The Environmental Benefits of Air/Rail Services What We Know and What We don't Know

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What did we learn yesterday?

From Christian's Presentation

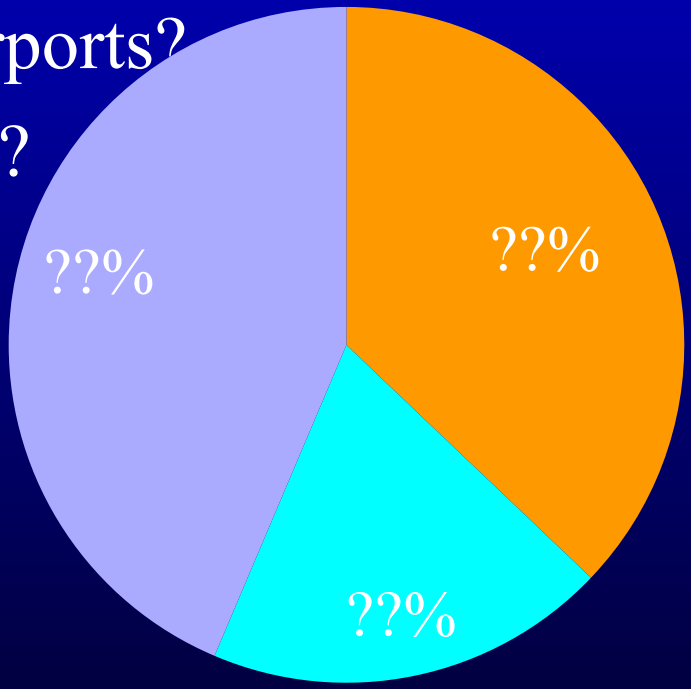
- We know how to make connections to the local metropolitan rail system
- Making connections to the long distance rail system *is much more difficult*
- Long distance rail managers do NOT want to add travel time for the majority of their users to serve a minority of their users

Three Categories for this Presentation

- We know how to make connections to the local metropolitan rail system
  - *Rail in a complementary mode with air*
- Making connections to the long distance rail system *is much more difficult*
  - *Rail in a complementary mode with air*
- Long distance rail managers do NOT want to add travel time for the majority of their users to serve a minority of their users
  - *Rail in the competitive mode vs. air*

Where are the major environmental benefits of air/rail intermodality?

- From metropolitan access to airports?
- From long distance access to airports?
- From diversion of trips from air?

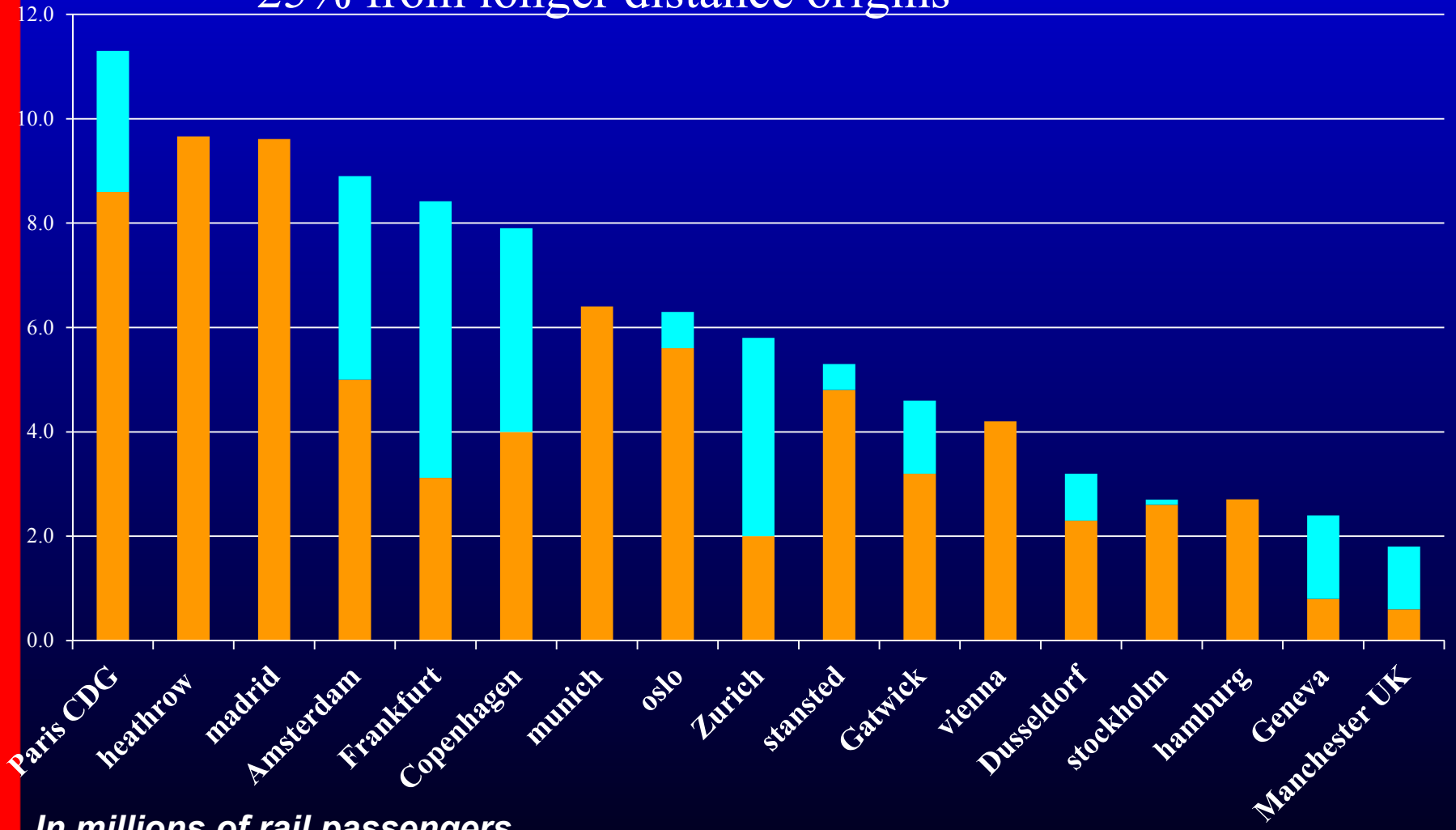


Calculating the Impacts on Greenhouse Gas (GHG) Emissions

- We used *full Life Cycle analysis*
  - Adapted from a program at University of California at Berkeley
- For diversion of air passengers, Life Cycle GHG emissions were compared with medium size aircraft
- For ground access to airports, Life Cycle GHG emissions were compared with private auto

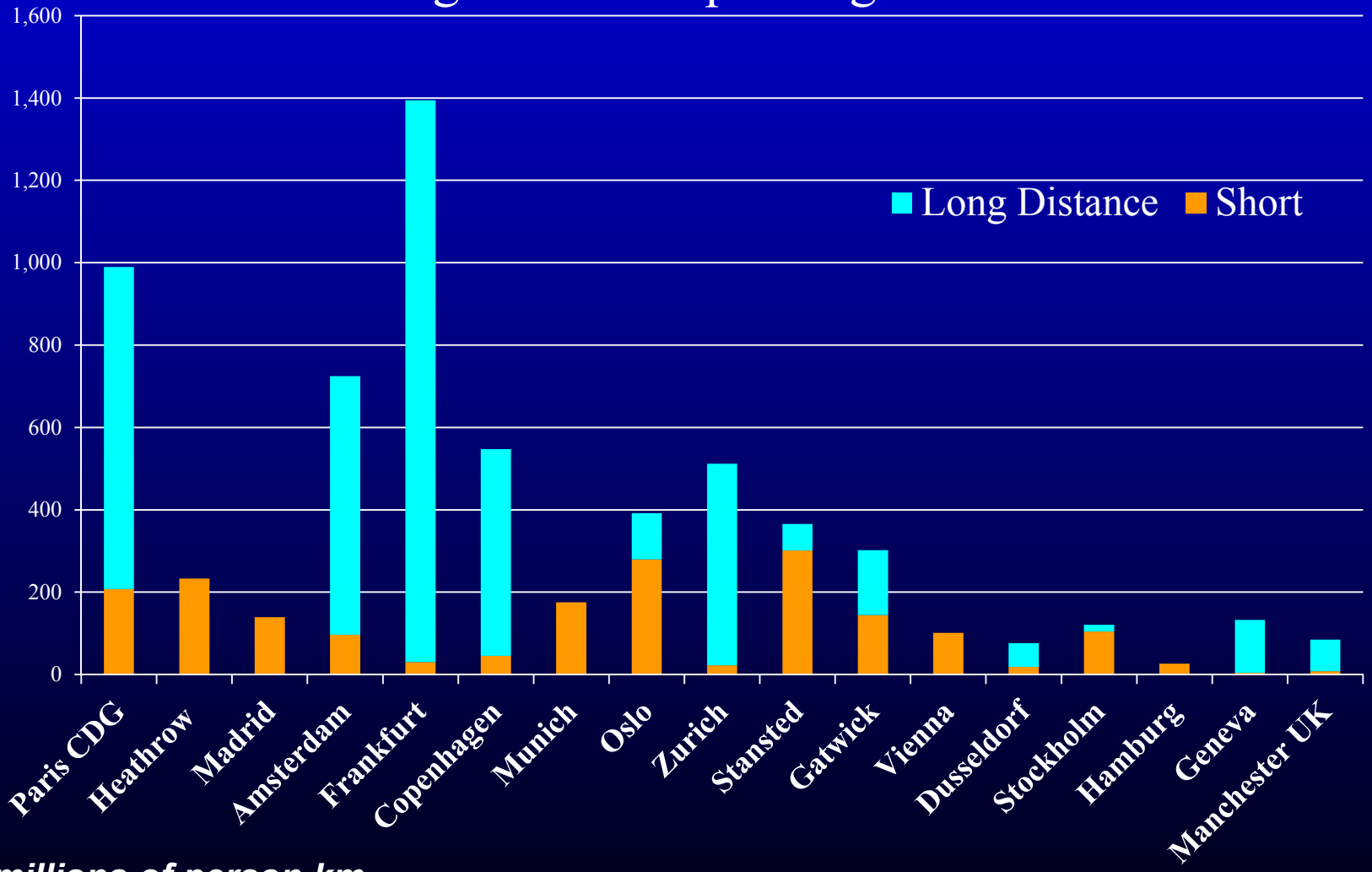
How Many People Use Rail to Airports?

- *100 million* annual rail trips from 18 European airports
  - 75% of them from metro origin
  - 25% from longer distance origins



How many passenger kilometers to rail?

- 6.3 billion kilometers of travel in the 18 airports
  - 30% from metro passengers
  - 70% from longer distance passengers



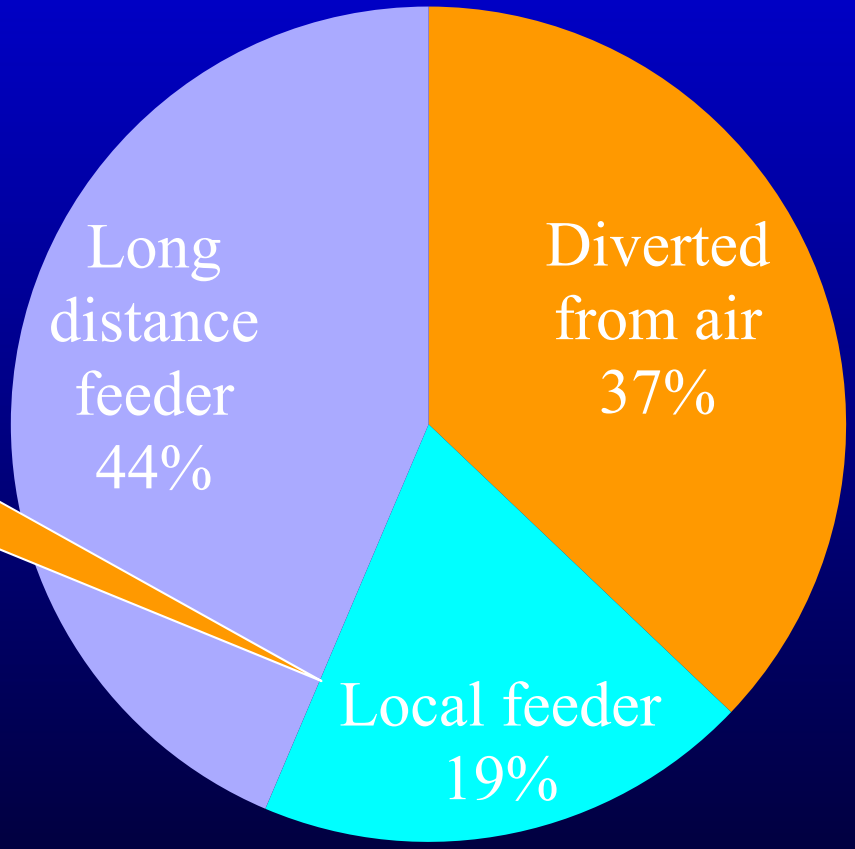
In millions of person km

With Life Cycle Analysis…

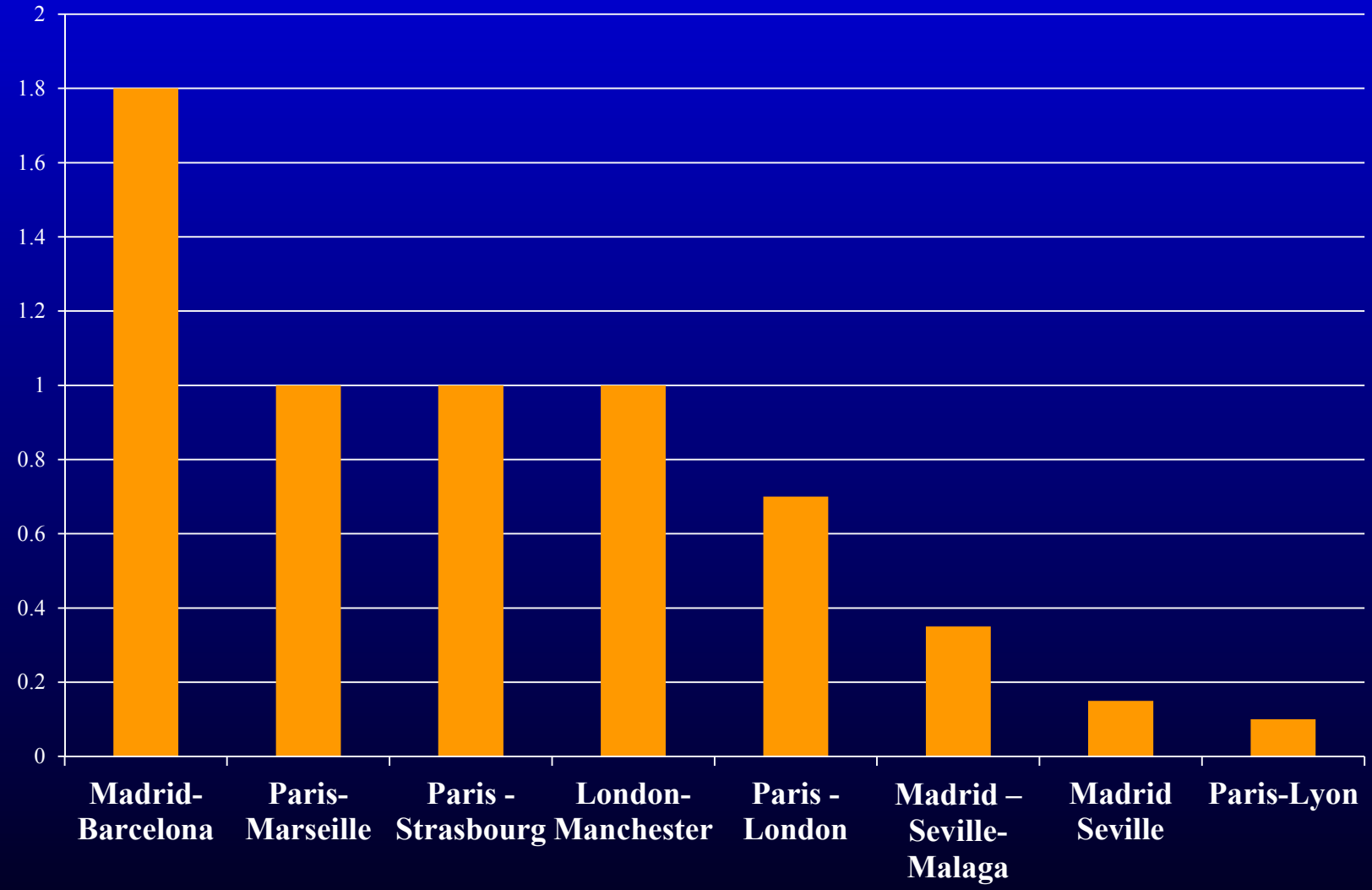
- A person-kilometer by rail creates *127* fewer grams of CO_2 than the base case of travel by car
  - Assumes US average occupancies
- A person-kilometer of High Speed Rail creates *194* fewer grams of CO_2 equivalent than the base case of medium size aircraft
  - HSR Rail occupancy at 63%
  - Radiative Force Index of 2.5 assumed

- Air Rail Intermodality brings about an annual savings of 1.3 million metric tons of GHG

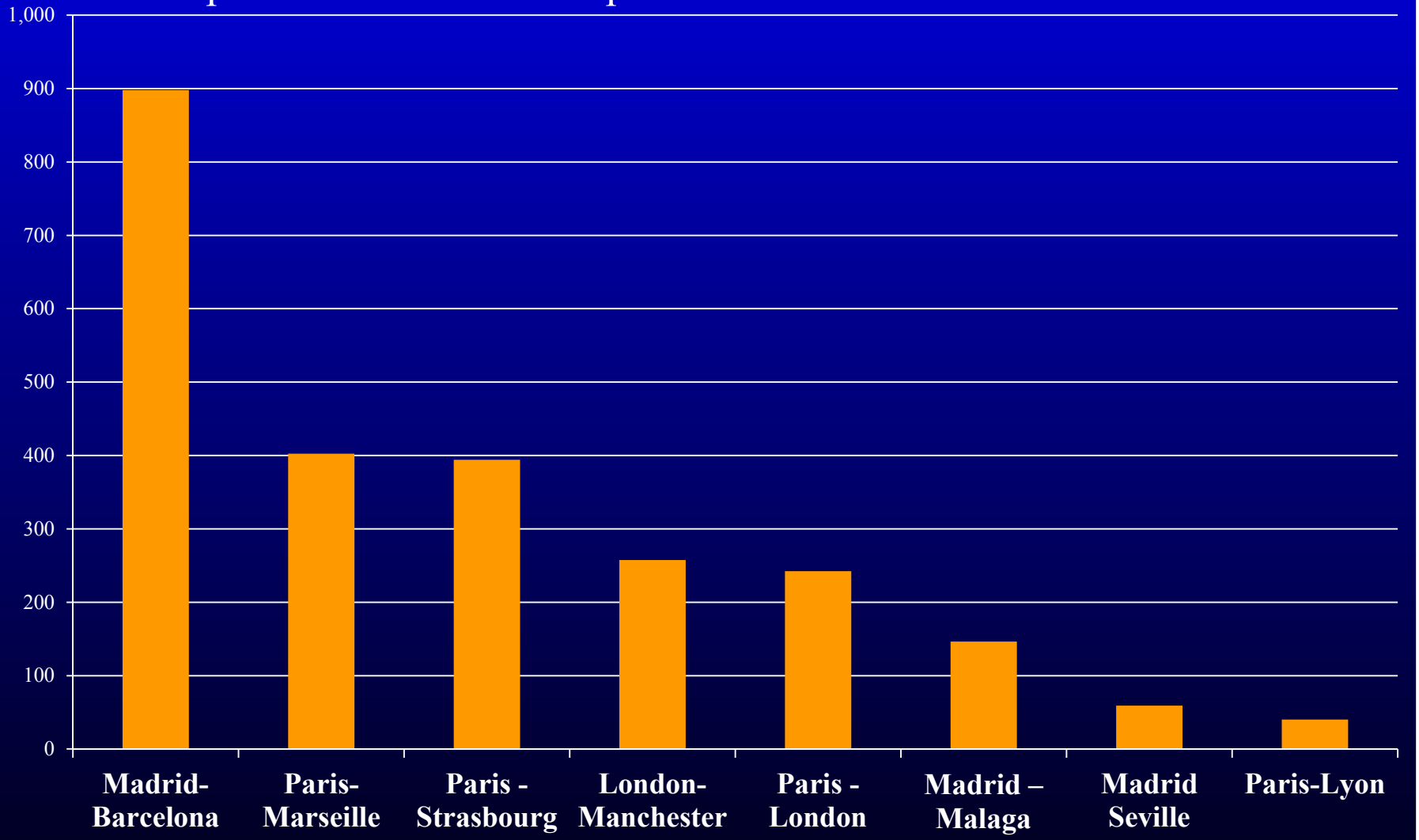
Complementary role comprises more than 60% of total environmental benefit



- Six million rail riders have been diverted from air
  - Graph in millions of annual rail riders



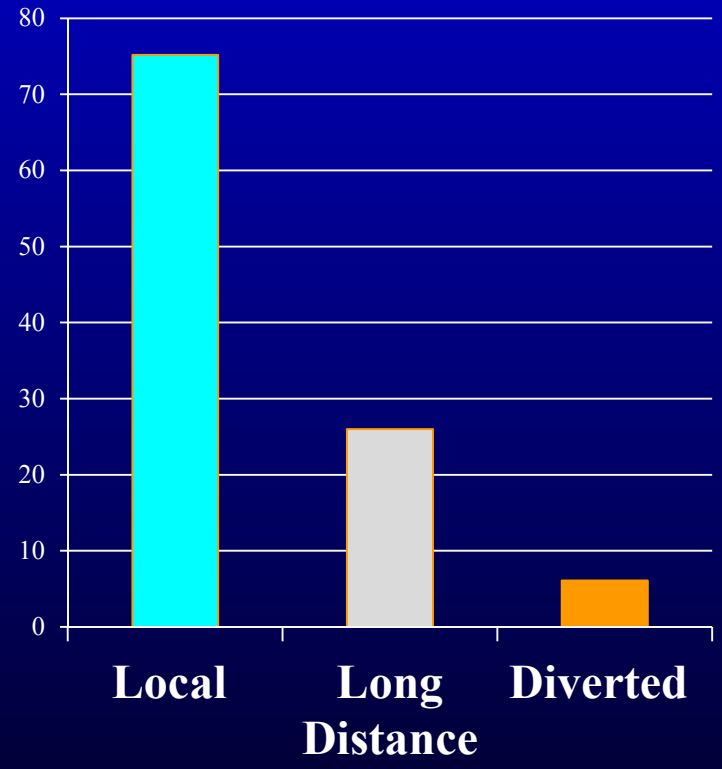
- 2.4 billion passenger kilometers of rail travel from passengers who have diverted from air
  - Graph in millions of km of person travel



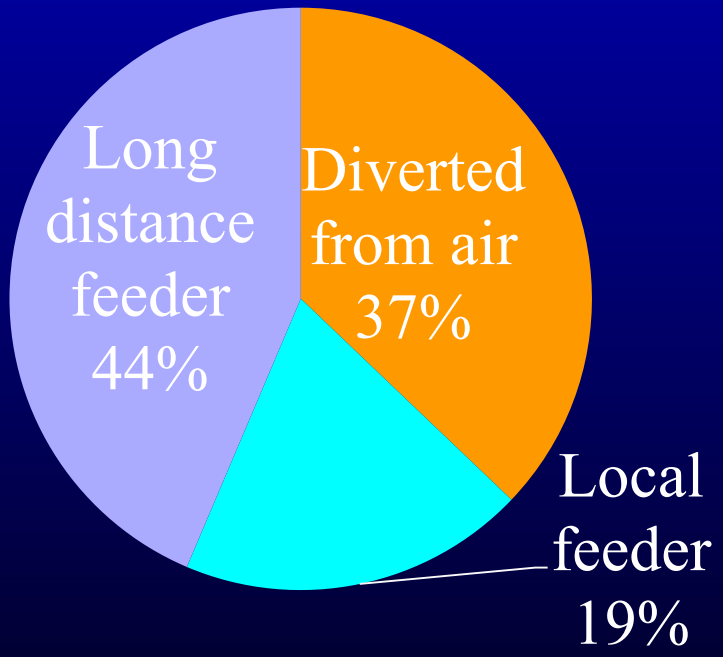
Source of the GHG Benefits

(Together saving 1.3 Million Metric Tons)

Number of Rail Riders (millions)



Source of GHG Benefits



What we do not know…

- We do not always know the full environmental consequences of the *source* of the electricity used by long distance rails systems
  - *We used average characteristics in this analysis*
- Great variation between countries
  - Heavy use of nuclear in France
  - Heavy dependence of coal in Germany
- Full impact of air not well defined in science…
  - The radiative force index varies by altitude..

Conclusion

In the interaction between aviation systems and rail systems…

- Significant environmental benefit can ocurr.
- More research is needed to document this.

Thanks to everyone who has made this IARO presentation possible, including ....