LCI-Quality - A challenge for mineral and metal resource companies

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Content

- BHP Billiton - The company
- LCA studies undertaken
  - Steel
  - Education
  - Olympics 2000
  - Nickel
- Our LCA approach
- Problems and advantages
- Conclusions

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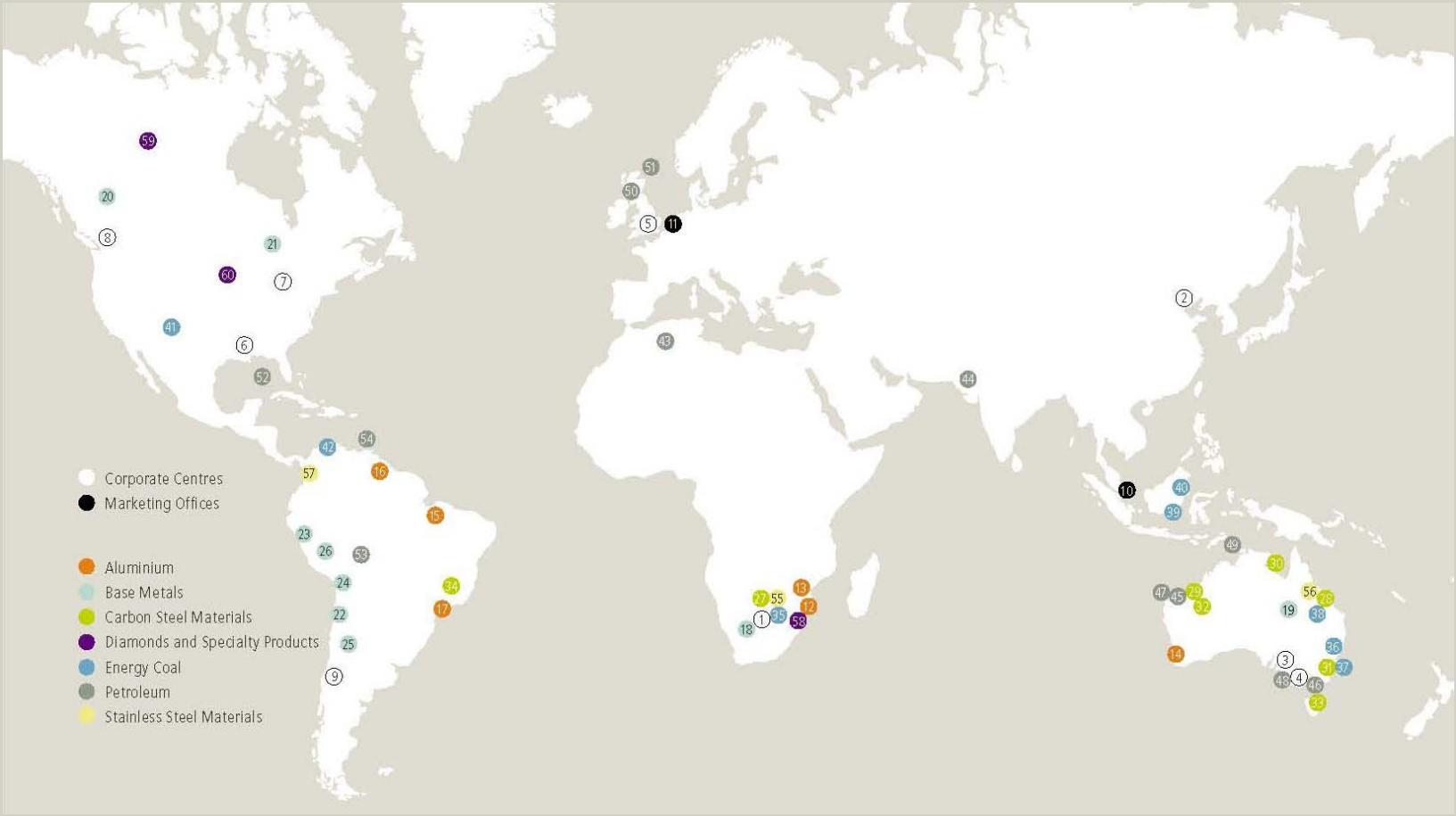
BHP Billiton (BHPB)

- BHPB is the world's largest diversified resources group, with commodity assets in aluminium, energy & metallurgical coal, copper, ferro-alloys, iron ore, titanium minerals, oil, gas, liquefied natural gas, nickel, diamonds and silver
- Created by merger of BHP (Australia) & Billiton (RSA) in June 2001
- 35,000 employees, > 100 operations in approximately 20 countries
- 2003 performance:
  - Turnover: 17.5 billion US$
  - Earnings before interest and tax (EBIT): 3.5 billion US$
  - Operating cash flow after interest and tax: 3.6 billion US$
  - Market capitalisation (as at 26 August 2003): 41.2 billion US$
  - Rank on Forbes' 2003 *Global 2000* list: 133

BHP Billiton – Global operations



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BHP Billiton LCA studies

1993

1. Steel in construction *
2. International Iron and Steel Institute
3. Education *
4. Sydney Olympics 2000 *

1999

5. Environment Australia - Waste oil reuse/recycling
6. NSW Department of Energy - Large scale use of renewables (SERDF)
7. Process improvement targeting
   - Value adding slags, gangues and tailings
8. Environmental credentials of coal
9. Energy technologies
10. Environmental credentials of nickel *
11. Role of coal in future energy systems (CCSD/COAL21)

2004

12. Iron ore

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Initial use of LCA

- Information management
- In-house reporting, and reporting to legislators
- Environmental management system
- Marketing
- Product and process support
- Environmental impact of alternatives
- Impacts of product improvements
- Information to customers, designers
- Process improvement targeting
- Evaluation of new technologies

Education

- LCA-type tools can assist in:
  - Educating the customer,
  - Engaging the consumer, and
  - The development of a systems understanding of the impacts of both industry and individuals/community

  Lifestyle in context - Understand the consequences

- BHPB has developed LCA based models to support education of:
  - Architects/building professionals (LISA)
  - Students/general community (CHAPPY)

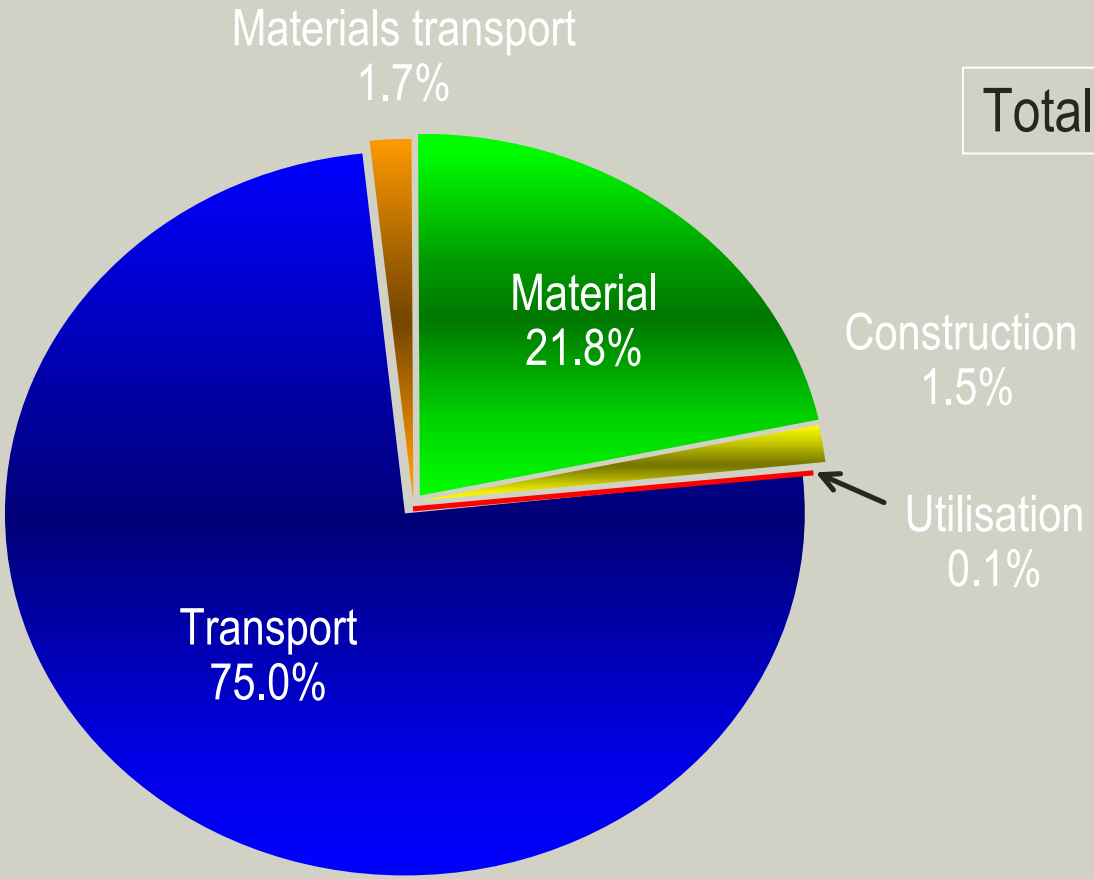
  Both available free from http://www.sustainabletechnology.com.au

Education

www.lisa.au.com

www.chappy.au.com

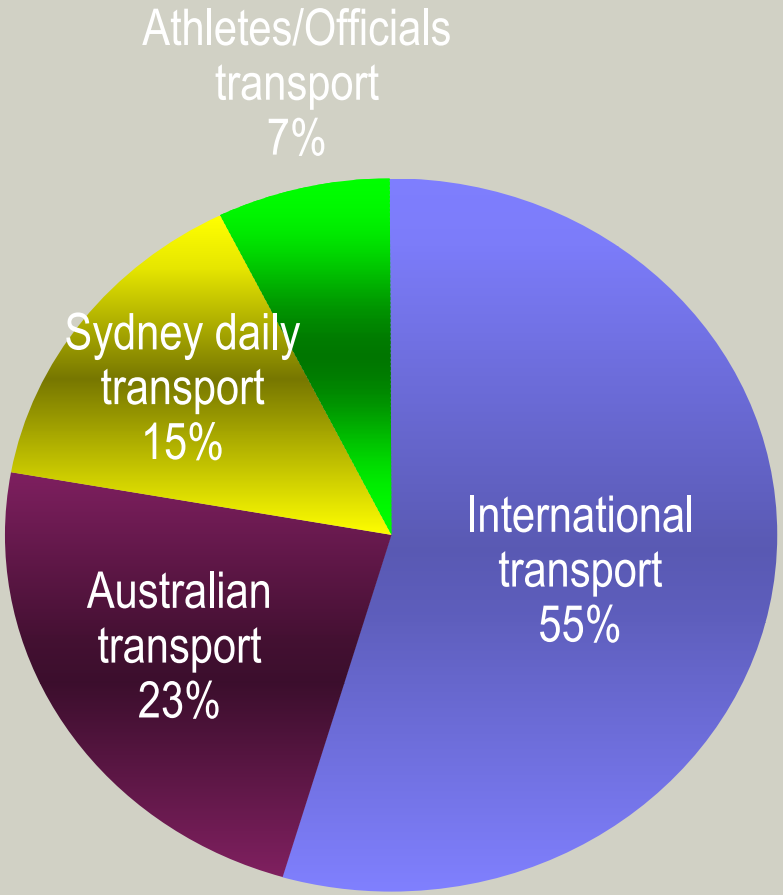
Olympics 2000 - Overall energy breakdown



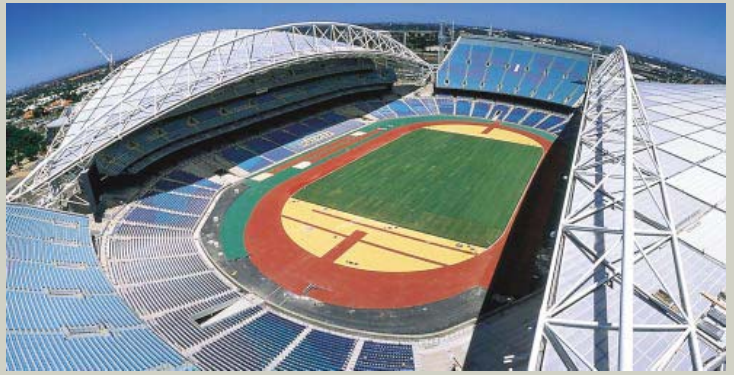
Total = 20.5 Million GJ

Official Partner
Sydney 2000

Olympics 2000 - Transportation



Total = 15.4 Million GJ



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Sustainable Minerals Processing - Nickel

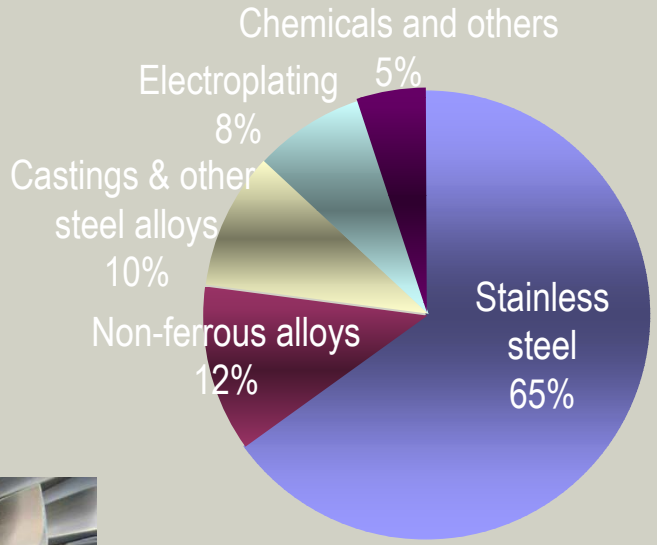
	NiDI 2000 *Generic Ni*	NiDI 2003* *Generic Ni*	NTC 2003 *Specific Ni*
Energy (GJ)	261	240	547
GGE (t CO_2-eq)	16.8	14.8	43.9
NO_x (kg)	79	52	191
SO_x (kg)	965	965	173
Fresh water (m^3)	1,910	1,910	373

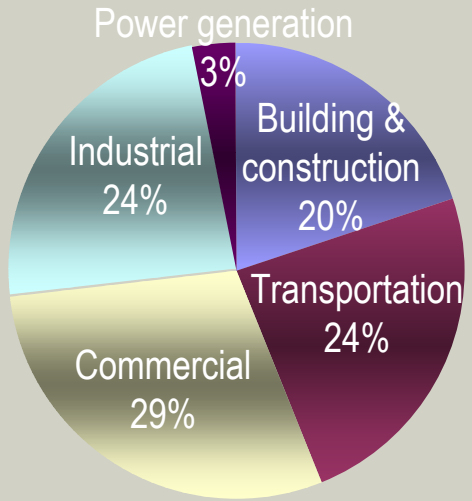
* Restated baseline

Different answers from generic and specific case studies

Life without nickel?

- Total nickel consumption is 1.1 Mt
  - 65% goes into stainless steel (first use)
  - 3% for power generation (end-use)
- High-temperature and corrosion resistant nickel alloys have played an integral part in increasing efficiencies of steam and gas turbines
  - No alternative for many large applications
  - Between 1973–1998, over 60 Gt less CO_2 due to use of nickel





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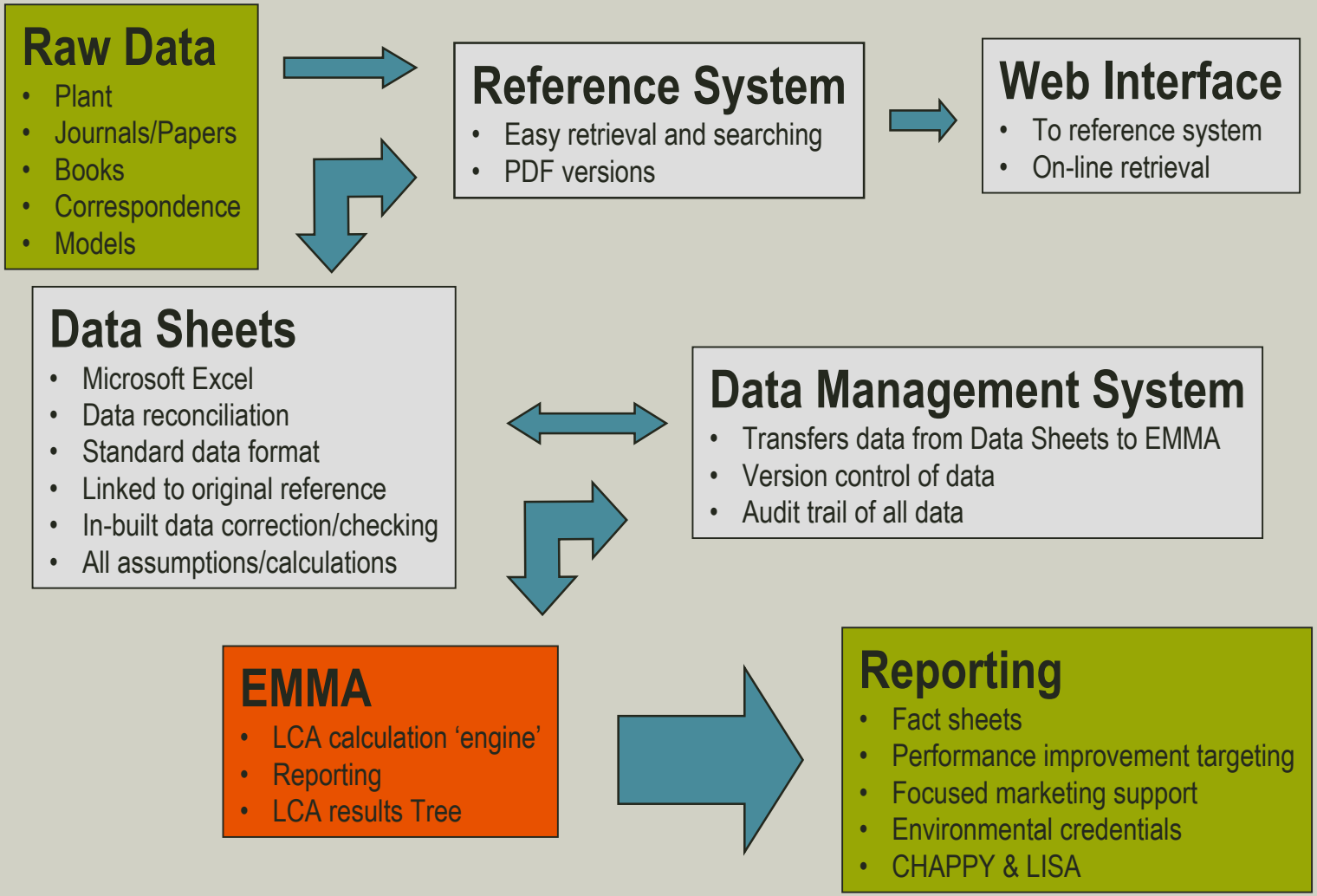
LCI dataflow



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EMMA

QUALITY SYSTEM

Data Management System	EMMA	Reports
Raw data → Data reconciliation Data sheets	Data base Building systems Calculations Scenarios Sensitivities Accuracy Reporting	LCI LCA Emissions Greenhouse … … Fact sheets

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Key LCI values

- Impact assessment is based on direct comparison of these inventory values:
  - Resource energy
  - GGE, i.e. CO_2, methane, N_2O, etc.
  - Fresh water
  - NO_x
  - SO_x
  - PM_{10}
  - Solid waste, both to landfill and tailings
- The actual system incorporates many more substances, e.g. substances included in the Australian National Pollutant Inventory, as well as others

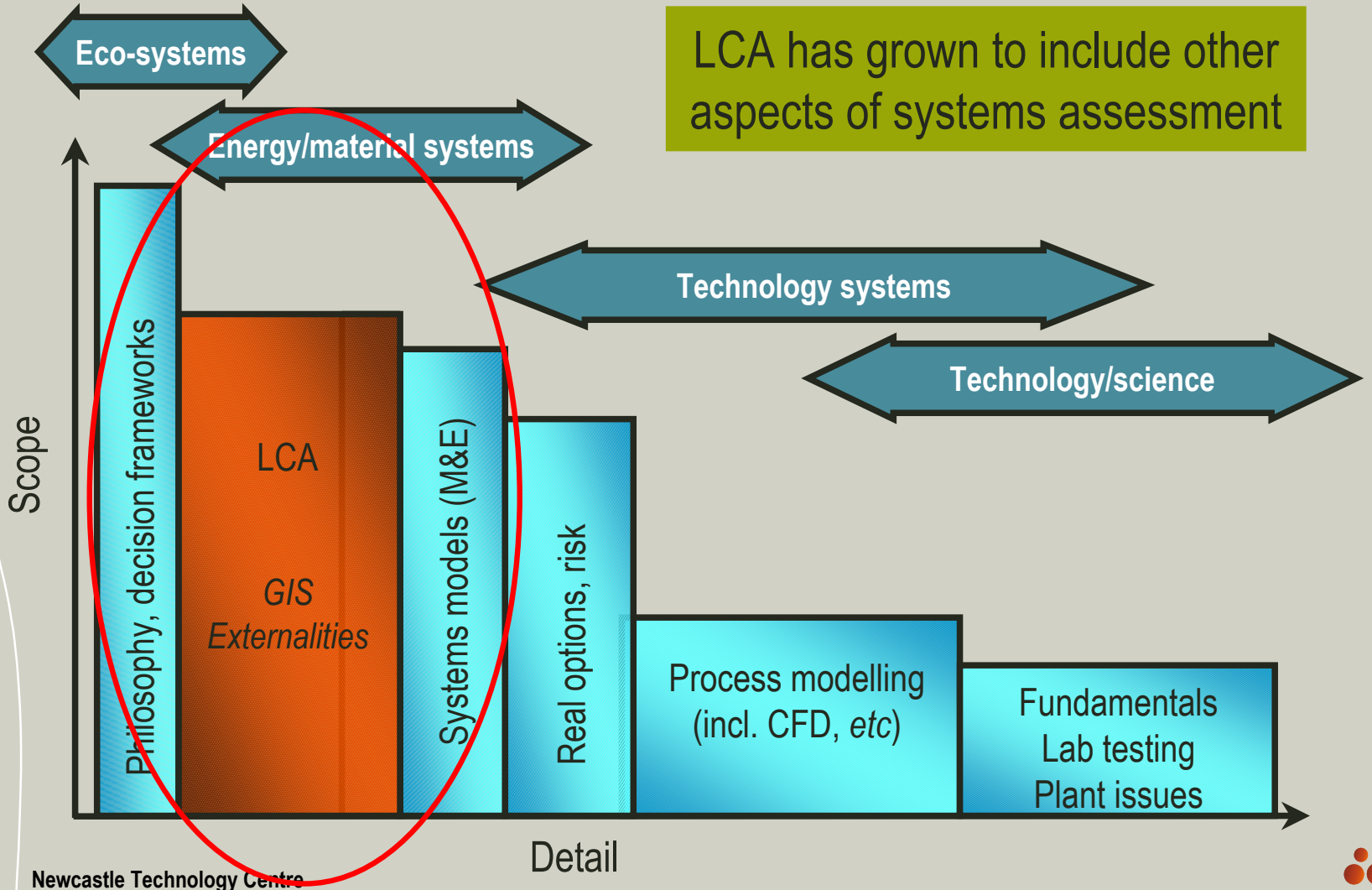
Summary - Potential problems with LCA

- Data quality - A major issue
  - Data collection and reconciliation is costly and time-intensive
  - Data management and quality control are essential
- Results may be:
  - Unfavourable (how do you handle this in the market place?)
  - Misused (e.g. by marketeers)
- Complications from system boundaries, allocation rules, displacement credits, materials, use, occupancy, construction practices, climate, geographical location, third party operations, confidentiality, …
- Limitations:
  - Spatial and temporal dimensions are usually lacking
  - Omits risk
  - Attempts to single point values (usually meaningless)
  - Need to integrate results with economic and technical data
  - Limited to input-output coefficient modelling (no chemistry or kinetics)

Summary - Advantages of LCA

- Encourages consideration of a greater range of impacts - not only “embodied energy”
- Includes effects of externalities (e.g. electricity, transport), wastes and by-products
- Data collection and reconciliation is a valuable step in understanding
- Generates data in context which leads to systems understanding
  - Encourages life cycle thinking
- Identifies uncertainties (missing data, impacts)
- Helps understand the trade-offs between options
- Assists and integrates Cleaner Production activities and provides new data for EMSs
- Provides data and a framework for improvement, cultural changes and education

Tools and methods



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Conclusions

- LCA has proven to be a valuable tool to identify & quantify product stewardship issues
  - But it has limitations without further development
  - Improved inventory data required (e.g. NPI)
  - Impact assessment remains the biggest challenge
  - Need to integrate externalities and operating economics
  - Important to ensure that appropriate level of detail is used without becoming bogged down in detail
- LCA and systems assessment of energy systems is of increasing importance
  - The entire energy chain must be considered
  - Many opportunities for improvement throughout the chain
  - Required for national and international policy
- Benefits in working together Internationally
  - Across different economic and environmental regions

And …

The act of performing an LCA can be more important than the LCA results themselves …

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The End

Thank You

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