Life Cycle Management in the Aluminum Industry

Implementation of LCA for Internal Applications

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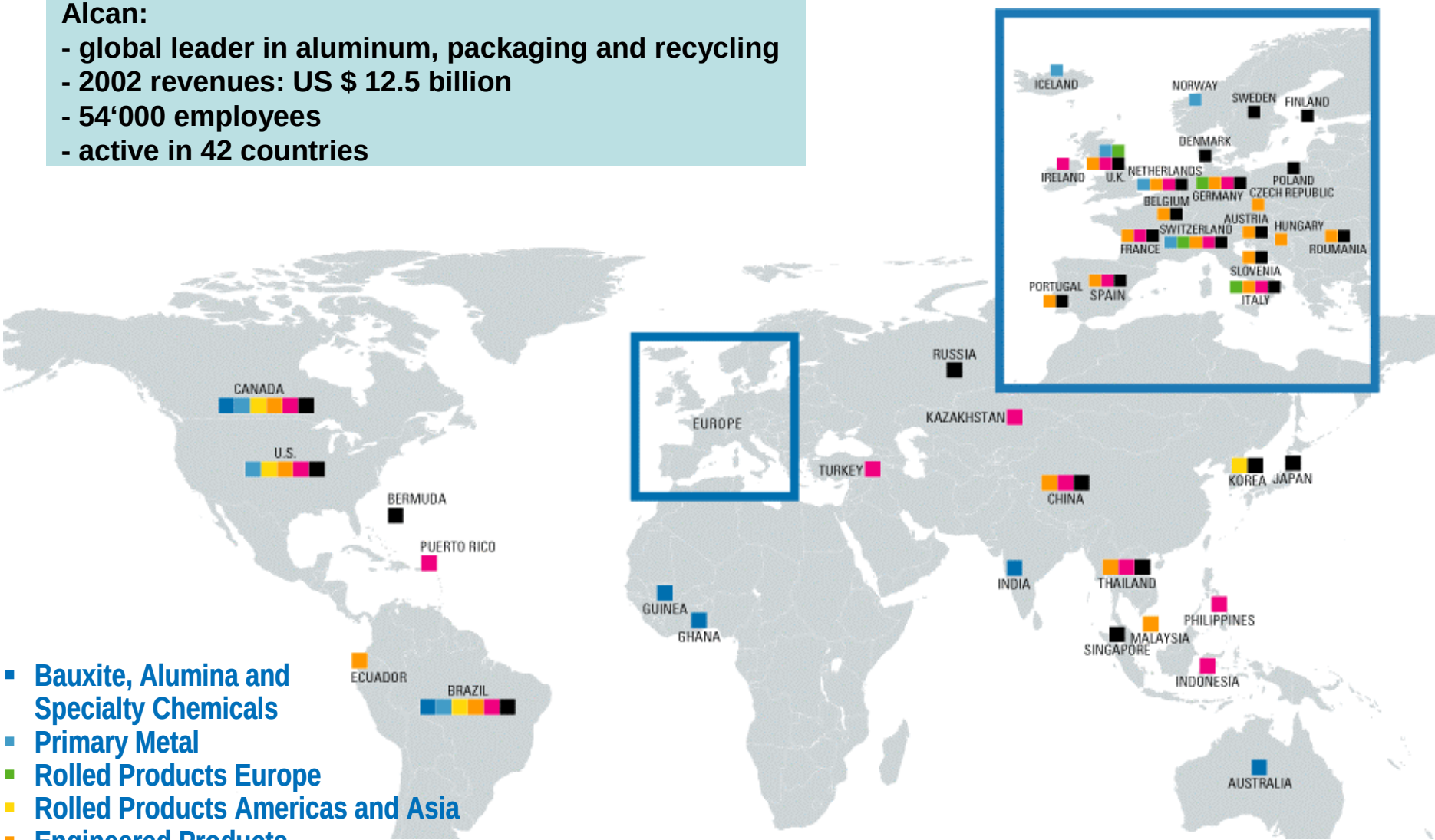
Alcan: Overview

Alcan:
- global leader in aluminum, packaging and recycling
- 2002 revenues: US $ 12.5 billion
- 54‘000 employees
- active in 42 countries



- Bauxite, Alumina and Specialty Chemicals
- Primary Metal
- Rolled Products Europe
- Rolled Products Americas and Asia
- Engineered Products
- Packaging
- Corporate/Other Offices

Alcan: Products

- Bauxite mining, alumina refining, and aluminum smelting
- Semi-finished products (aluminum, plastics, and composites) as well as components for
  - light-weight vehicles
  - building and construction
  - beverage cans and rigid containers
- Leading supplier of packaging material

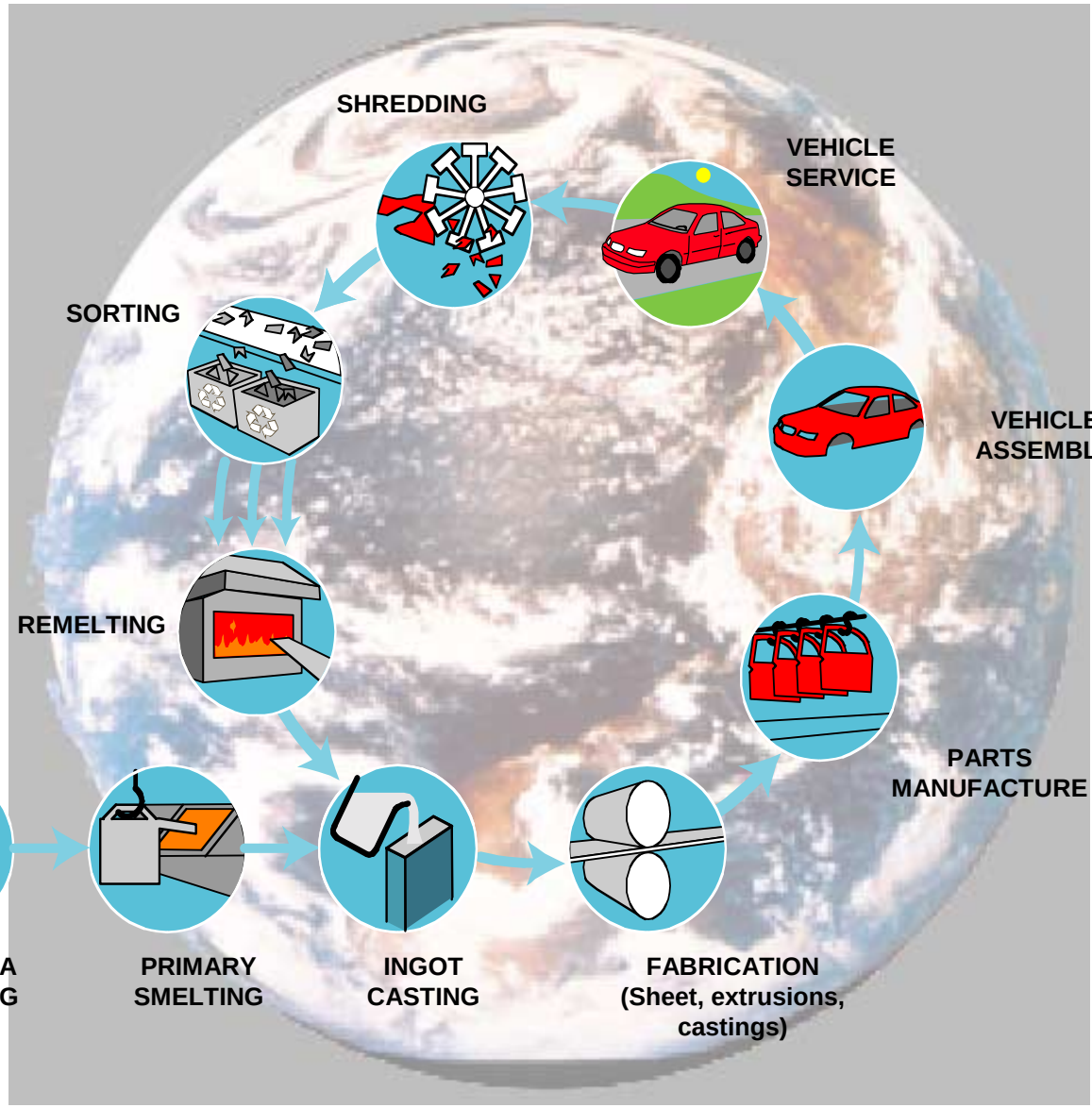
Product Stewardship and LCM

- **Product Stewardship (PS) is understood as management of the sustainability aspects of products throughout their life cycles**
  - **Environmental aspects → also relevant for ISO 14001**
    Including LCA as essential element!
  - **Social issues, including health and safety**
  - **Economic aspects → life cycle costing**

- **Product Stewardship – covers LCM, maybe widely equivalent terminology?**

The Life Cycle Perspective

Example of automobile



LCA within PS at Alcan

1 Product related issues in the context of environmental management systems

How to improve the environmental performance of Alcan products (including DfE)

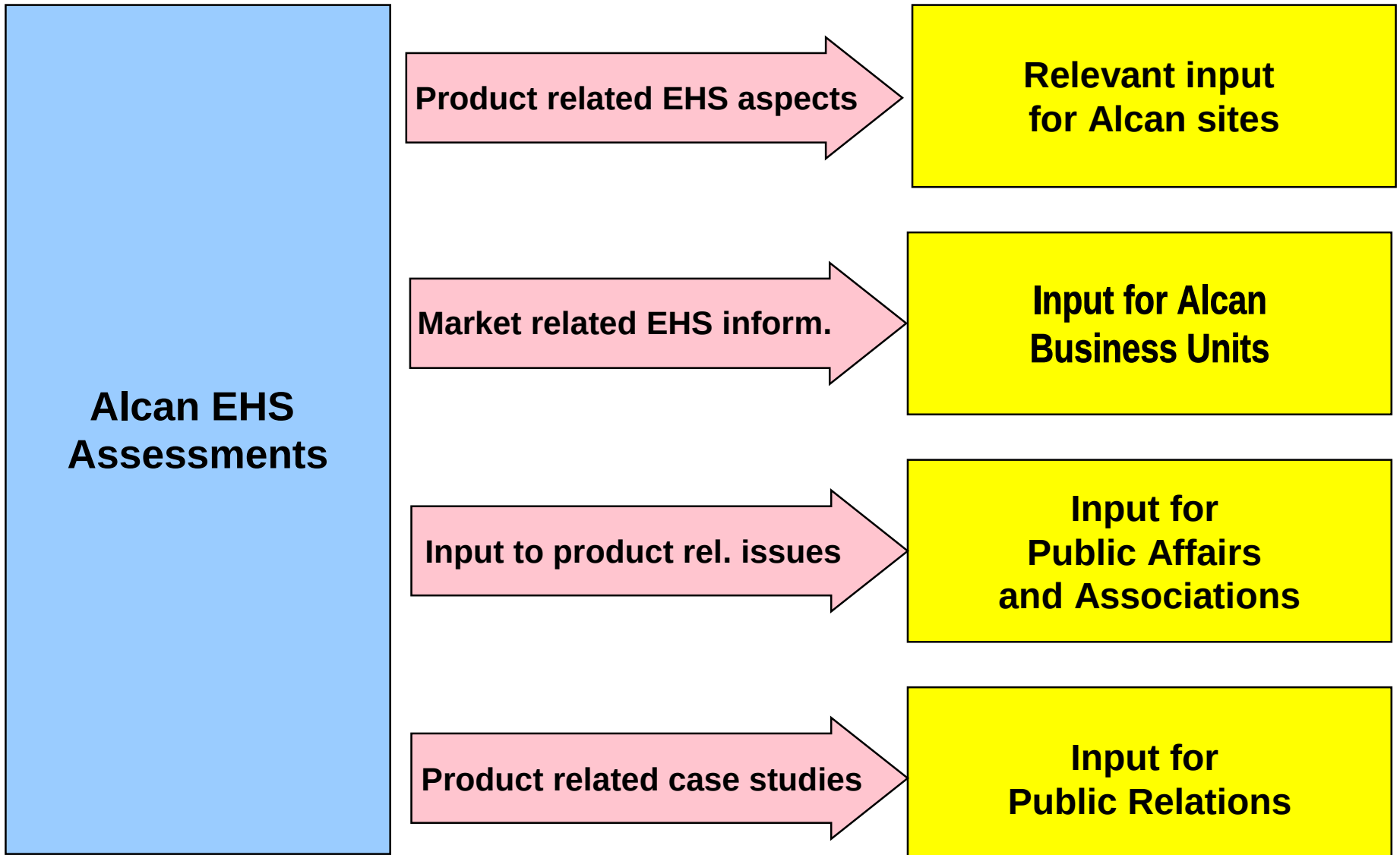
2 Basis for life cycle costing (LCC)

Efficient use of LCI data for internal cost estimations

3 Marketing/Communication

Comparison to competing materials/products; benchmarking

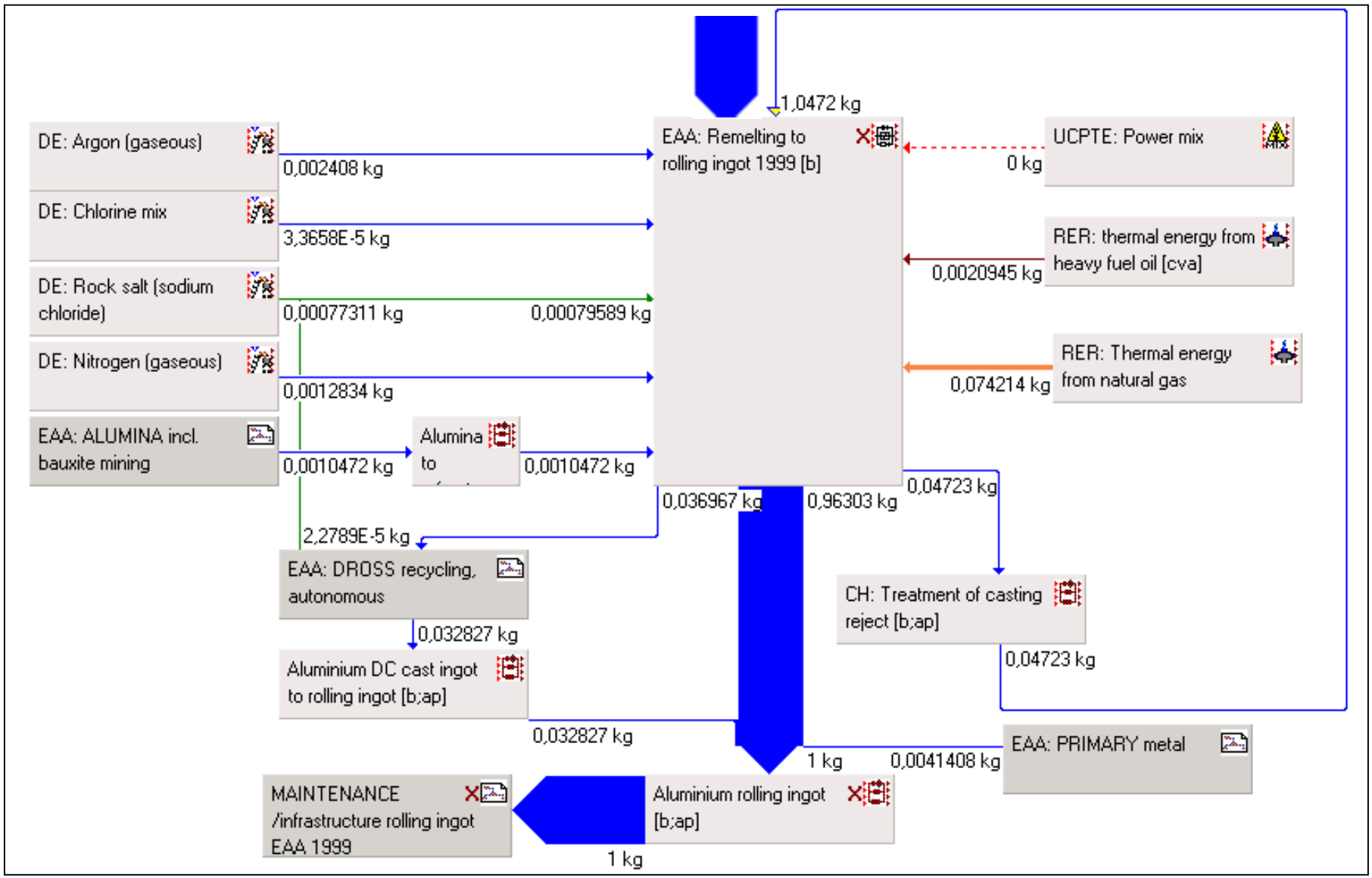
EHS (PS) Assessments of Products



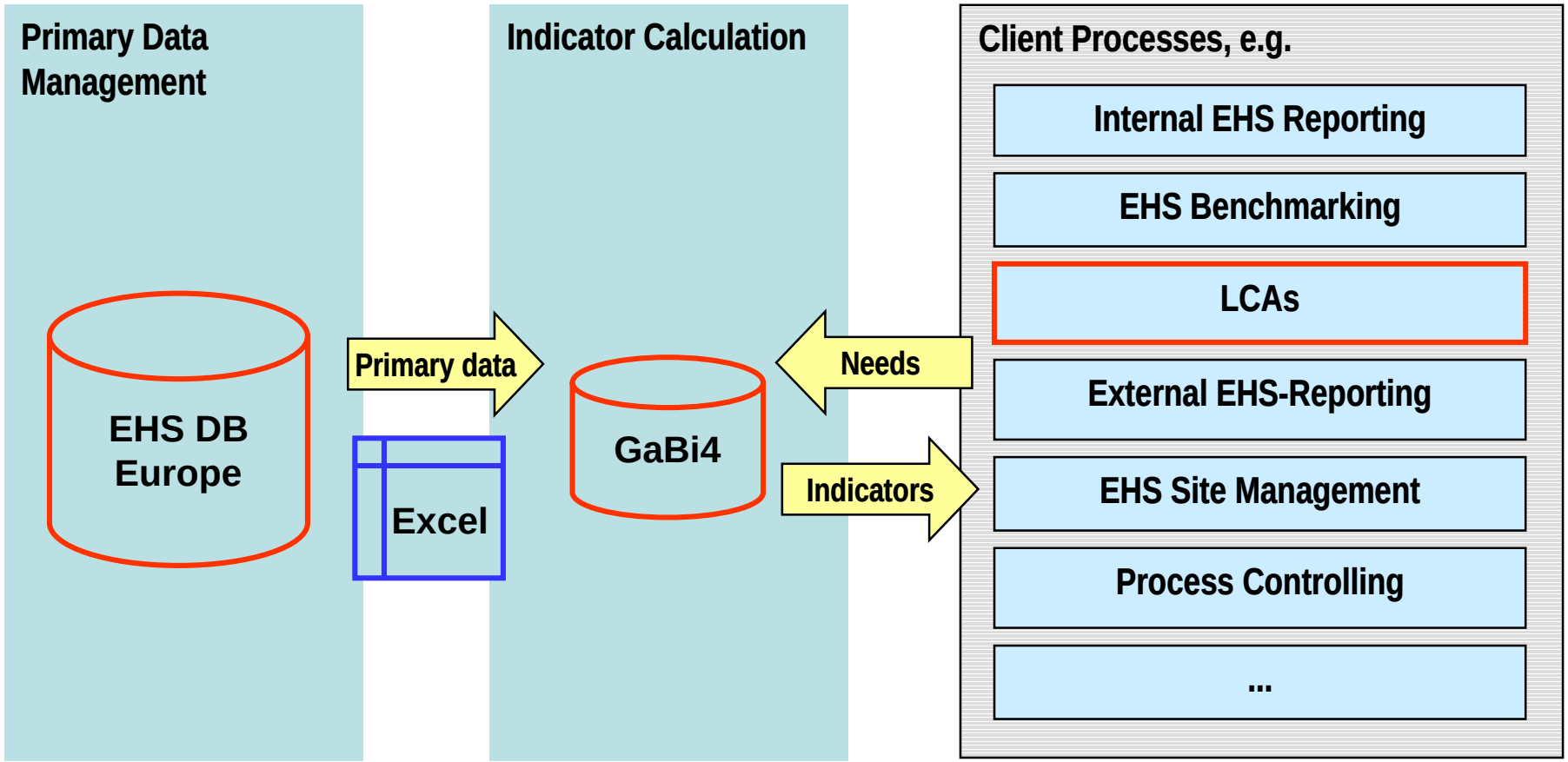
Simplified LCA Implementation

- Rough data collection via EHS-DB
- Independent LCI data modules via Gabi SW
- Calculation and presentation of 4 indicators
  - Primary energy
  - Global Warming
  - Ecoindicator (w/o energy and global warming)
  - Waste
- Analysis of results and iterative refining, where necessary

Independent LCI Data Modules



Organization & IT-Implementation



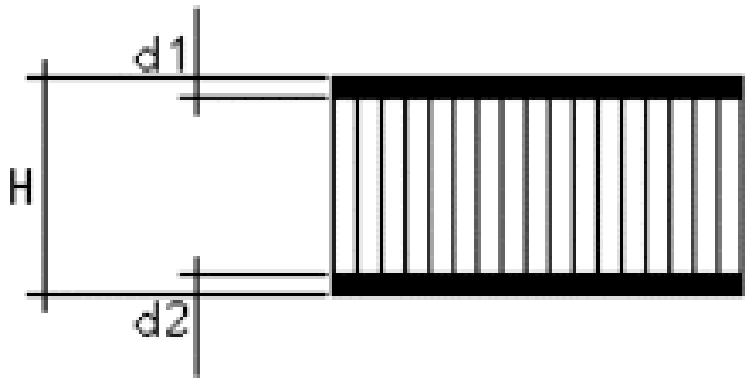
- Primary environmental data from one source used for all applications
- Double inventories and inconsistencies are avoided

Exploitation of Modular LCAs

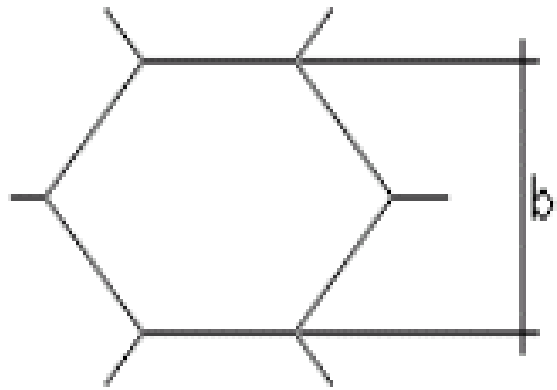
- Valid for specified product groups
- Usable for
  - Integrated management systems of sites
  - Sustainability and other reporting
  - Public relations
- Living documents/modules
  → easy updates and adaptations

Modular LCA for Alucore®

Panel



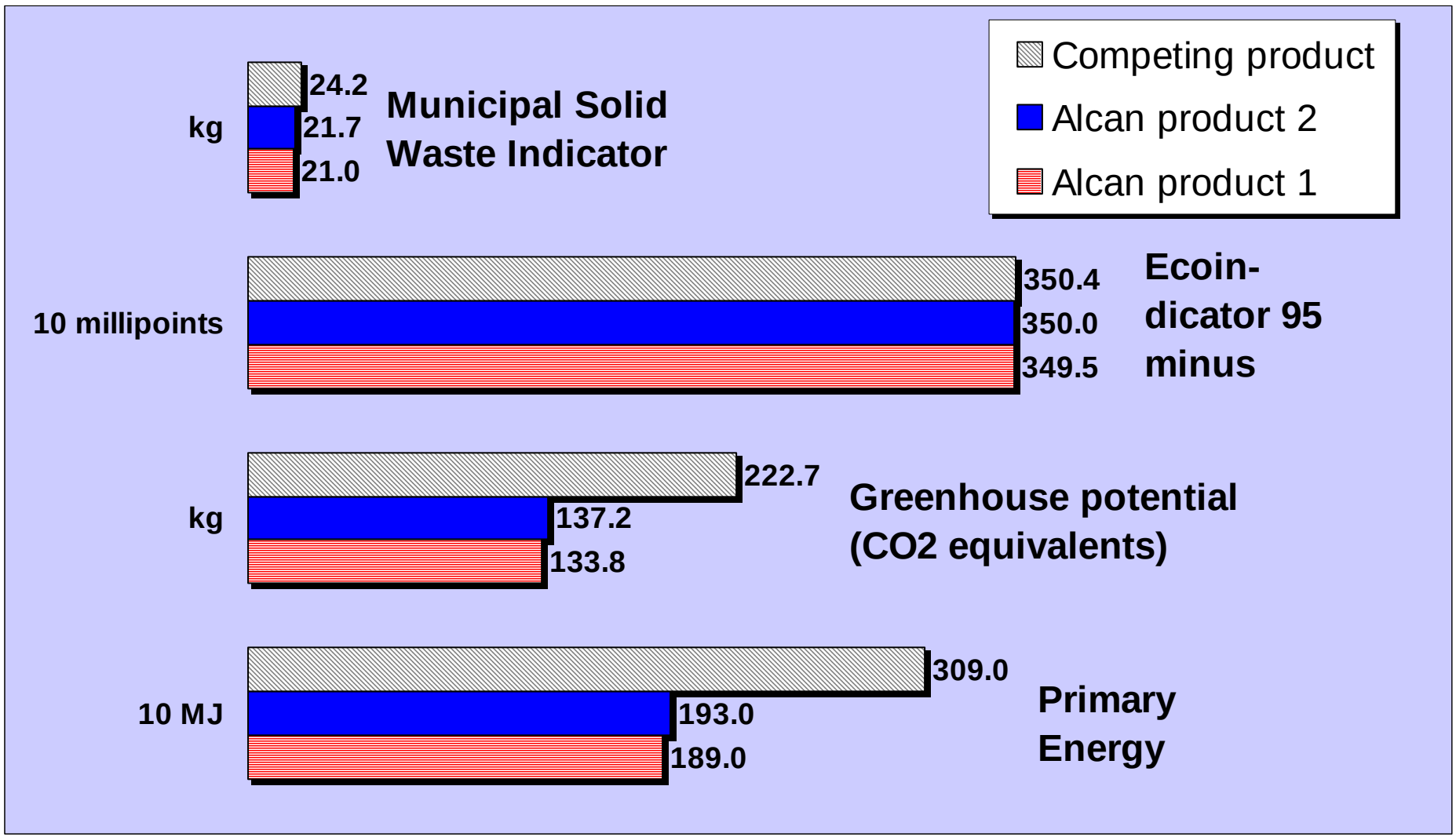
Core



H:	Total thickness
d1:	Al-Cover sheet (Front side)
d2:	Al-Cover sheet (Reverse side)
b:	Core size

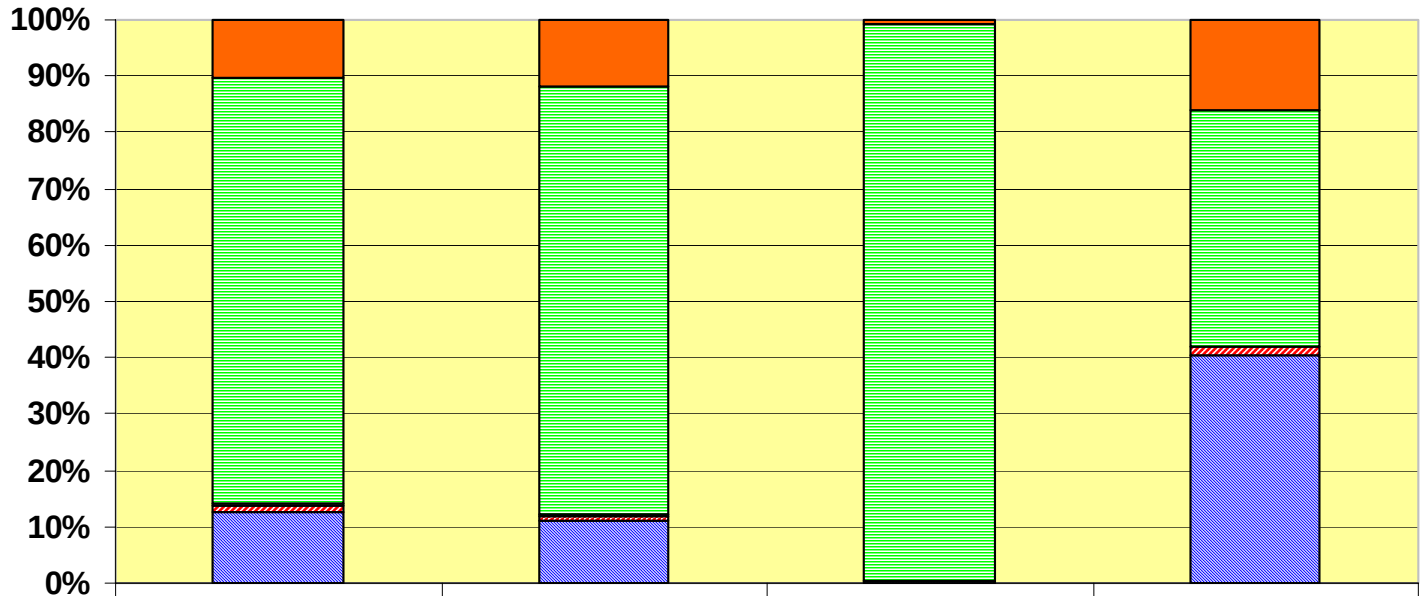
Example from Transport Sector

Passenger automobile component with Alucore®



Internal Analysis of Alcan Products

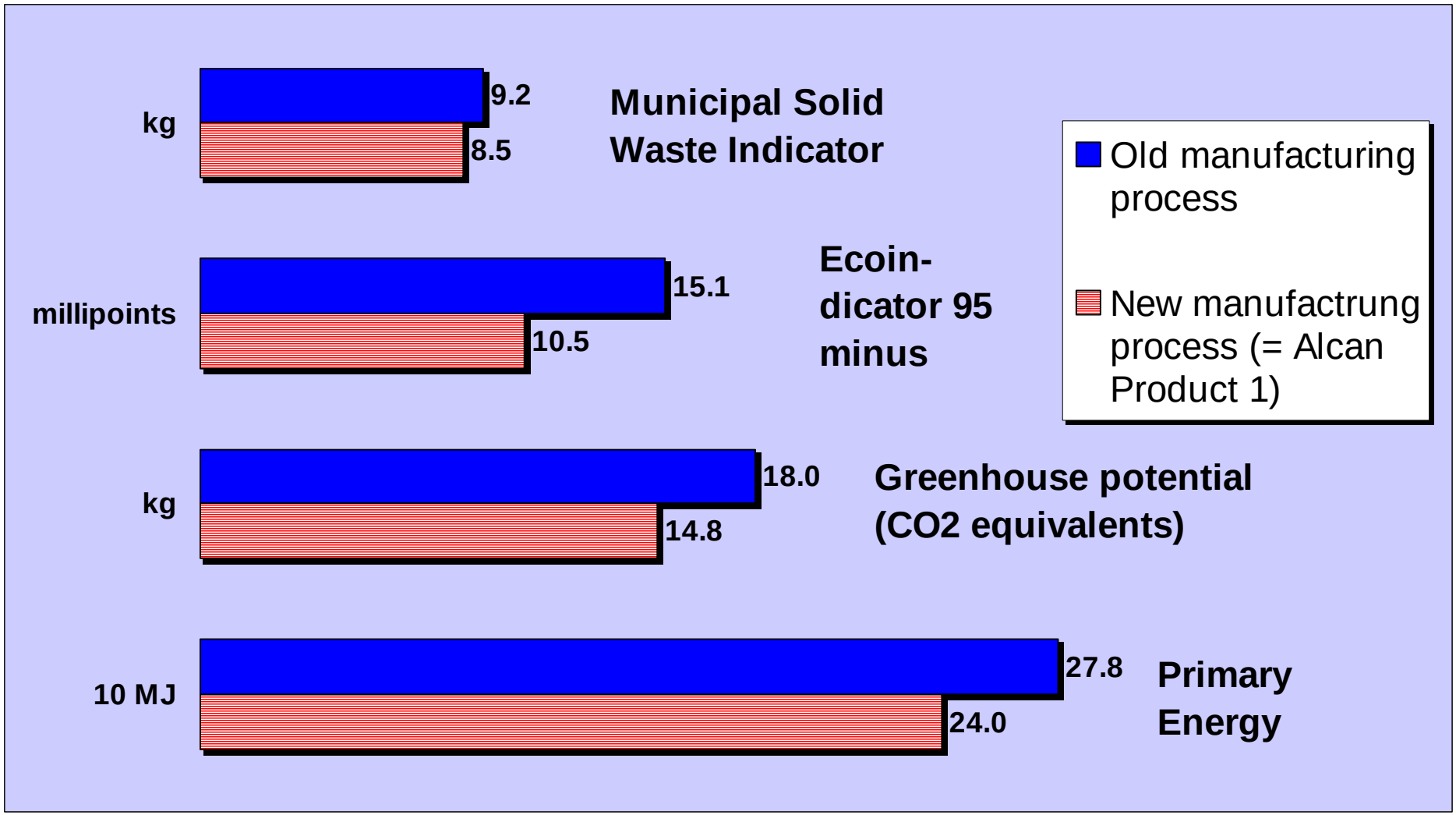
Passenger automobile component: Alcan product 1



	MJ Primary energy	kg Green-house potential (CO2 equiv)	millipoints EcoIndicator minus	kg Municipal waste-indicator
EOL Recycling	196.1	15.9	21.6	3.4
Use	1424.8	101.5	3461.0	8.8
Transports	8.3	0.6	0.8	0.1
Finishing	20.0	1.0	1.1	0.3
Fabrication	240.3	14.8	10.5	8.5

Improvement in Fabrication Phase

Improvement in manufacturing process for automobile component



Social Aspects & Economic Considerations

Product Safety Aspects

- Example West Germany: percentage injuries/fatalities of persons which were involved in an accident
  - 1980: 17 %
  - 1998: 11 %

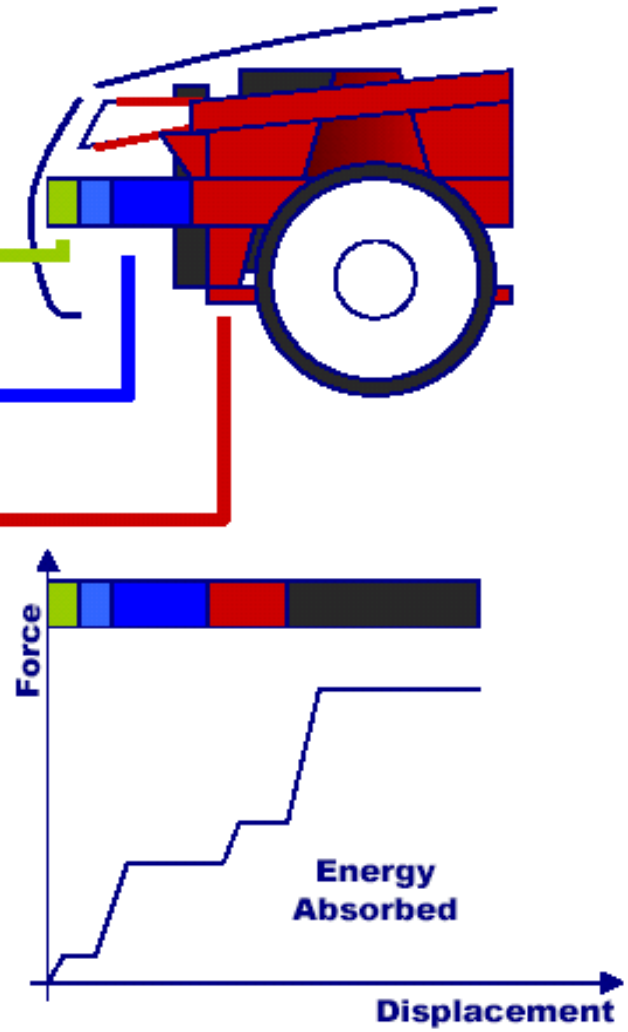
If this percentage had remained at 17 %

this would have caused additional 25‘000 injuries/fatalities annually

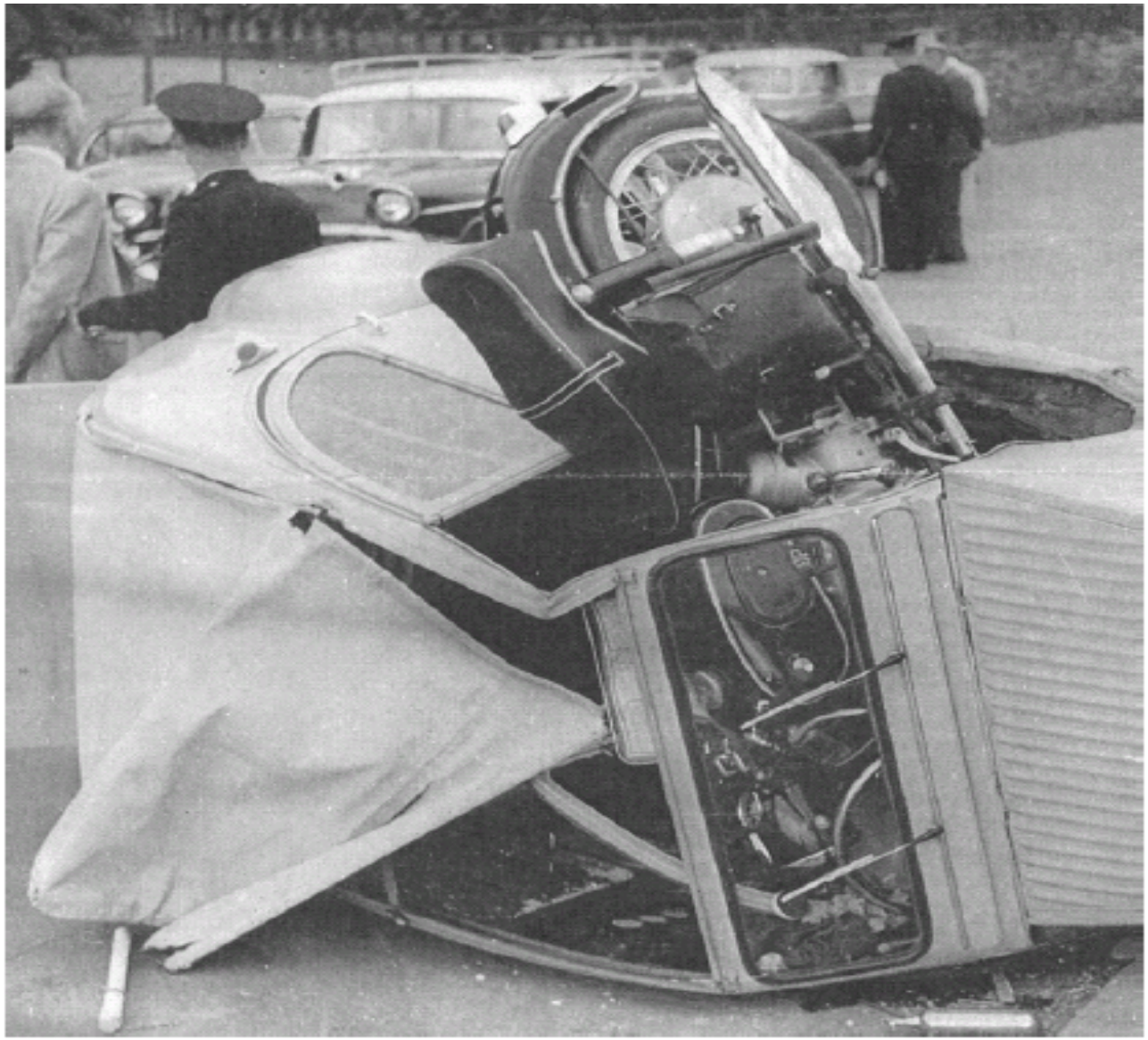
Performance in a Crash Situation

Crash Management

- Considerations at different speeds;
  - Low Speed; Prevent Damage of Car
  - Medium Speed; Minimize Damage of Car
  - High Speed; Protect Occupants



Side Impacts



Aluminum in a Car too Expensive?

		Aluminium	Steel
Reference masses	kg	300	500
Metal price	US$ per 100 kg	130	40
Scrap value (80 % recycling rate)	US$ per 100 kg	50	15
Net materials cost	US$ per 100 kg	80	25
Total material costs	US $	240	125
Additional gasoline consumption	litres		2000
additional gasoline costs (w/o taxes)	US $		600
Total life cycle costs	US $	240	725

(cost estimates excluding interests and taxes)

Gasoline savings over the life cycle are higher than raw material value difference

Economic Aspects - Statements

- Life cycle costing not (yet) sufficiently considered by customers
- Many aluminum parts are already the most economical solution (w/o use and EOL costs)
- Real price difference between aluminum and other materials depends on position on the learning curve
- Aluminum industry should invest more into R&D - for future generations

Conclusions and Outlook

- Alcan‘s product stewardship program enables efficient implementation of LCA
- Data and results can be used for product assessments as well as ISO 14001 activities
- LCA can be implemented on a transparent basis, suitable for operational as well as strategic decision-making
- Planned to cover all product groups of Alcan
- Social & economic aspects are more and more included