Enabling Better Green Supply Chain Management

H. Scott Matthews
Carnegie Mellon University

Carbon Management

Industry and Policy Drivers

- H.R. 2764 (2007) - EPA Registry Initiative
- EU-Emissions Trading System and draft Climate Change rules
- Retail efforts - Wal-Mart, TESCO (UK), Labels
- Voluntary: The Climate Registry, Carbon Disclosure Project, Global Reporting Initiative

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Why Care?

- Policies affecting business on multiple levels:
  - Direct cost increases
  - Indirect (supply chain) costs
  - Consumer/investor perception/activism
  - Compliance (govt, retail) -> labels?
- Large data demands; both inside and outside companies' organizational boundaries

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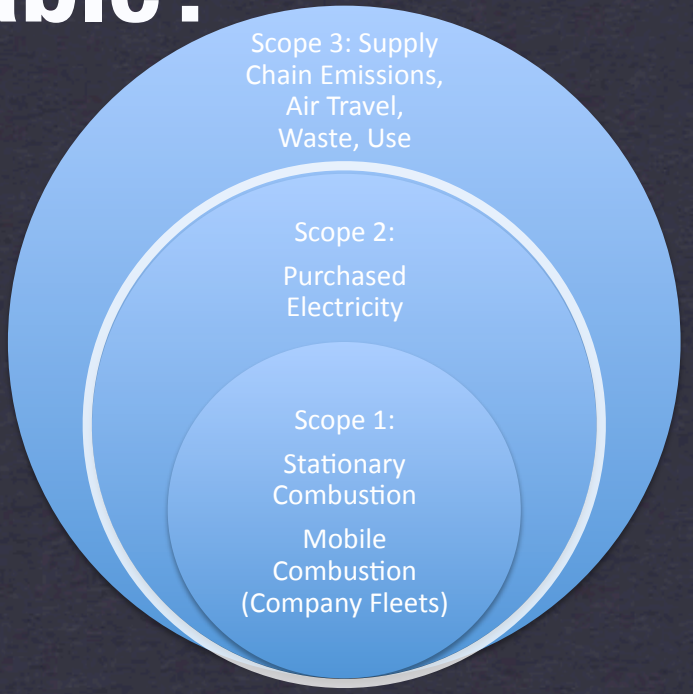
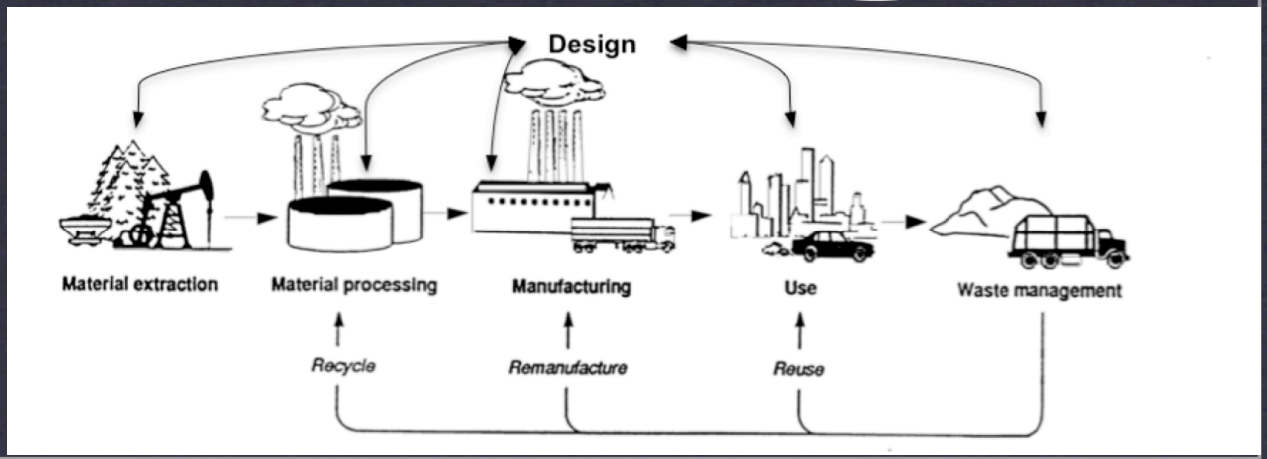
What tools are available?

- "Carbon footprint" tools



- Life Cycle Assessment



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Protocol Boundaries for Entities

CCAR, WRI/WBCSD, Others

- Scope 1 - Direct Emissions (Fleet, Fuels)
- Scope 2 - Purchased Energy Emissions
- Scope 3 - Indirect (supply chain) Emissions

- These may / not include non-CO2 GHGs

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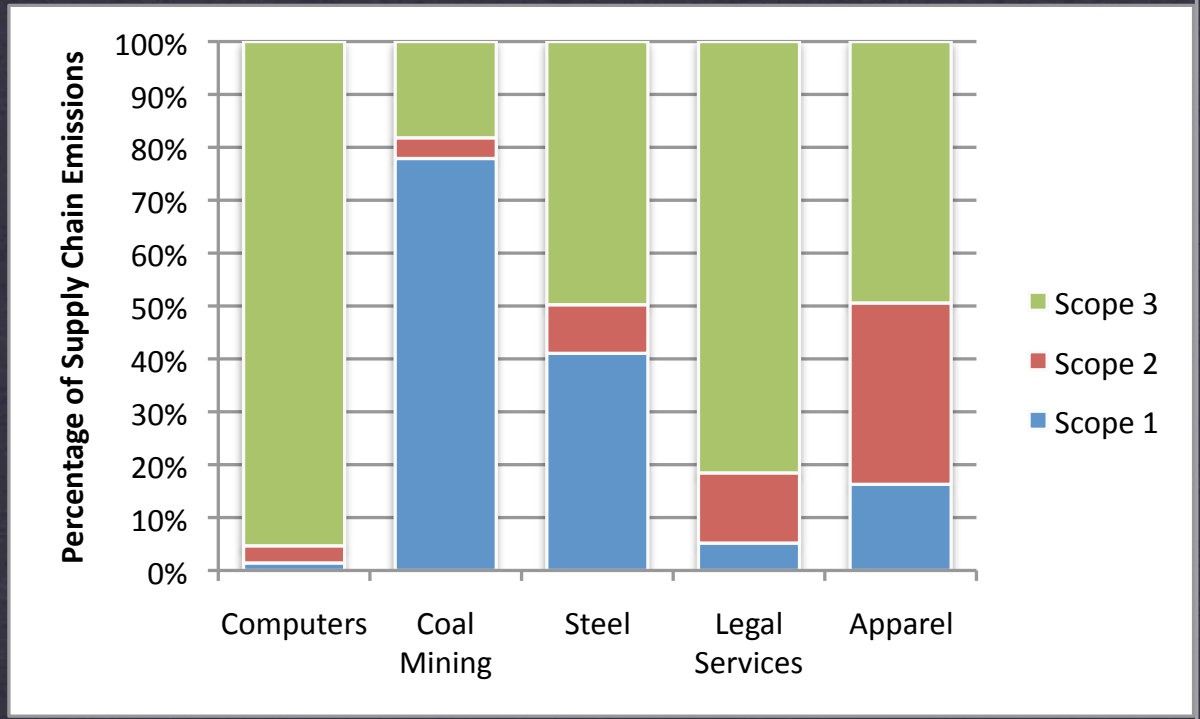
What's the Difference?

- Consumer Goods have large shares of emissions in supply chain
- "Footprint" can't adequately measure risk



Source: EIO-LCA model, http://www.eiolca.net

75% OF PRODUCTS HAVE MORE THAN 75% OF EMISSIONS IN SCOPE 3

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Life Cycle (supply chain) Approach

- **Two main schools: Top-down vs. Bottom-up**

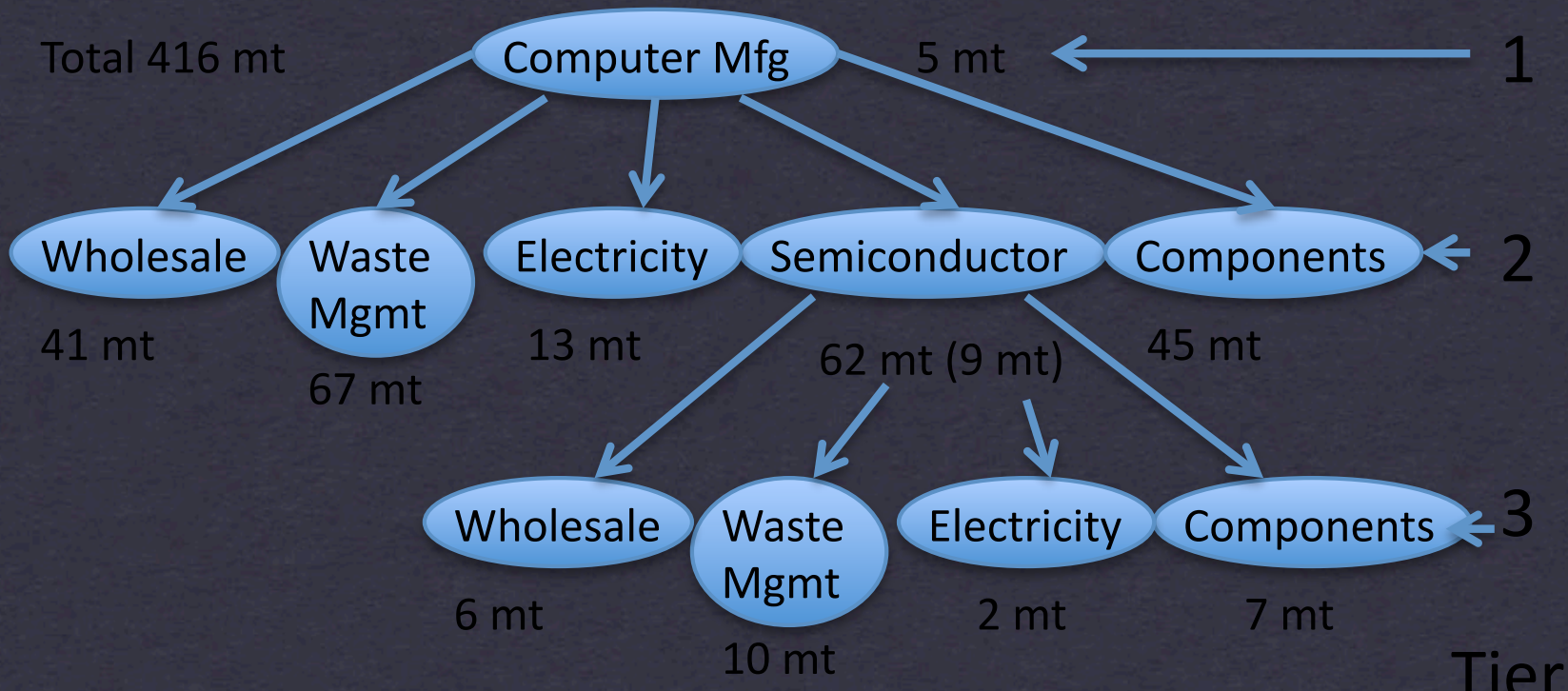
Method	Resources	Specificity	Completeness	Functional Unit
Process LCA	Substantial; data intensive	High; Product-specific	Cut-off Issues	Mass or product level (kg, units, etc)
EIO-LCA (top-down)	Relatively small	Low; Average Sector Production	Complete by definition	Economic Value ($, etc)

Economic Input-Output Life Cycle Assessment (EIO-LCA)

- Developed CMU 1995 - full supply chain
- Available on Internet (www.eiolca.net)
  - First free LCA tool, 1 million uses to date
  - Actively used by companies
- Data and model - continual development
  - Renewed interest - carbon management

EIO-LCA Sample Results

Model Capabilities: Supply Chain by purchase



- **Extracts entire supply chain and GHG emissions by production sector**

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Hybrid Assessment: Best of Both

- EIO-LCA fast and complete, but averaged
- Process LCA more exact but takes large amounts of $ and time
- Can combine best of both methods to achieve more exact but still complete assessments
- What data types are available?

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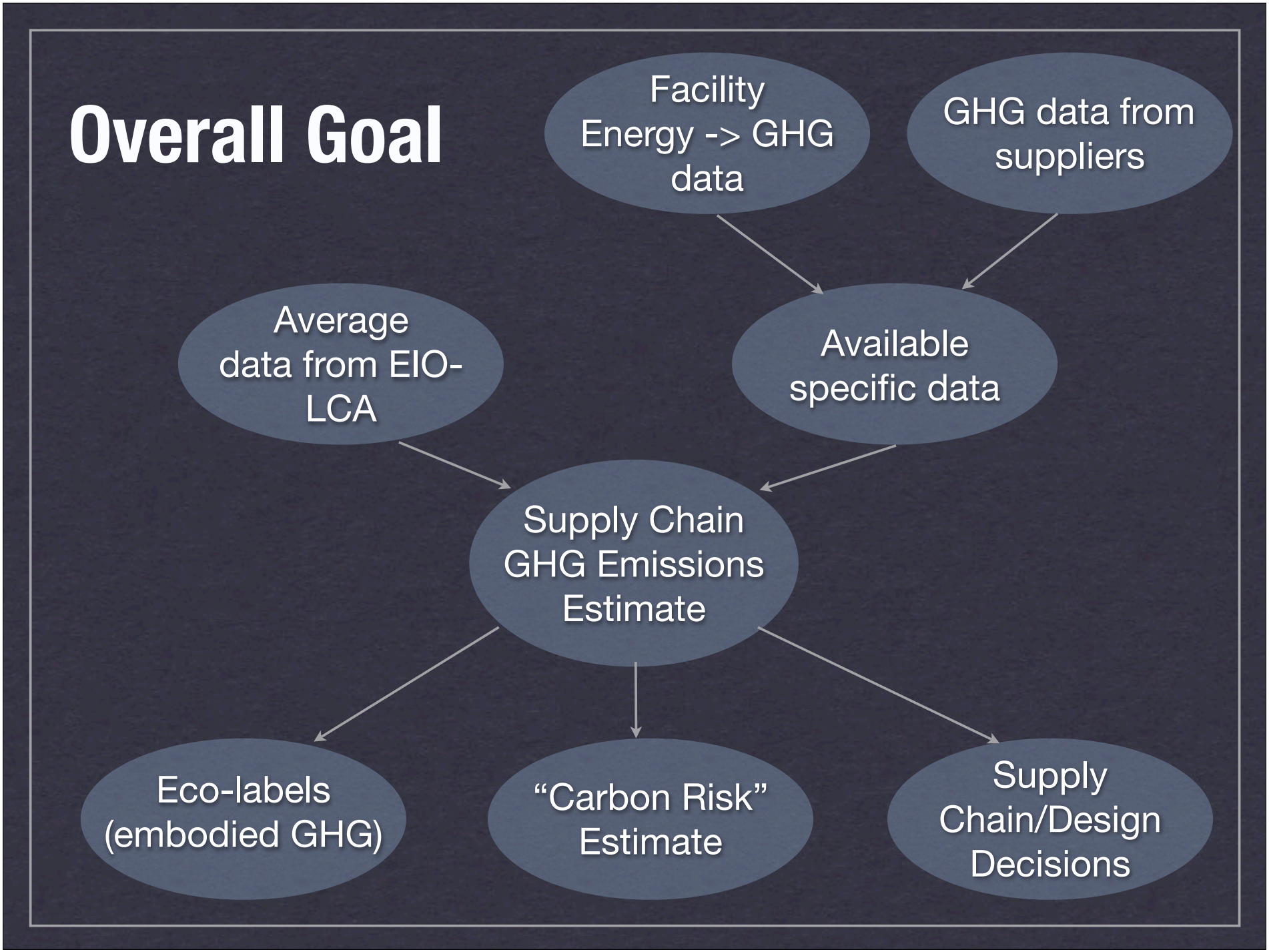
Data for Hybrid Assessment

- Emissions generally estimated from energy
  - Often this information in ERP systems

Name	Level of analysis	Units	Product or Facility
Primary Facility Level Data	Facility	CO_2e/yr	Facility-level or product-level
Secondary LCI data	Process or Product	CO_2e/kg (usually)	Product-level (usually)
Registry-type Data	Facility or group of facilities	CO_2e/yr	Facility-level
EIO-LCA (top-down)	Group of Industries	CO2e/$/yr	supply-chain of facilities

Overall Goal



Relevance of Uncertainty

- Allocation issues (facility vs. product)
- Determining necessary precision
- Linking uncertainty to results - visualization
  - Tools to identify most uncertain parts?
  - "Labels" ignoring uncertainty
    - Developing framework for IT industry

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Thank You

Questions?

hsm@cmu.edu

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