UNCERTAINTY ANALYSIS AND NETWORK STRUCTURE

ESD.00

Recitation 12

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May 4, 2011

UNCERTAINTY ANALYSIS

- **Project focus: life-cycle assessment of high-speed rail and aviation.**

- **What are the sources of uncertainty in this analysis?**

  - Demand
  - Availability of alternative energies
  - Technological innovation (e.g. fuel efficiency)
  - Fuel prices
  - …

UNCERTAINTY ANALYSIS: DEMAND

- How might uncertainty of future demand affect your analysis?
- How could you present these uncertainties to (for example) policymakers?

Sensitivity Analysis: Potential Variation in Load Factors

Mode	Single	Low	Current	High
Boeing 737	1 pax	30% LF (45 pax)	50% LF (75 pax)	80% (119 pax)
Acela Express	1 pax	XX% LF (xx pax)	XX% LF (xx pax)	XX% LF (xx pax)

Sample Results: Load Factor Variability on Energy Performance (MJ/PMT)
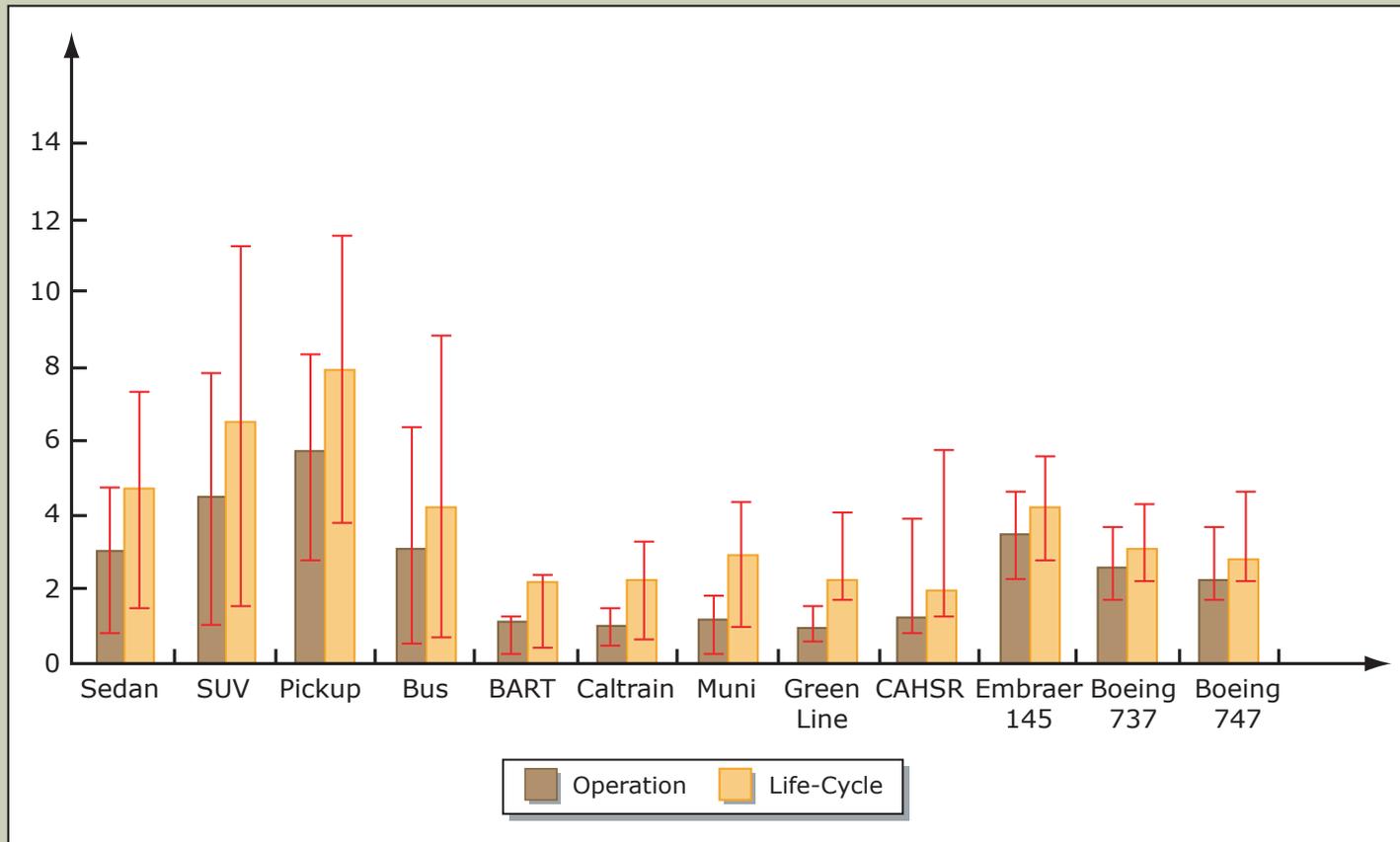
Image by MIT OpenCourseWare.

Source: Chester, "Life-cycle Environmental Inventory of Passenger Transportation Modes in the United States," 2008

UNCERTAINTY ANALYSIS: ENERGY

- **How might uncertainty of future energy affect your analysis?**

Sensitivity Analysis: Fuel Efficiency & Renewable Electricity Generation in 2030

Mode	Low	Average	High
Aviation	0.5% efficiency gain per year	1% efficiency gain per year	3% efficiency gain per year
High-Speed Rail	Current electricity mix	50% renewable electricity mix	100% renewable electricity mix

■ **How might network structure impact demand for high-speed rail and aviation?**
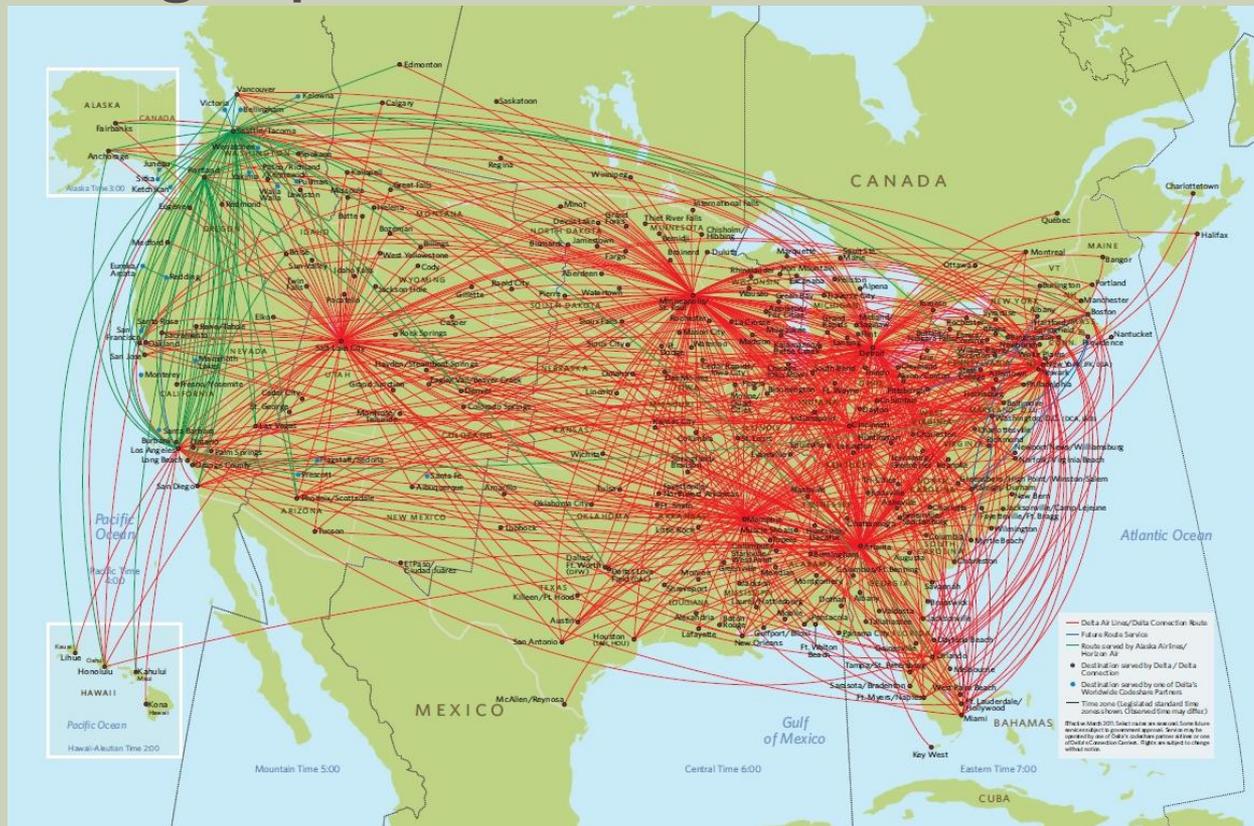
Delta Airlines Route Map

Source: Delta Airlines

ESD.00 Introduction to Engineering Systems
Spring 2011