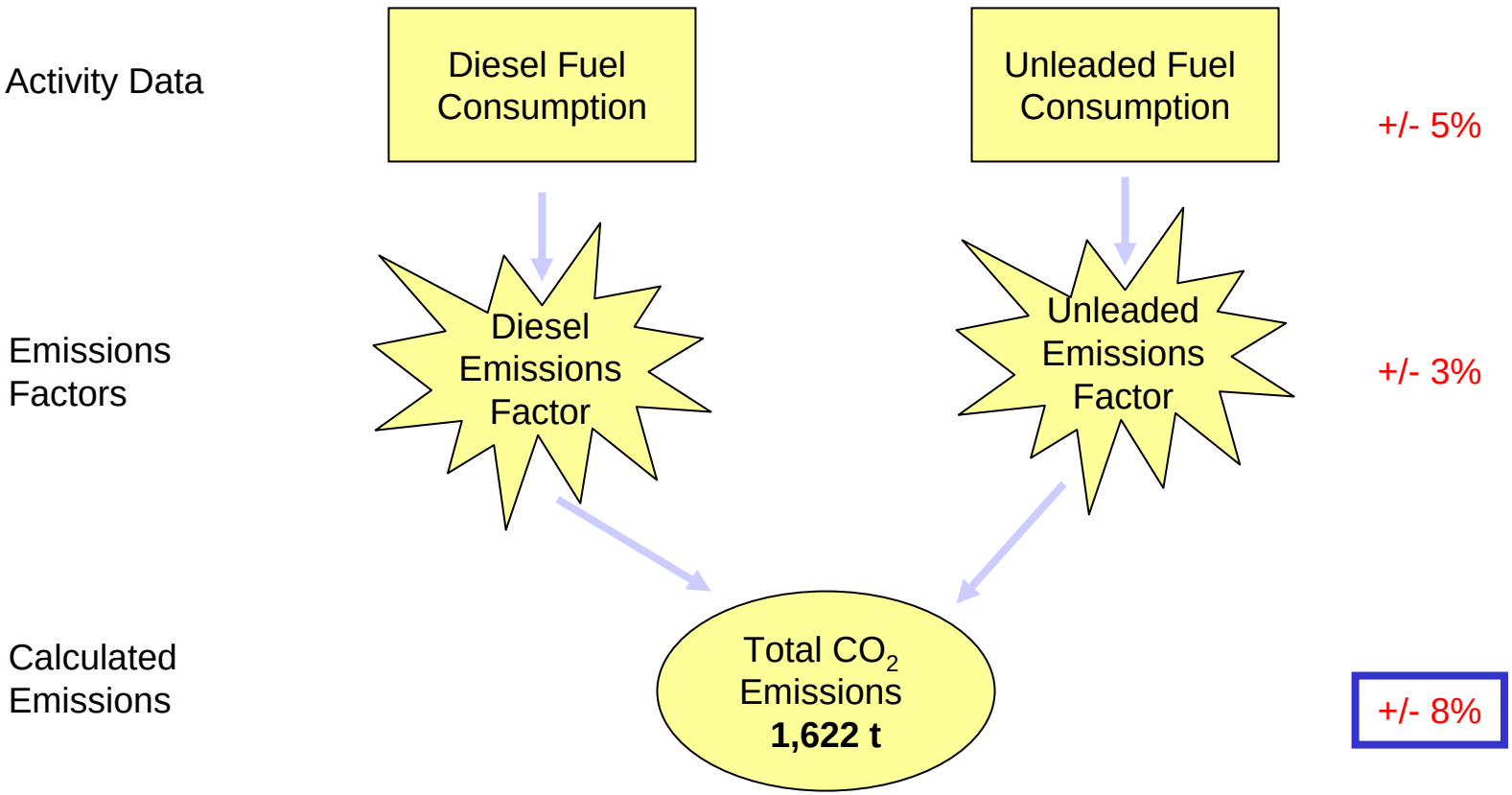
The ‘inventory community’ has an opportunity to define more standardized factors and procedures

Institutional Emissions: Data

- Vehicles owned and operated by Yale University
  - Vehicle purchasing decisions made by Yale
  - Fuel purchases made by Yale drivers

Data sources
- Kept centrally
  - Up-to-date list of vehicles
  - Accurate fuel purchase information from credit card transactions
  - Inconsistent identification of vehicles being refueled
  - Inaccurate vehicle mileage data

Institutional Emissions: Analysis



Institutional Emissions: Conclusions

- Low uncertainty for total institutional emissions, but
- High uncertainty on the emissions and efficiency of individual vehicles and users

→ Difficult to translate to mitigation opportunities

Case studies and “Best management practices” to help companies gather and analyze more granular data?

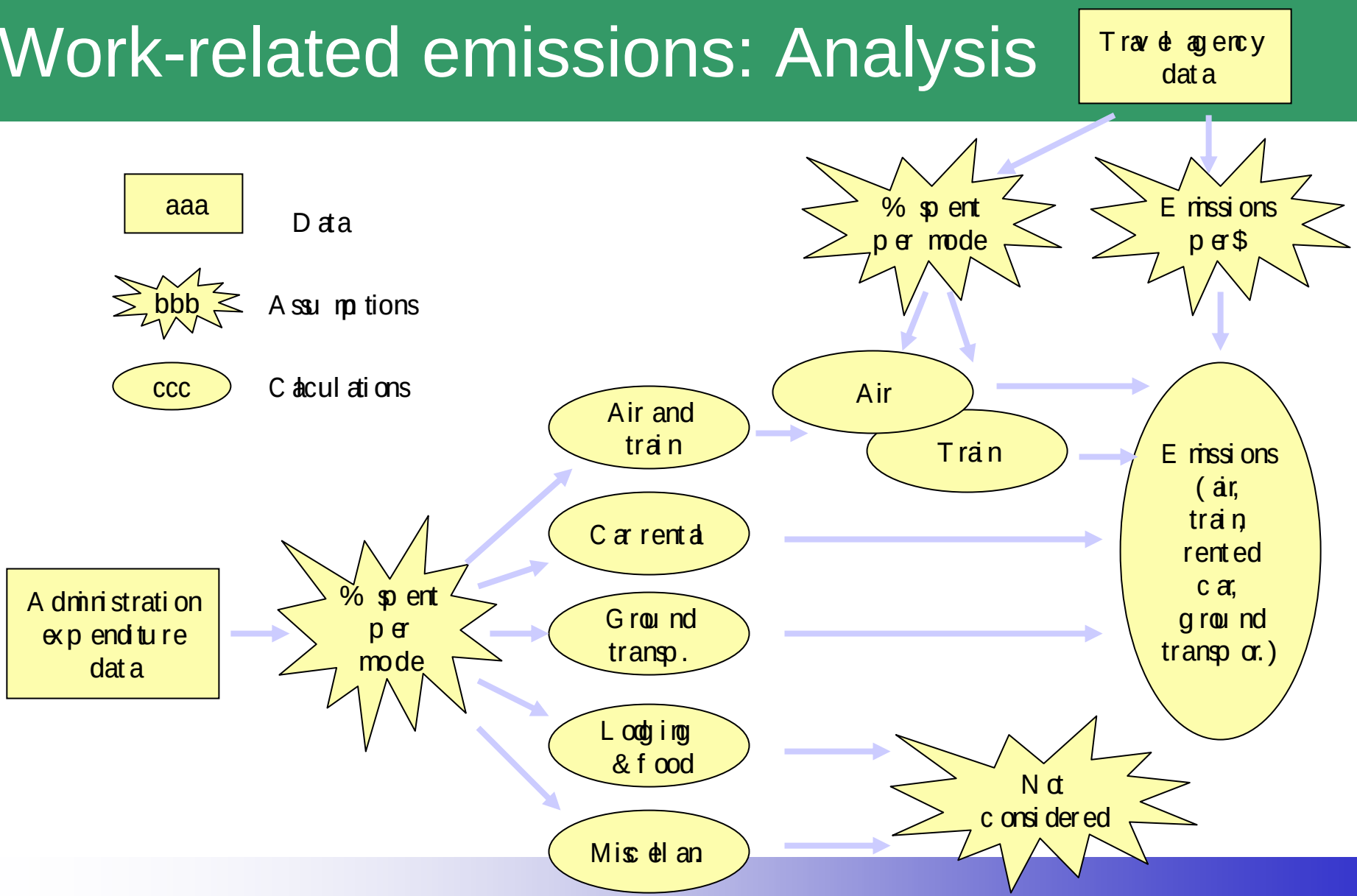
Work-related emissions: Data

- Travel directly linked with university activities
  - Conferences, meetings, research trips
- Includes many modes of transport
  - Flights, train, ground transportation

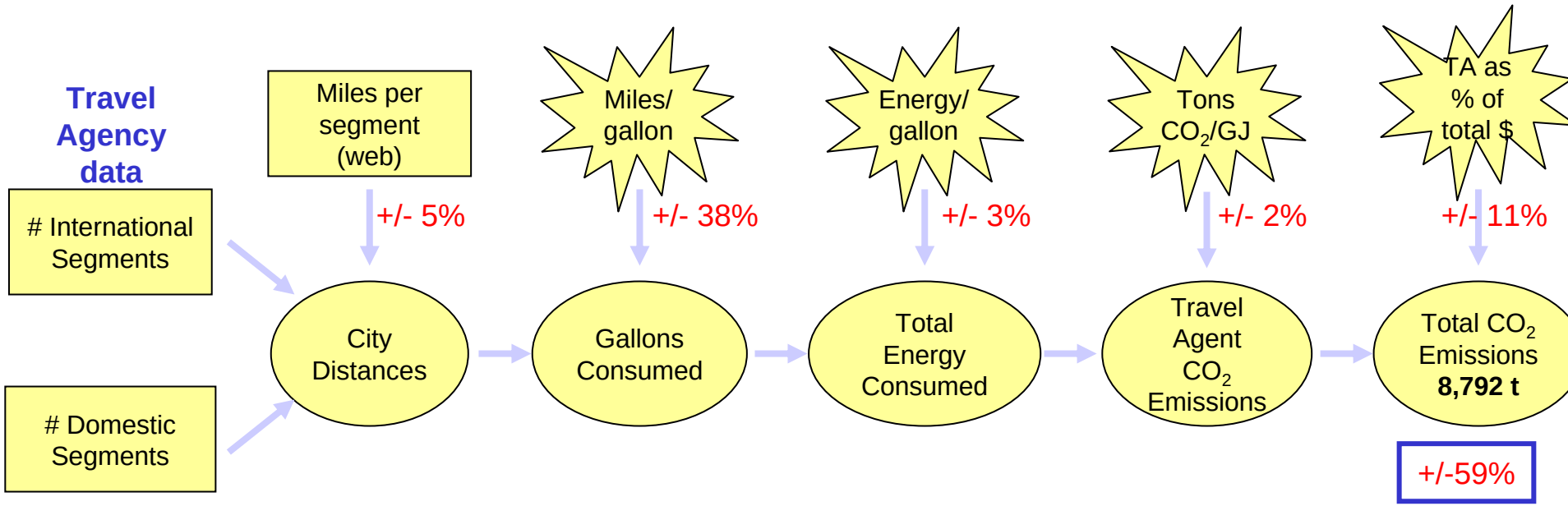
Data sources

- Financial records (from expenditure reports etc.)
- Yale's travel agency records (with good granular information about flights)
- Some purchases not made through centralized process
- Many types of trips are aggregated monetarily, not separated by mode

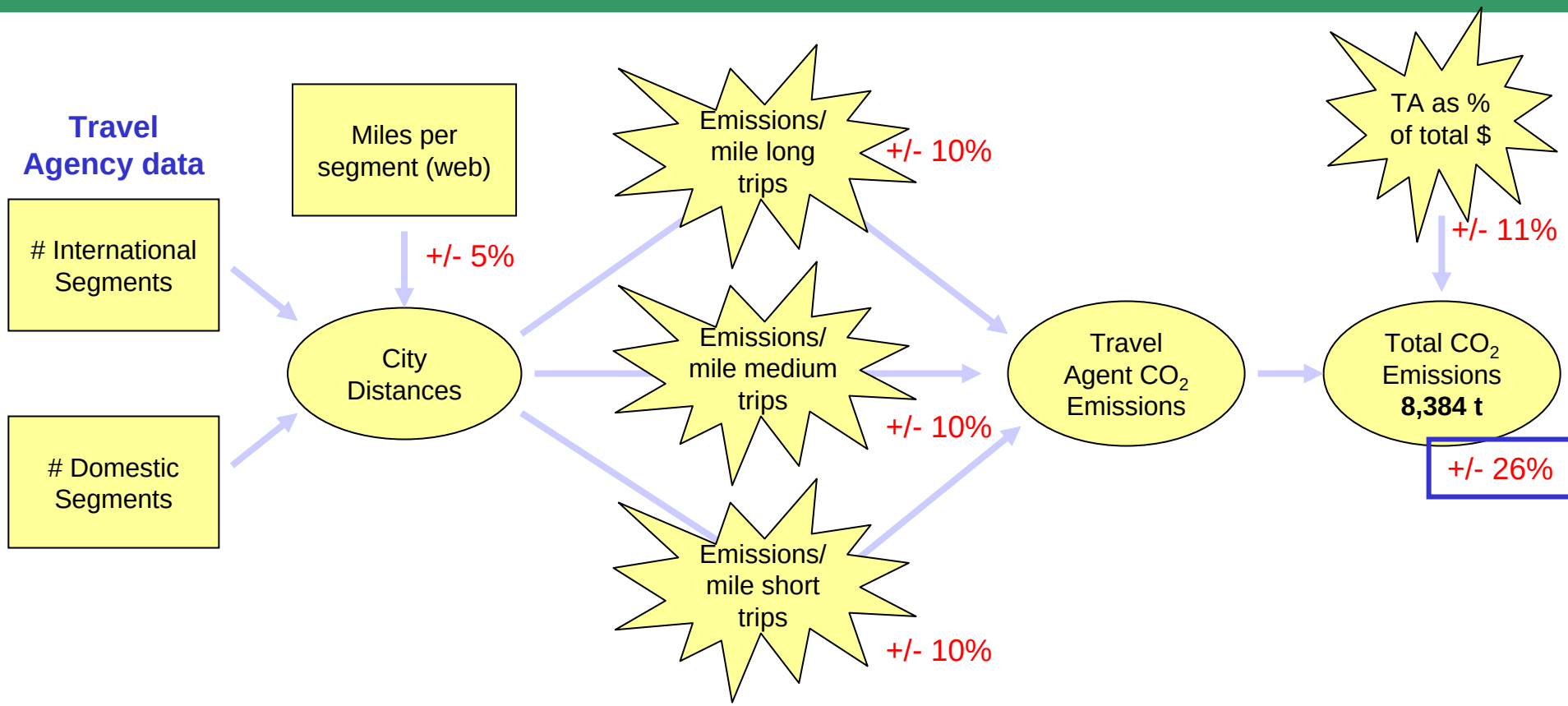
Work-related emissions: Analysis



Air travel analysis v. 1



Air travel analysis v. 2



Work-related emissions

- Using financial data to calculate GHG emissions required a variety of assumptions. E.g.

Parameter	Sources	Notes
Miles/$ train GHG/passenger-mile train	TA, Market prices WRI	Significant variability in train prices Only one factor for the US at the time of the analysis (now improved)
$/day car rental Miles/day car rental GHG/pass. mile car rental	TA, Market prices TA benchmark WRI	Based on limited random sample Based on industry data
Miles/$ ground transportation GHG/pass. mile ground t.	Expenses mile rebate Market prices WRI, DOT	Based on limited sample Few data available

None of these parameters influenced the work related emissions by more than 3.3% of the total

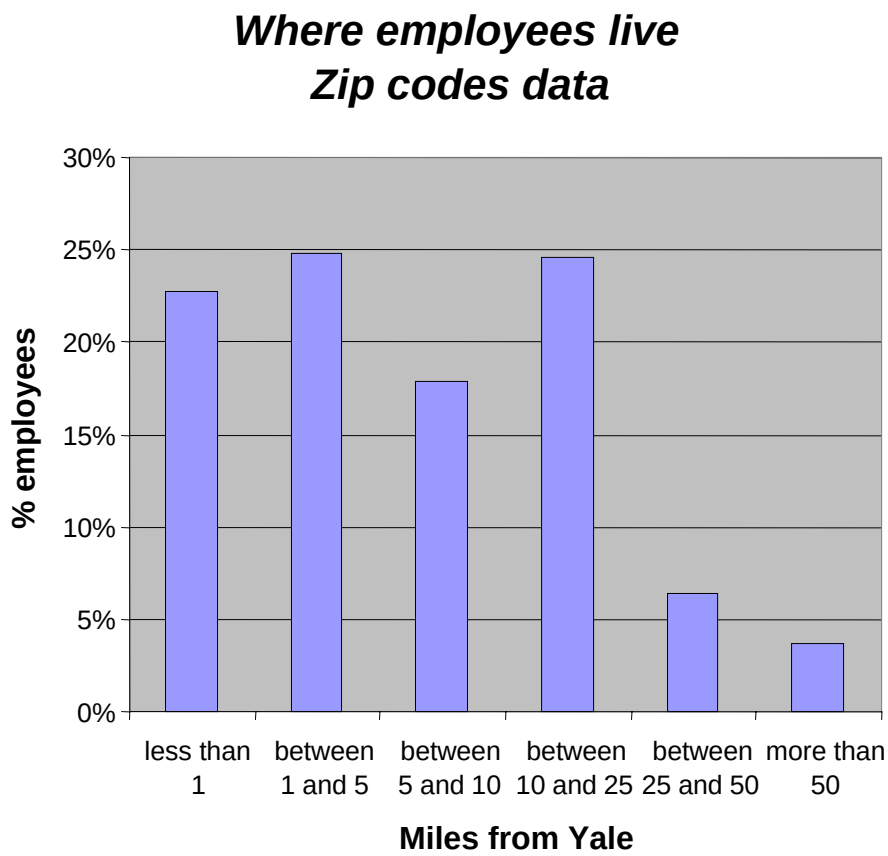
Work related emissions: Conclusions

- Several parameters can affect uncertainty when calculating work related emissions
- The inventory community could improve consistency, if not accuracy, if it agrees on parameters such as:
  - Miles per $ spent for various transportation methods (ideally at state or local level)
  - Emissions per mile for different transportation methods (requires aggregating different options)
- With transportation companies looking at offering GHG emissions offset services we should also think about information protocols to transfer relevant data between transportation companies and their customers

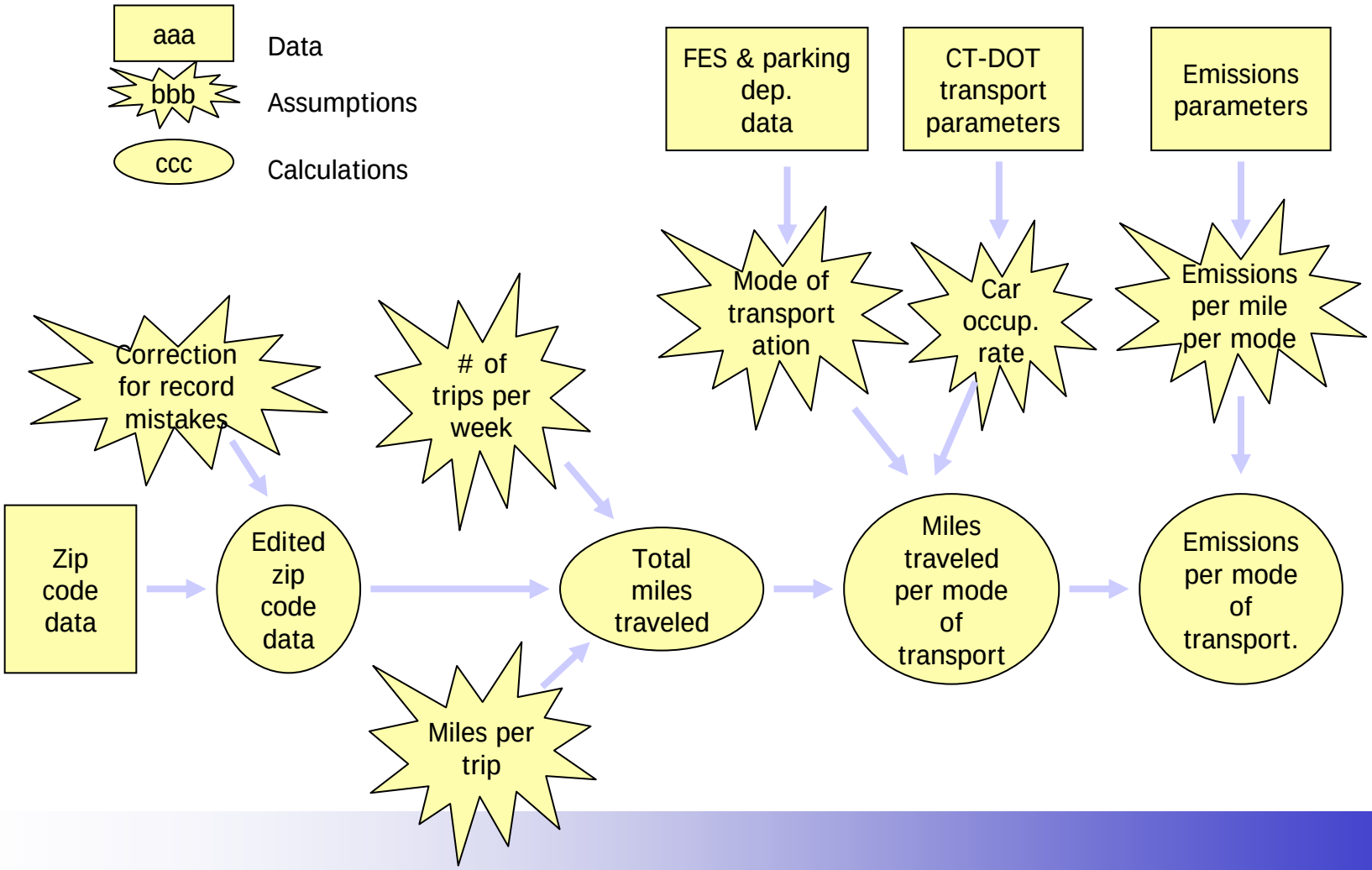
Personnel commuting: Data

- Overall Yale employees about 12.500 people
  - Faculty
  - Researchers
  - Management
  - Support

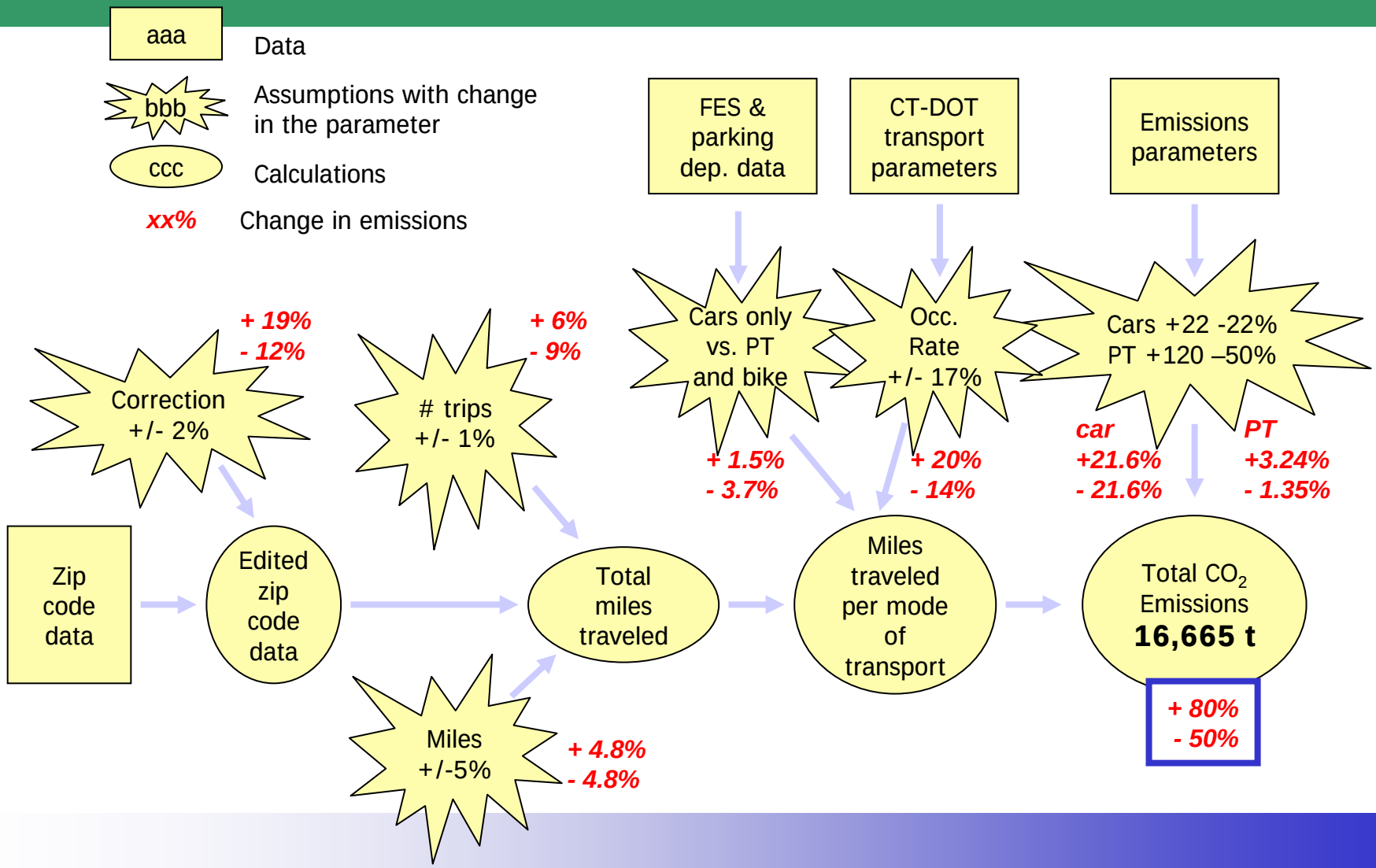
Data sources
- Zip code records from Human Resource Department



Personnel commuting: Analysis



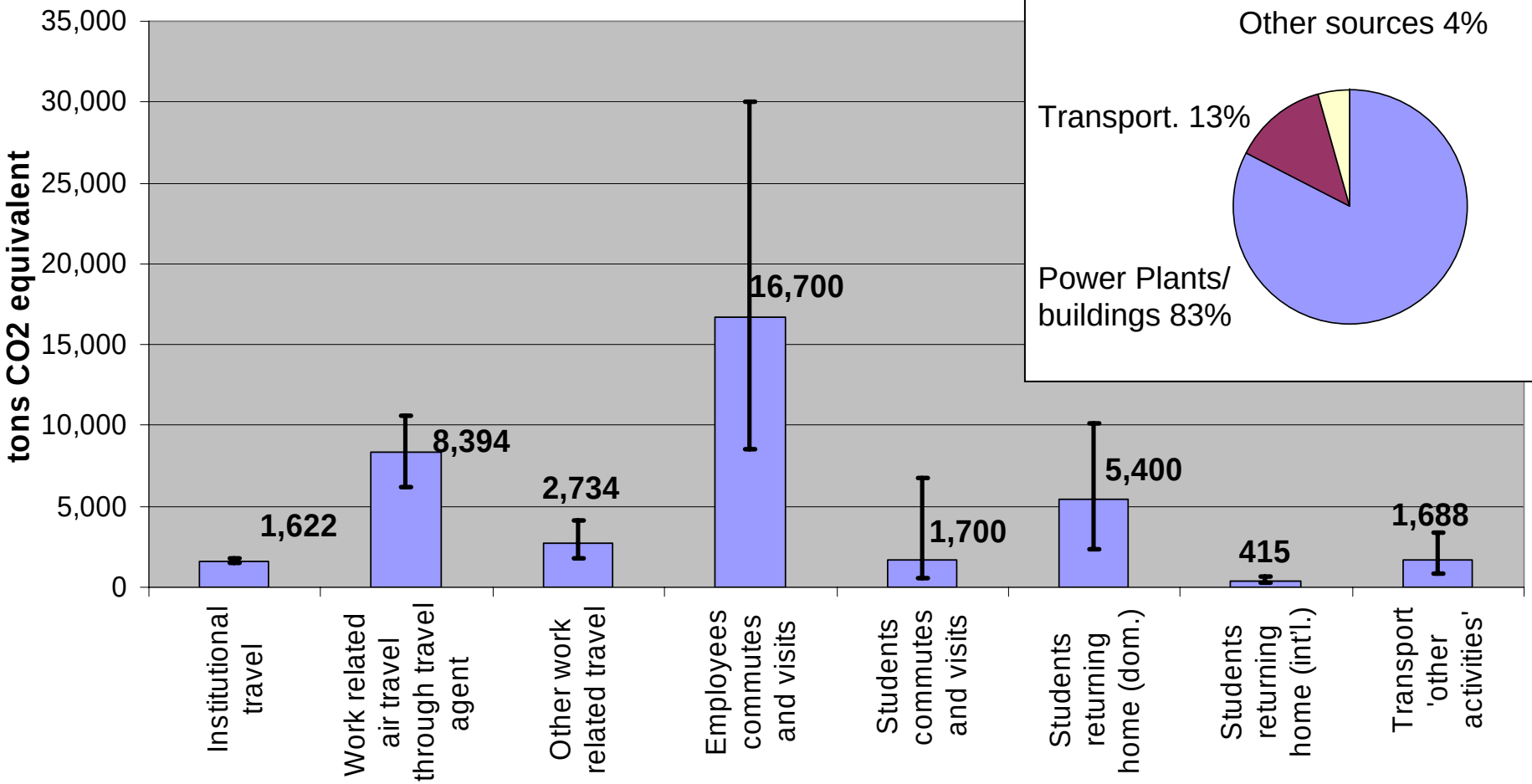
Personnel commuting: Analysis



Personnel commuting: Conclusions

- Work related emissions estimate could have benefited from
  - A mobility study for the University
  - More precise and current data on personnel and students residence
  - Vehicle-specific parking data (dept name doesn't matter, but type of data desired seems important)
  - State level and local data on transportation behavior
  - State level and local emission parameters (e.g. for car, train or bus emissions)
  - Average (non-technology-specific) automobile emissions parameters

Summary: Emissions from Transportation



Conclusions: Data Quality

- Lack of Data
  - Define management systems and templates for data gathering and emissions calculation
  - Prepare standard templates for mobility studies for Universities
  - (In the future?) Define communication protocols between the travel industry and end users
    - E.g. For airline or train companies to communicate CO_2 emission data to their users

Conclusions: Emissions factors

- Create a repository with agreed/standard parameters for:
  - Miles per $ spent per mode of transportation
  - Emissions per mile traveled per mode of transportation
  - Regional and local vehicle use parameters
    - Occupation rate
    - Distance traveled for commutes
    - Mode of transportation chosen
  - Average automobile emission factors

Parameters of increasing level of granularity can be provided and associated with decreasing level of uncertainty

Conclusions: Methodology

- Current calculations tools for transportation emissions can be a basis for improving scope and precision
  - New calculation tools and protocol can broaden calculations
  - More granular analysis is possible if suitable parameters are available (and provided by reputable sources)
  - More explicit uncertainty analysis
- Case studies, ‘best practices’ and training to help companies improve:
  - Internal data management systems and
  - Processes and incentive structures

Thank you!

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