ÉCOLE POLYTECHNIQUE
FÉDÉRALE DE LAUSANNE

Life Cycle Analysis for Green Investment

Data quality, key impacts & benchmarking

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Outline

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From a quantitative perspective:

1. **What can be the use of & how to check Environmental Reports ?**
2. **How to assess the environmental impacts of companies ?**
3. **How to benchmark corporate environmental performances ?**

With examples from automotive & pharmaceuticals industries
(collaboration with Centre-Info)

“Mainstream” assessment: qualitative

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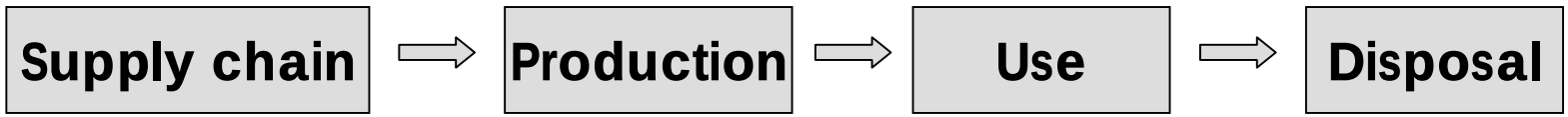
1. **Company’s environmental characteristics**
   - Large panel of heteroclite issues
   - Partial view
   - Focus on the company

2. **Selection procedure**
   - Based on exclusions & common sense

3. **Ranking**
   - Among companies of the same “investment sector”
   - Preferences rather than true performance

A life cycle perspective: key issues



=> a chain of actors/activities to deliver a service

- **Holistic**: direct + indirect (up & downstream)
- **Function:** equivalent services (vs same sector)
- **Aggregation:** impact assessment: reduction of indicators
- **Model + data:** bottom-up & top-down approaches + use of engineering & technical data

=> On the hedge of maturity: Increasing standardisation & development of databases

1. Quality of environmental reporting

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Coverage of Environmental Reporting (ER)

Environmental indicators in the automotive industry	Frequency (12)
Energy (GWh) & Water (m^3) consumption, Industrial waste (tons)	10-12
GHG & VOC emissions (tons), Common waste (tons), Discharges to water (m^3)	8 – 5
Environmental expenditures (Euro), NOx, C, PM (tons)	4 – 1

- **Geography** (1 site/area), **Turnover** (geog.), **Life Cycle** (on-site)
- **Energy:** Final vs grey (+30% per MJ)
  - Non renewable primary energy (hydro vs fossils fuels)
- **Green House Gases:** CO2 or CO2 equivalent?
- **Meta-data:** Units, structural issues

Validation techniques

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First attempts

- Evolution **over time:** structural changes (M&A) ?
- Comparisons within the **same inv. sector:** diversified activities?
  - Median value (1st est.)
  - Example: BMW 80% auto, 17% finance, 3% motorbike

LCA intelligence

- **References values per sector**
  - Data transformation
  - Basis for comparison (value-added, turnover, EBIT, employee, units produced)
- **Ratios: [CO_2/non renewable primary energy]**
  - Internal coherence

Basis for comparison (energy cons.)

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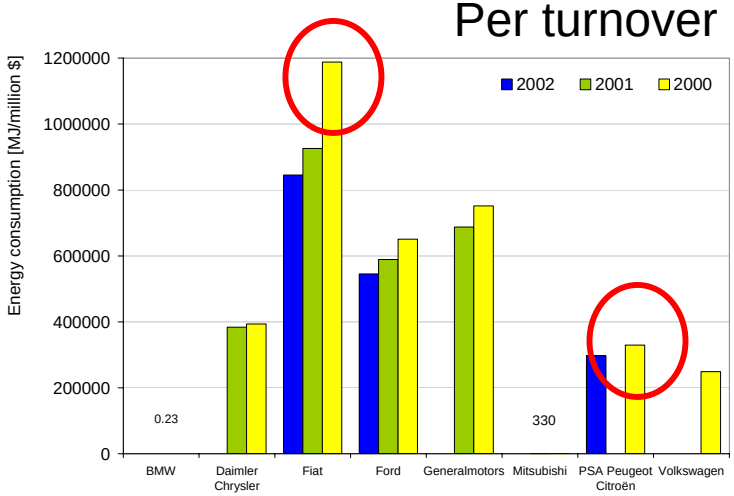
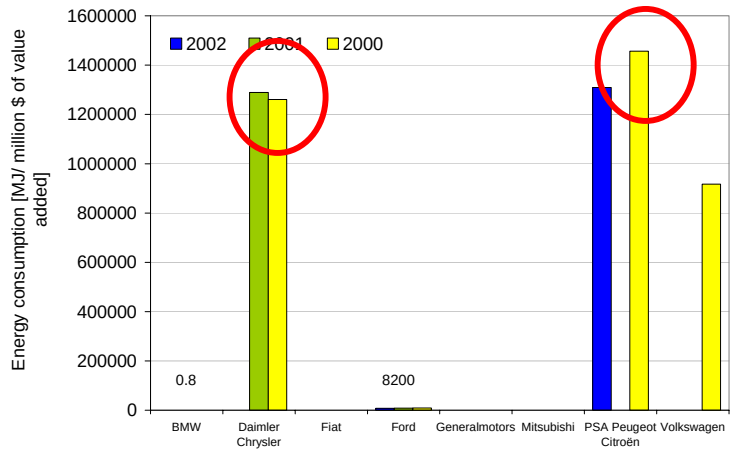
Automotive industry

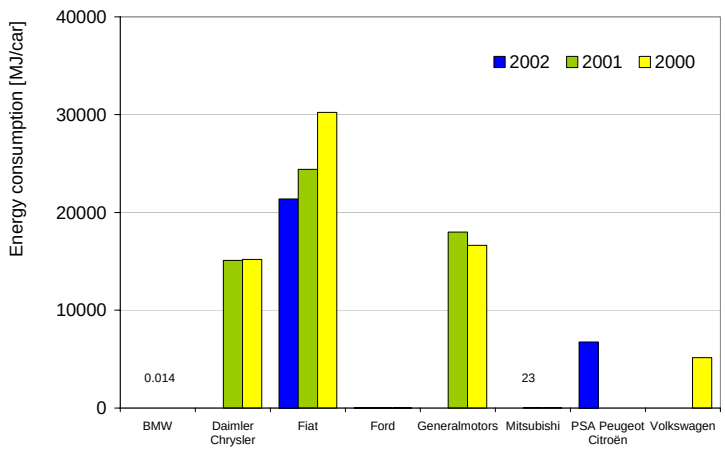
Per turnover



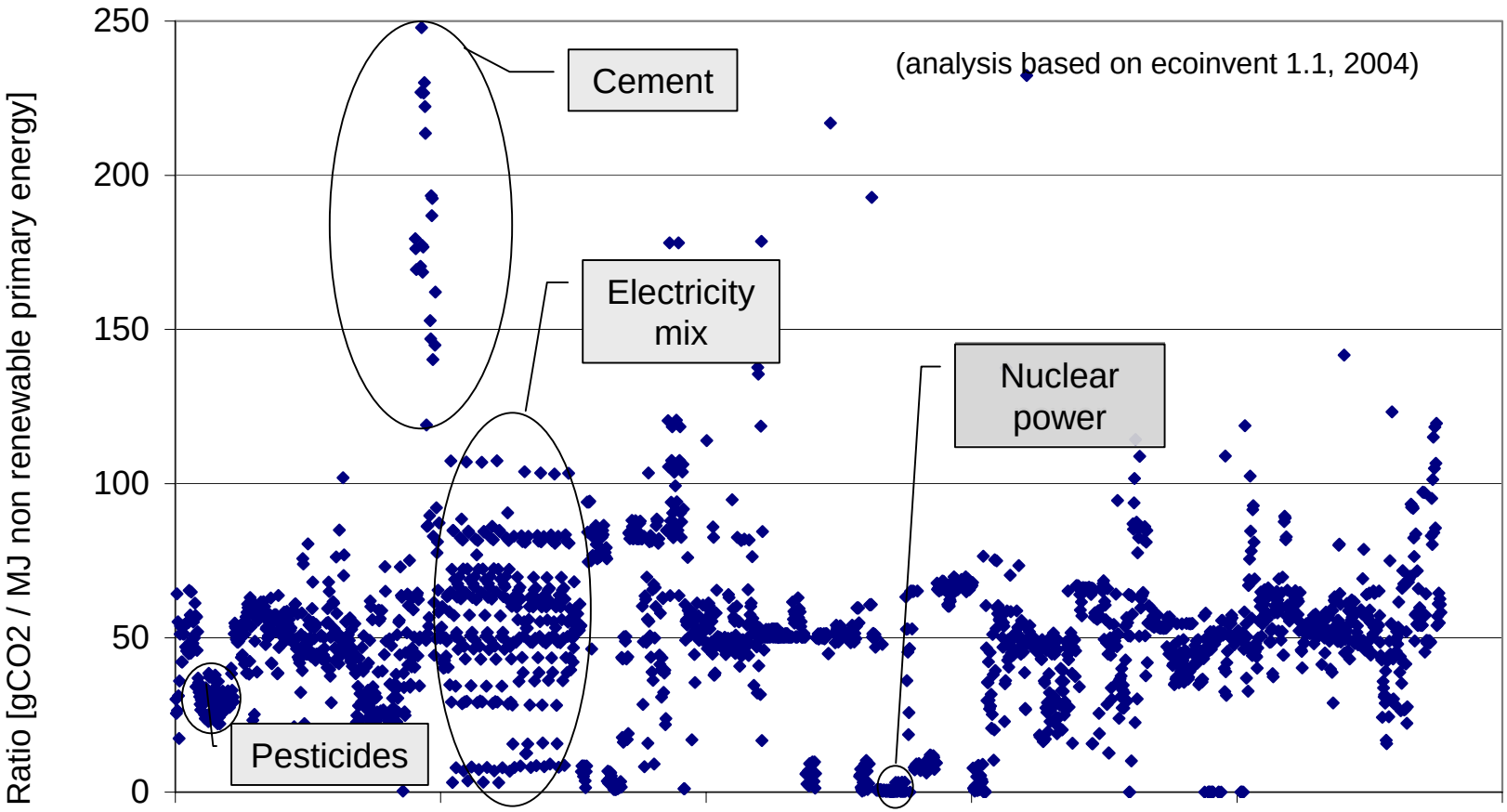
Per added value



Per unit produced (car)



Ratio [CO_2 /non ren. primary energy]



About 2500 products and services (use stage and disposal not taken into account)

Ratio [CO_2 (eq.) / final energy]

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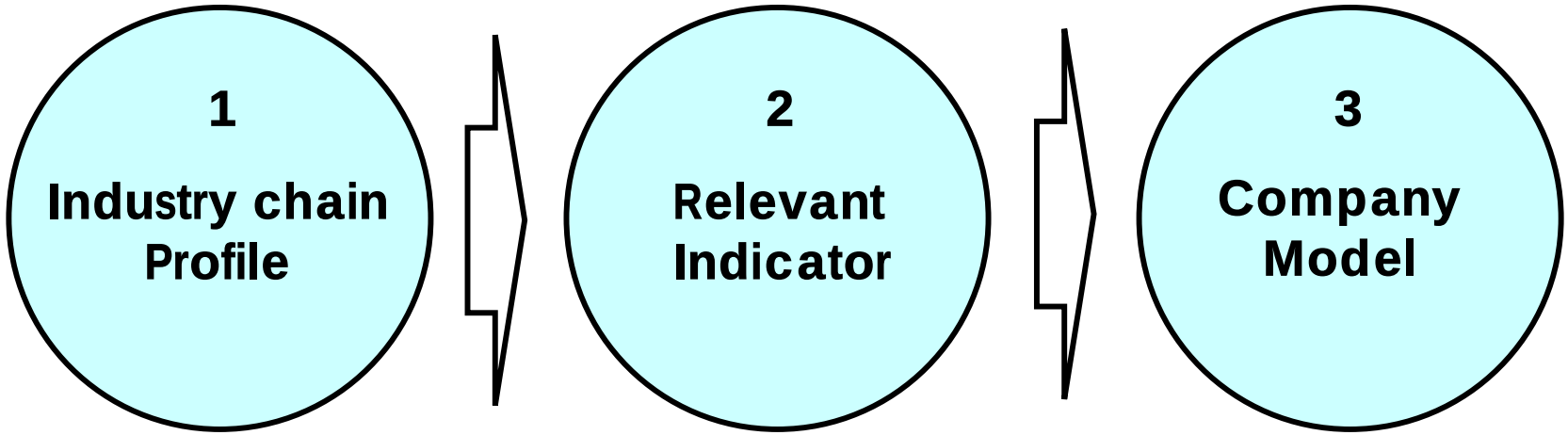
Banks	Ratio: GHG / final energy [gCO_2 / MJ]
ABN AMRO	56
Banca Monte Paschi Siena	141
Citigroup	115
Credit suisse group	141
HBOS	111241
KBC	48
Royal Bank of Scotland	87
San Paolo IMI	117
UBS	106
Westpac Banking	345

Automotive companies	Ratio: GHG / final energy [gCO_2 / MJ]
BMW	89
Daimler Chrysler	108
Ford	97212
Generalmotors	79
PSA Peugeot Citroën	35

<u>Expected values</u>: 30 – 150 gCO_2 (eq.) /MJ final energy

2. Identification of key impacts



-Hybrid Screening
- Process LCA
- Input-Output

- Reference
- Processes
- Sectors
- Product
- Company

- Function oriented

- Upstream: suppliers
- Prod: on-site
- Use: products
- Disp: products

- Reconstruction
- processes
- activities
- products

-Selection /Aggreg. of indicators

Synthesis: Life Cycle & impacts

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Pharmaceuticals

Ressources

Global Warming

Human health

Ecosystems quality

Key impacts Life cycle Key indicators

Impacts clés		Points clés pour l'impact environnemental						Indicateurs clés
		Transport des représentants		Packaging		Rejet de médicaments		
+: Influence faible ++: Influence moyen +++: Influence important Phase dans le cycle de vie		Distance	Type de transport	Composition de l'emballage	Masse de l'emballage	Quantité de médicaments relarguée dans l'environnement	Toxicité et écotoxicité du médicament	
Consommation de matières premières	Extraction des matières			+				kg substance extraite/emballage
	Chaîne des fournisseurs				+			kg d'emballage/kg substance active
	Production			+				
	Utilisation							
	Fin de vie			+				
Effet de serre	Extraction des matières			+				Taux de recyclage
	Chaîne des fournisseurs	++	++		+			Km parcourus MJ énergie primaire non-renouvelable ou/et émissions de CO2/100km
	Production			+				
	Utilisation							
	Fin de vie			+				
Santé humaine	Extraction des matières							
	Chaîne des fournisseurs							
	Production							
	Utilisation						++	
	Fin de vie					+++	+++	kg substance relarguée/kg produit[1] EC50 substance
Qualité des écosystèmes	Extraction des matières							
	Chaîne des fournisseurs							
	Production							
	Utilisation							
	Fin de vie					+++	+++	kg substance relarguée/kg produit[1] EC50 substance
Indicateurs clés								

- **Main impacts: Human health & ecosystem quality**
- **Travel of sales people is dominant**

Env. impacts from economic data

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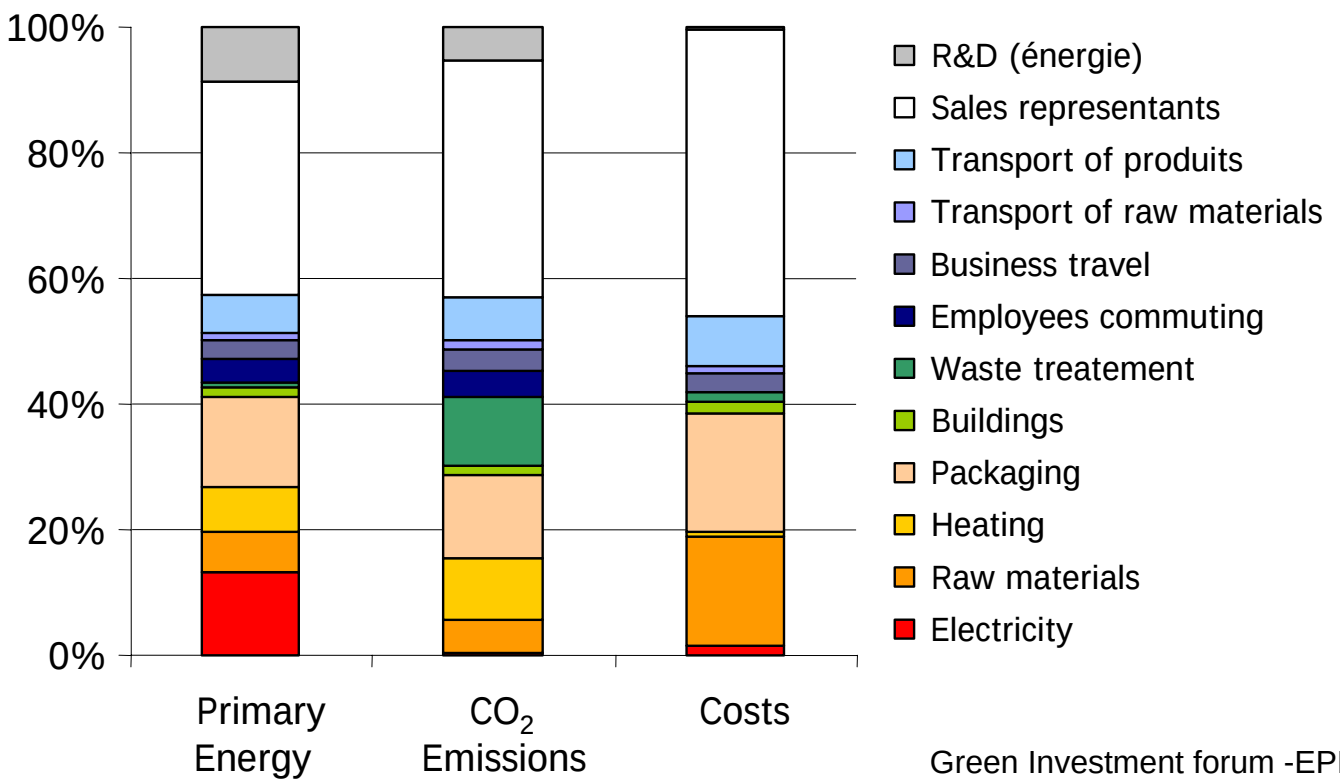
Econ. & technical data
Purchases, on-site, sales, products

+

LCA data
LCI DB, LCIA methods

Pharmaceuticals: Energy balance & costs (Green-e)



Data comparison: automotive ind.

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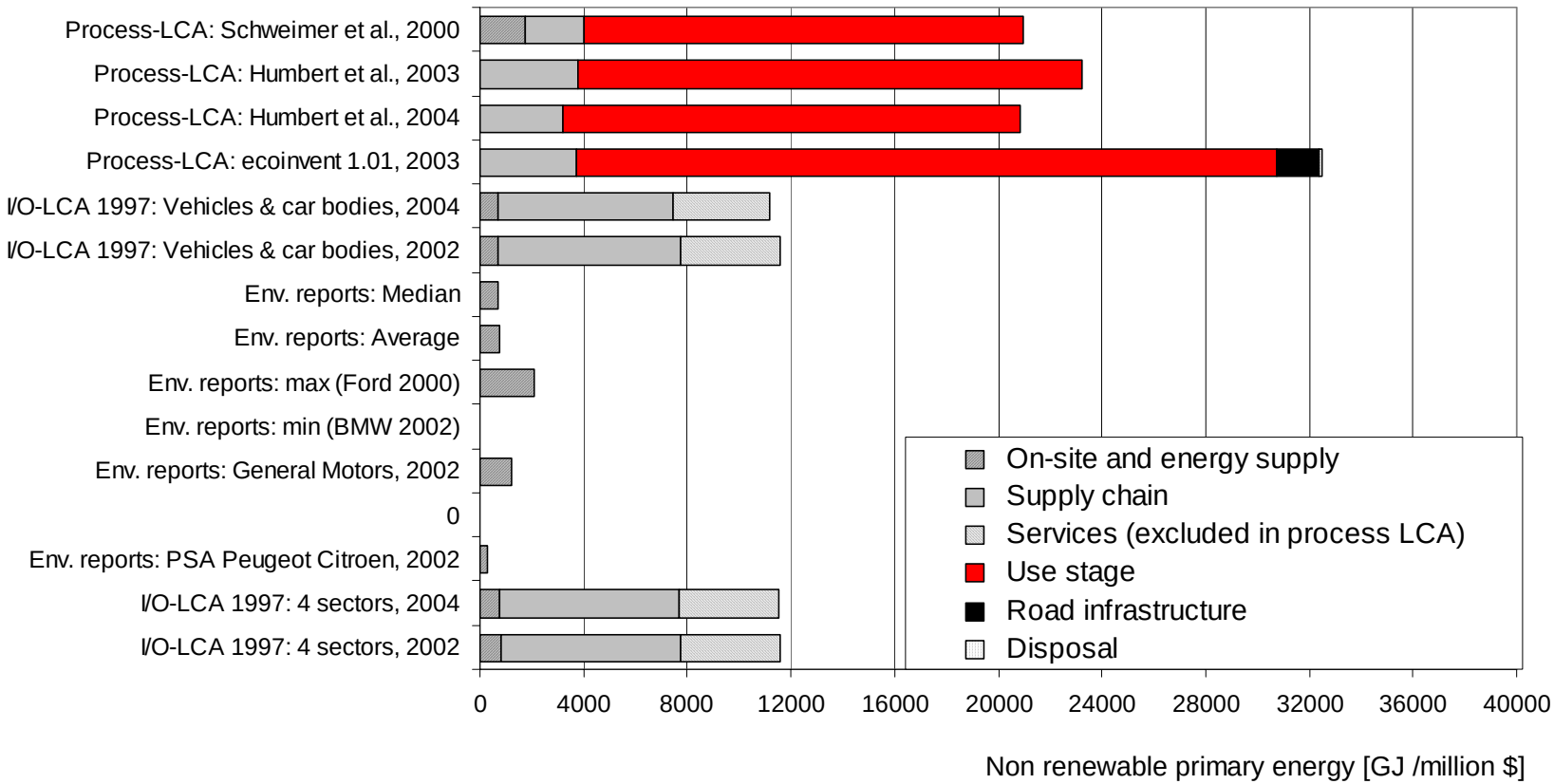
Energy consumption due to 1 million $ output of the automotive industry



Hypothesis: 1.59 passenger/vehicle, 150000 km/vehicle, ~21'000 $/vehicle

Energy efficiency: USA / Average of industrial countries = 360/238 = 1.5

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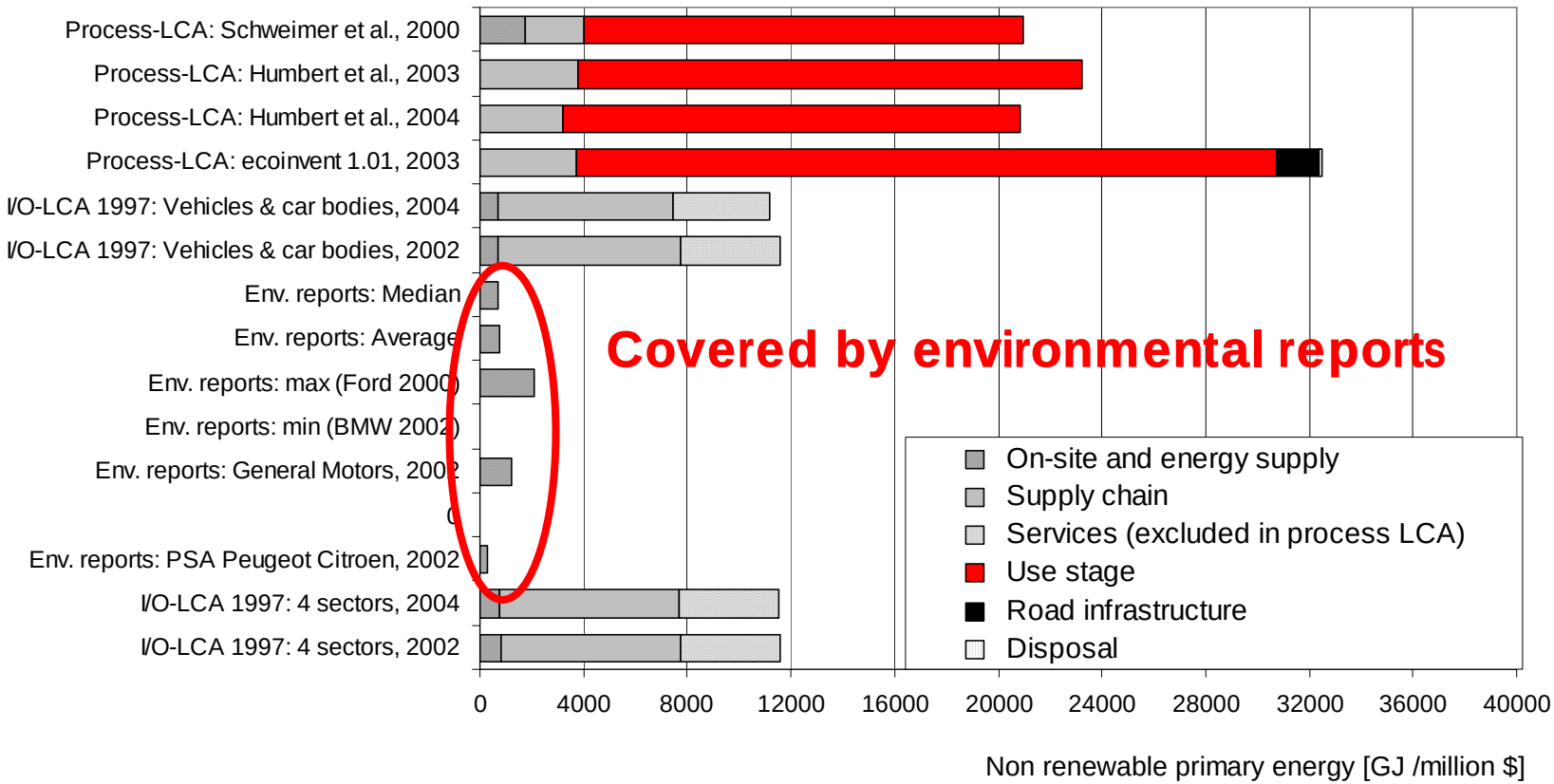

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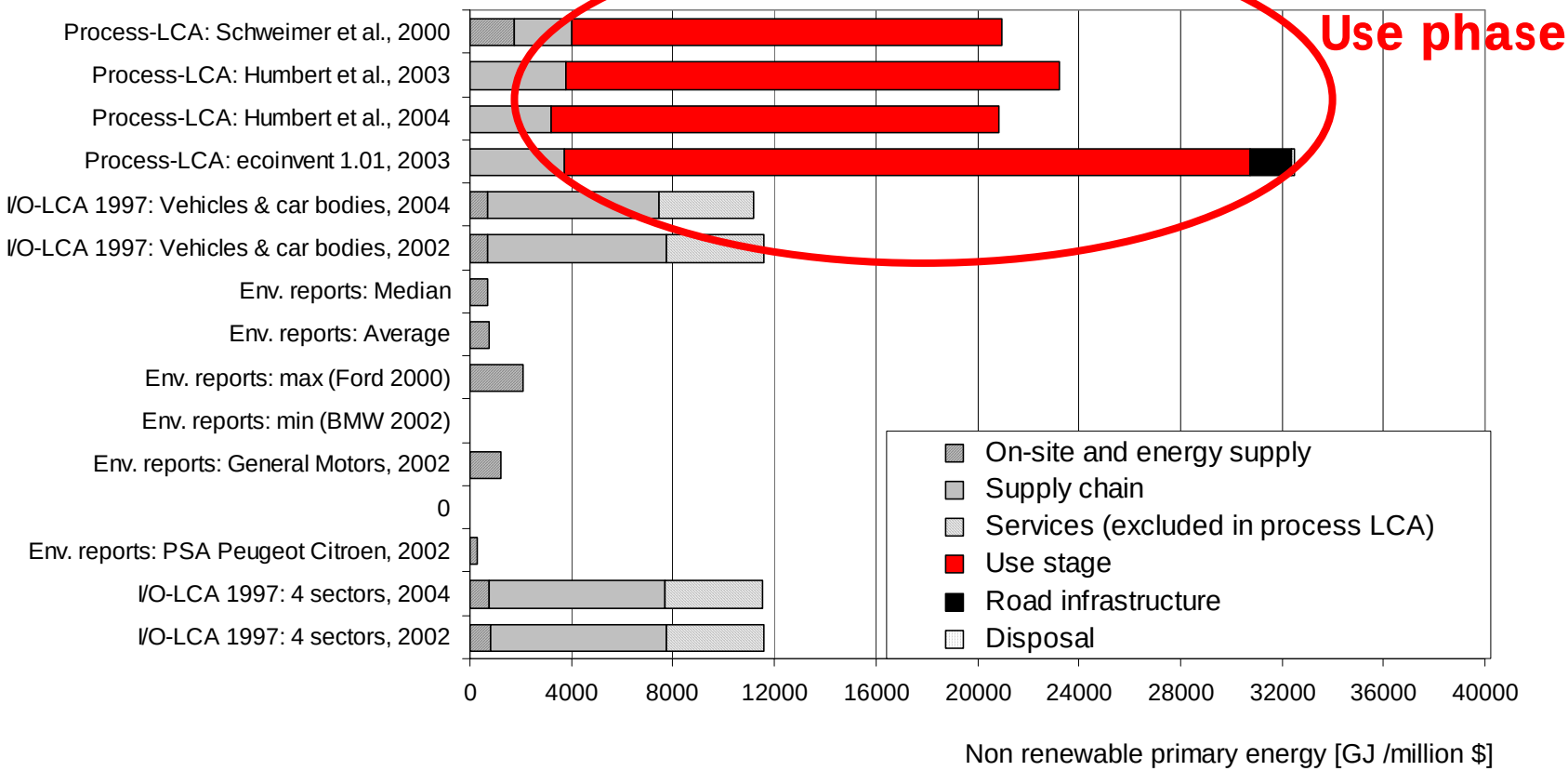

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3. Benchmarking for the use phase

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Automotive industry

"Average emissions of a generic car per company [gCO_2/km]"

Technology Eff. **vs** **Marketing Strategy**

Required data:

1. CO_2 emissions per vehicle
2. Composition of the car fleet of each company
3. Sales per vehicle

Partial results: different rankings

	gCO_2/km	Energy-Label (class A, B, …)	Ranking based on env. reports	Ranking Sam and WRI
FIAT	160	2	5	?
VW	176	1	2	6
TOYOTA	179	4	3	1
DC	209	3	4	5
BMW	212	5	1	8
Life cycle stage:	Use	Use	Production	Use

- The ranking based on the use phase: opposite to the ranking established with data from environmental reports
- Evaluations with high quality expectations are time intensive

Conclusion

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- **Low reliability of current corporate environmental data**
  - Incomplete **coverage**
  - No focus on **key impacts & key phase**

  => **Monitoring** of companies effort/compliance

  => Low comparability: **No benchmarking**

- Life-cycle data for **Identification** of key impacts & **aggregation**
  - Multiple approaches are required

- **Benchmarking**: **complement** a qualitative approach
  - Open questions:
    - Relative vs absolute
    - Sum of activities or average/optimal profile