

Introduction to LCI, LCA and the AusLCI National Database Initiative

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Australian Government
Department of Industry



Objectives

- Show why a life cycle approach is critical when assessing sustainability performance
- Provide an understanding of LCA methodology, its limits and potentials
- Explain what life cycle data an LCA uses
- Explain the role and importance of AusLCI

Content

- Why is a life cycle approach important?
- What is LCA?
- What data are used in an LCA?
- AusLCI

Poll

Question

How do you rate your understanding of LCA?

Answer

First time I have heard about it

I understand the basic principles of the Life Cycle Thinking

I am pretty competent around LCA

Would you like me to explain 12 different allocation methods

Why is a life cycle approach important?

Questions people ask

- Does making solar cells emit more carbon than their use prevents?
- Why do our drinks now come in plastic bottles rather than reusable glass?
- Does electronic billing help save the environment or should we be worried about the extra internet servers switched on 24/7?

Answers limited by our intuition

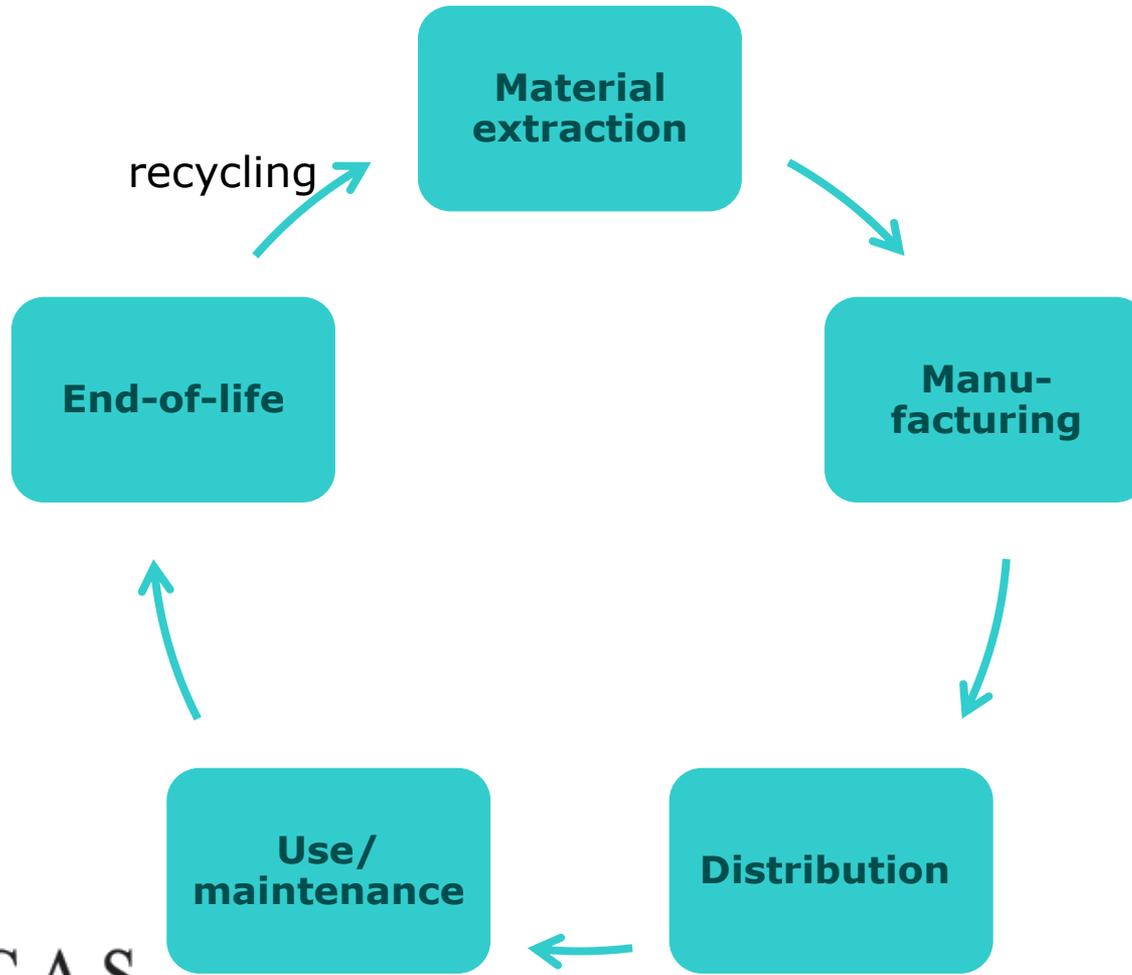
- We often focus on peripheral issues, as the periphery is what you see when you look from the outside, or the issues we interact with.
- We often use our intuition to explain the answer we would like to hear
or
- We cast doubt so as to paralyse our action or the action of others.

Our intuition

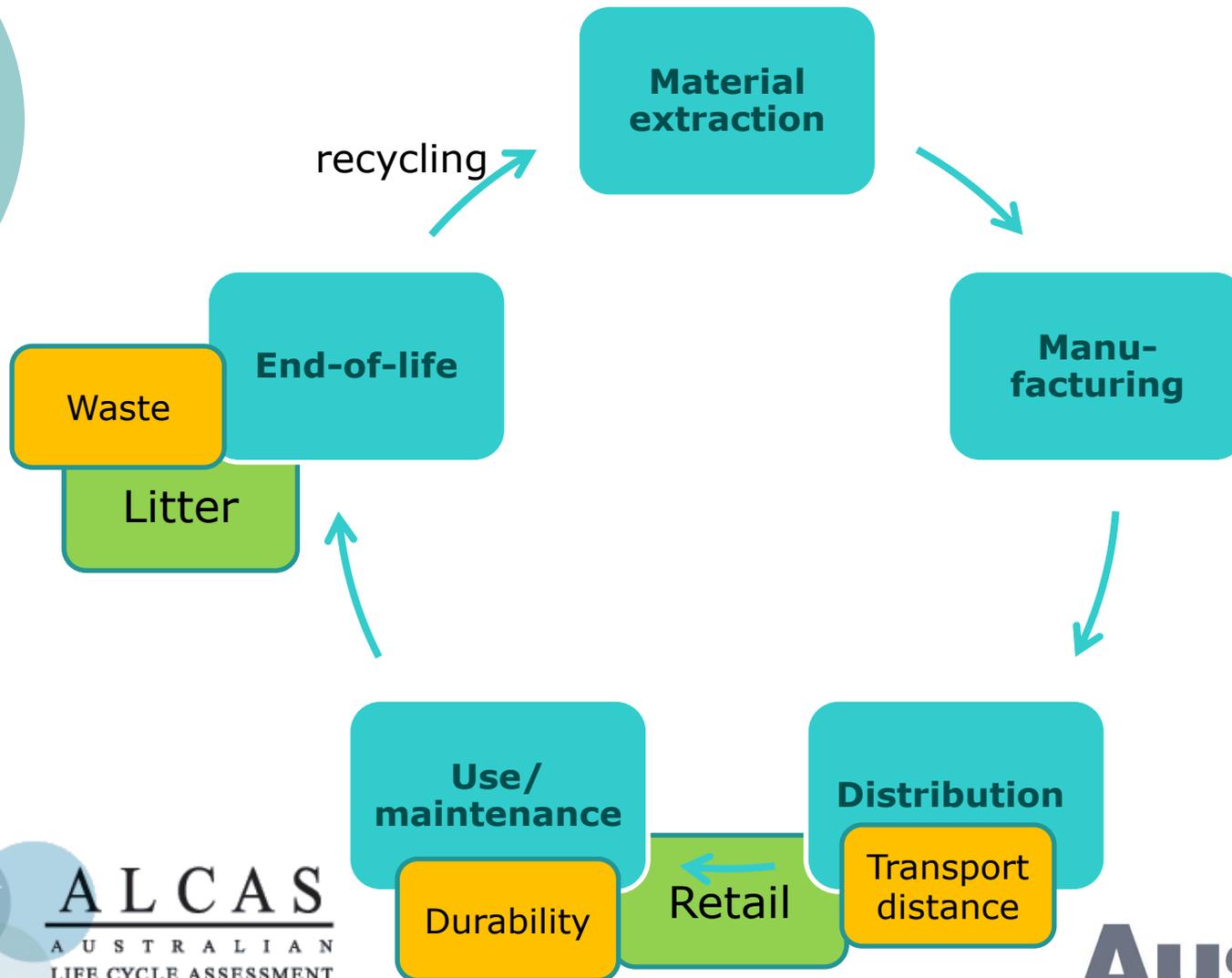
- Our intuition is largely based on our experience.
- Hands up those who have
 - Smelted steel
 - Polymerised ethylene
 - Grown maize
 - Put out the recycling
 - Seen rubbish in the environment

Life Cycle Assessment tests & confronts our intuition with fact

Typical Life Cycle of a Product



Typical Life Cycle of a Product



Example (what does your intuition say)

- Reusable cup vs. disposable cups

Reusable

Disposable

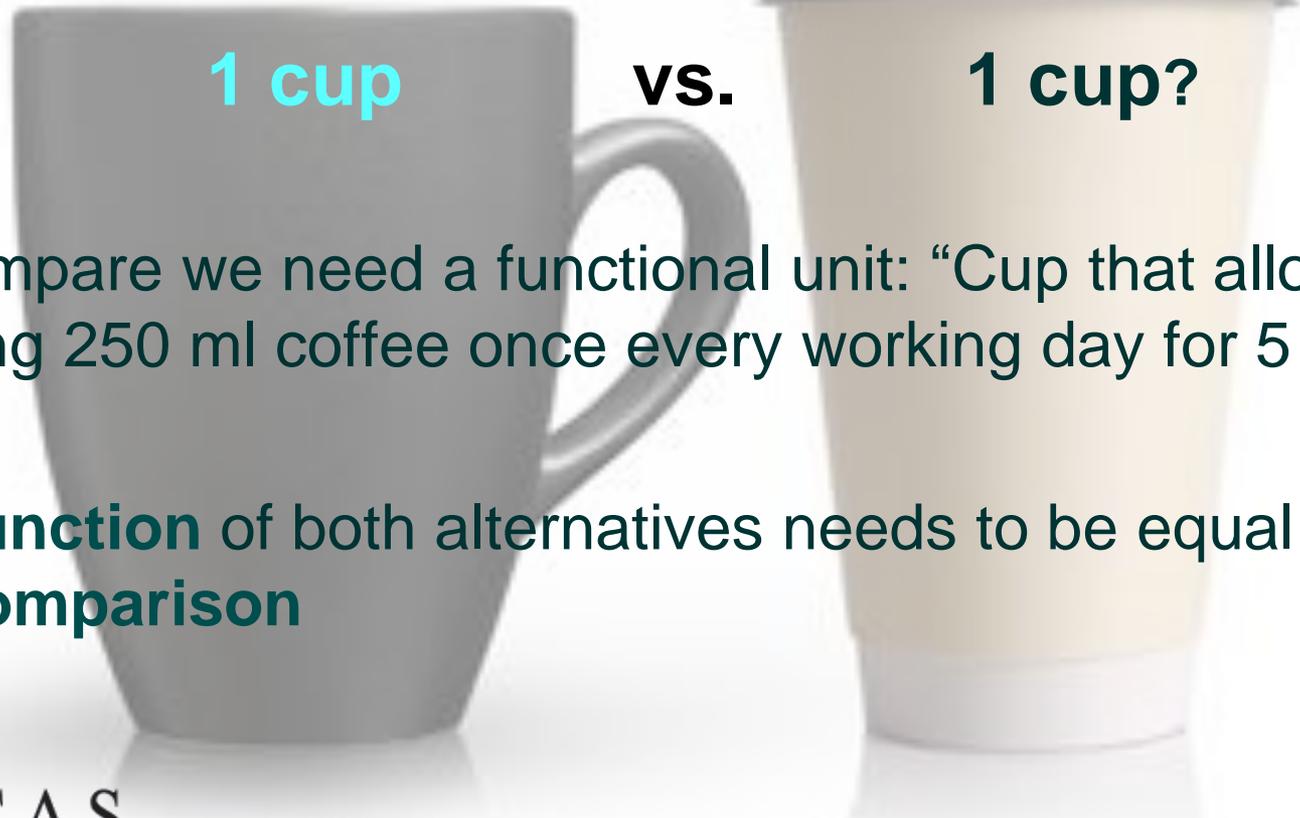
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Waste

Source: www.gmagazine.com.au

Example (How to go past intuition)

- Reusable cup vs. disposable cups



- To compare we need a functional unit: “Cup that allows drinking 250 ml coffee once every working day for 5 yrs”
- The **function** of both alternatives needs to be equal for a **fair comparison**

Example

	Reusable cup	Disposable cups
Raw materials		
Manufacture	Ceramics to Produce 1 cup	Paper/plastic to Produce 5x250 = 1250 cups
Distribution		
Use	1250 x Rinsing (hot water & detergent)	No impact
End of life	Ceramic to landfill	Paper/plastic to landfill

Source: www.gmagazine.com.au

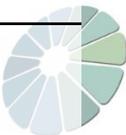
ALCAS

A U S T R A L I A N
L I F E C Y C L E A S S E S S M E N T
S O C I E T Y

Example

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Source: www.gmagazine.com.au



Why take a life cycle approach?

- It's seldom straightforward to compare contrasting products
- Integrated thinking is necessary to see the complete picture; make trade-offs visible
- A valid decision requires a full life cycle approach, including quantification: LCA

What does this mean for (bio-based) materials?

- There is no point in reducing sustainability to statements such as “bio-based”, “renewable”, “% recycled content” or “100% recyclable”
- When comparing materials it is essential to consider functionality, e.g.:
 - Performance
 - Durability
 - Flexibility

Benefits of integrated life cycle thinking

- Revealing the world behind the product
- Life cycle thinking is the only rational approach for evaluating environmental (economic, social) decisions
 - including only parts of the product system risks shifting problems rather than solving them
- LCA can identify risks and opportunities for your product or service

What is LCA?

What is LCA ? - Standards

INTERNATIONAL
STANDARD

ISO
14040

Second edition
2006-07-01

**Environmental management — Life cycle
assessment — Principles and framework**

*Management environnemental — Analyse du cycle de vie — Principes
et cadre*



Reference number
ISO 14040:2006(E)

© ISO 2006

INTERNATIONAL
STANDARD

ISO
14044

First edition
2006-07-01

**Environmental management — Life cycle
assessment — Requirements and
guidelines**

*Management environnemental — Analyse du cycle de vie — Exigences
et lignes directrices*



Reference number
ISO 14044:2006(E)

© ISO 2006

What is LCA ? - Definitions

What is a life cycle?

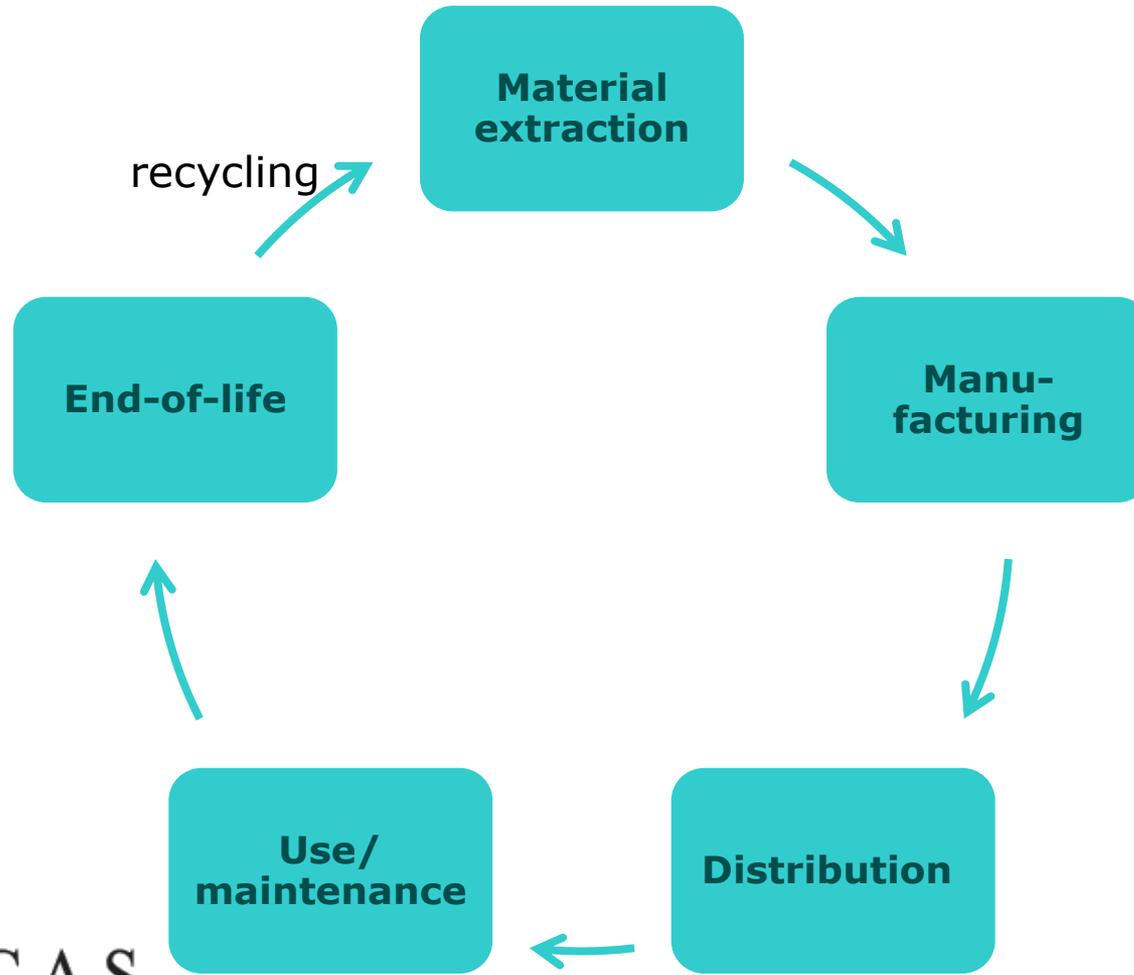
“Consecutive and interlinked stages of a product system, from raw material acquisition or generation from natural resources to final disposal”

Life Cycle Assessment

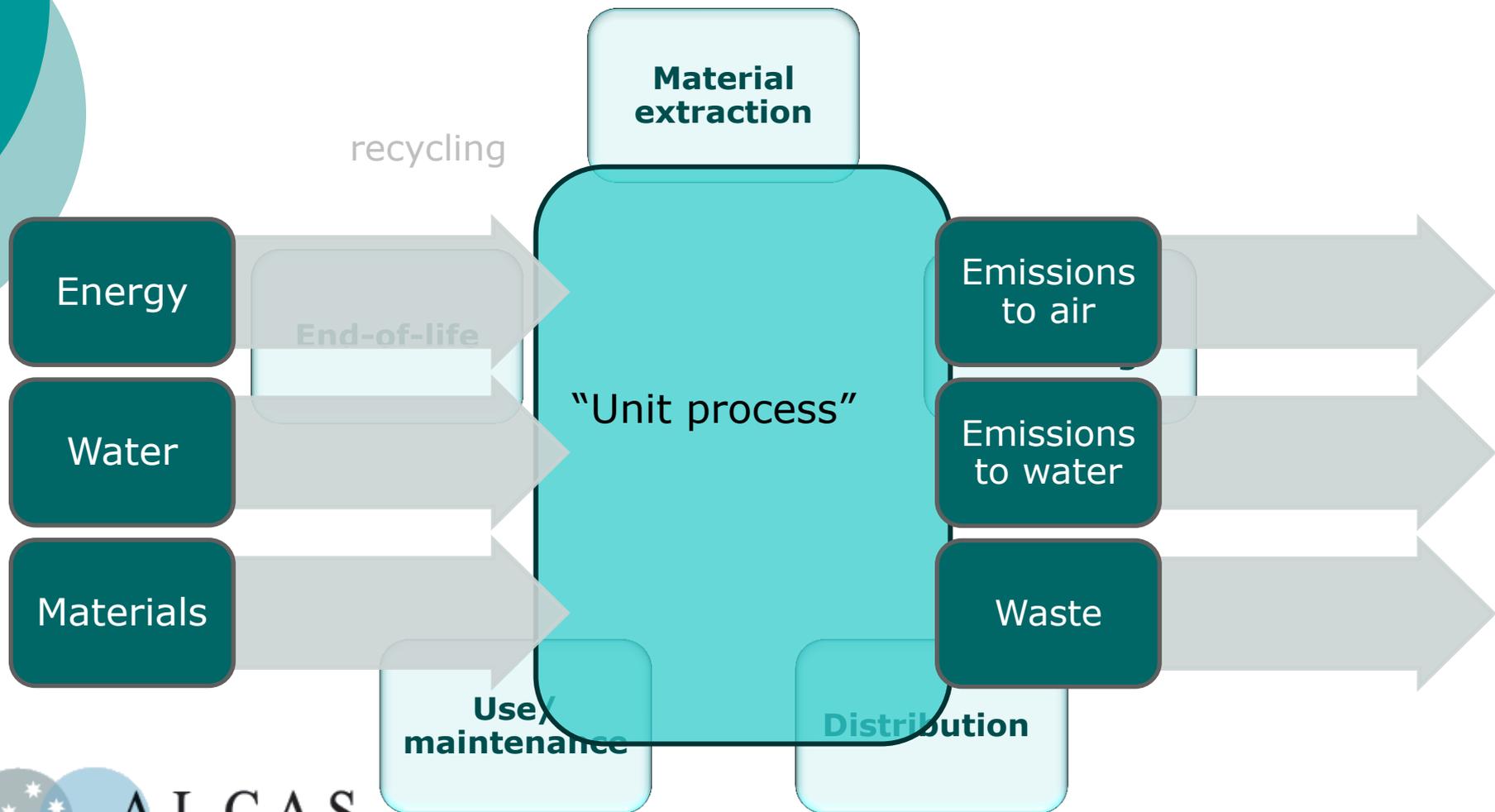
“Compilation and evaluation of the inputs, outputs and the potential environmental impacts of a product system throughout its life cycle”

Source: ISO14040:2006

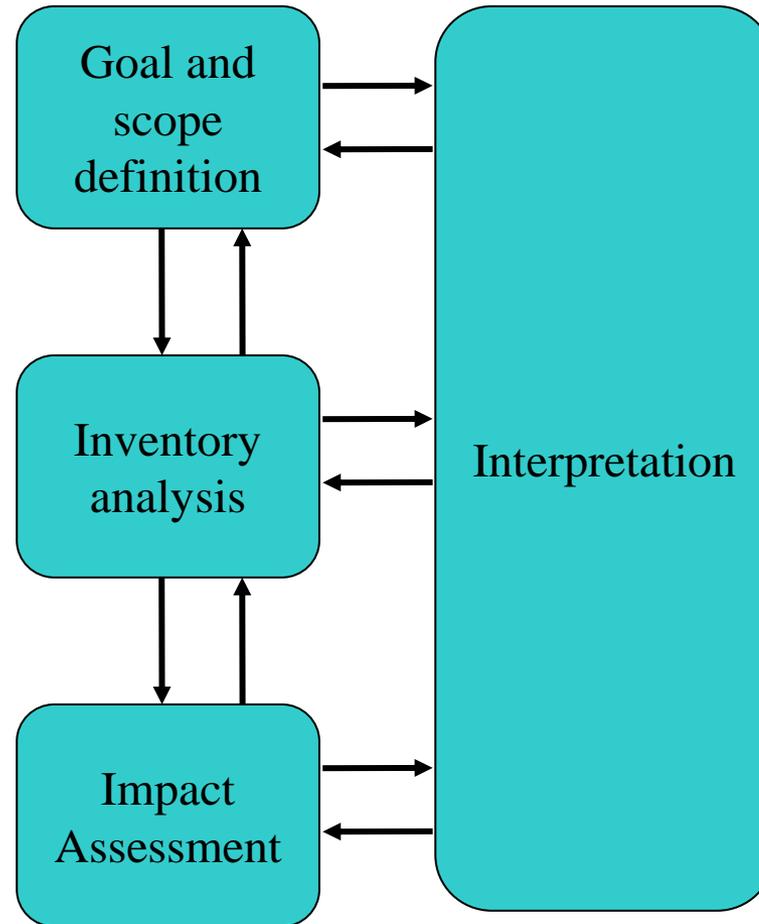
Typical Life Cycle of a Product



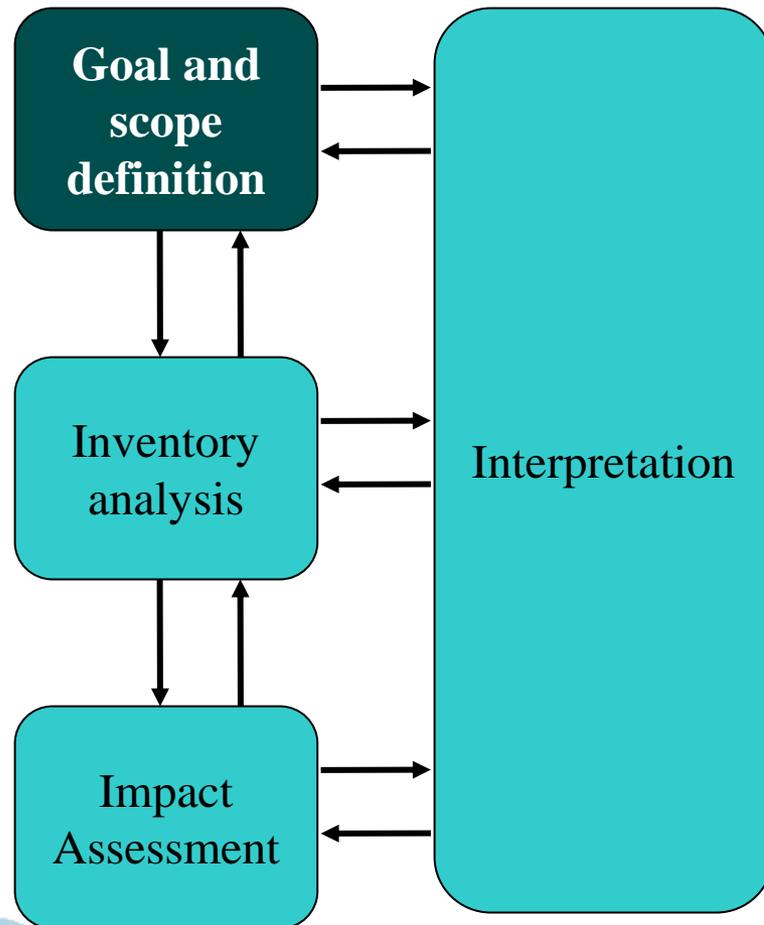
Typical Life Cycle of a Product



Four step procedure for LCA

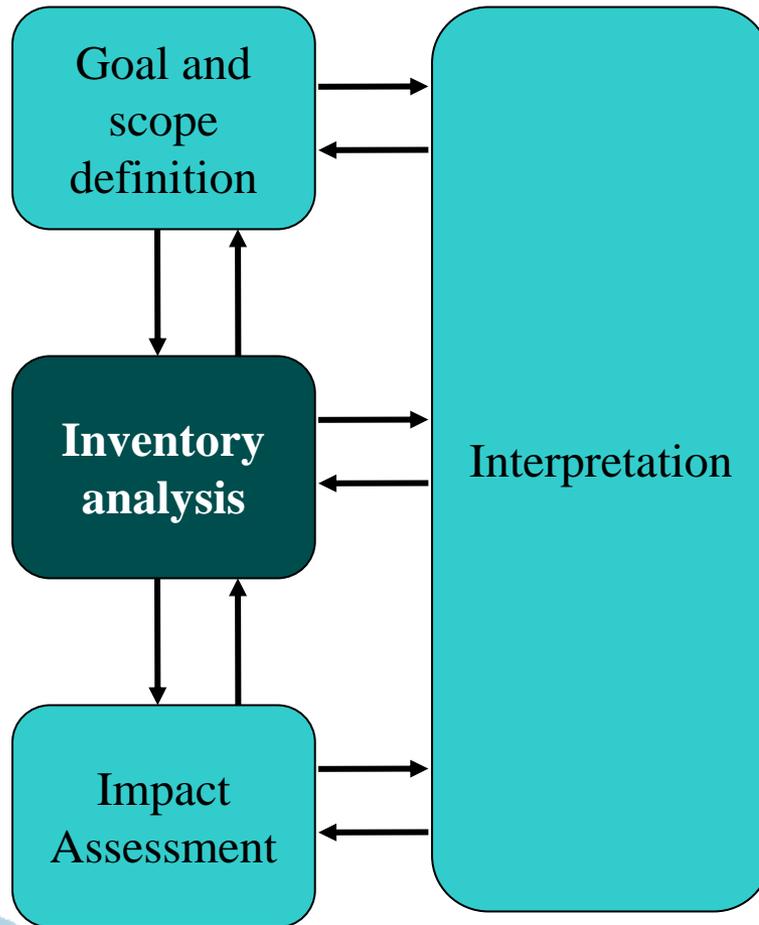


Step 1: Goal & Scope



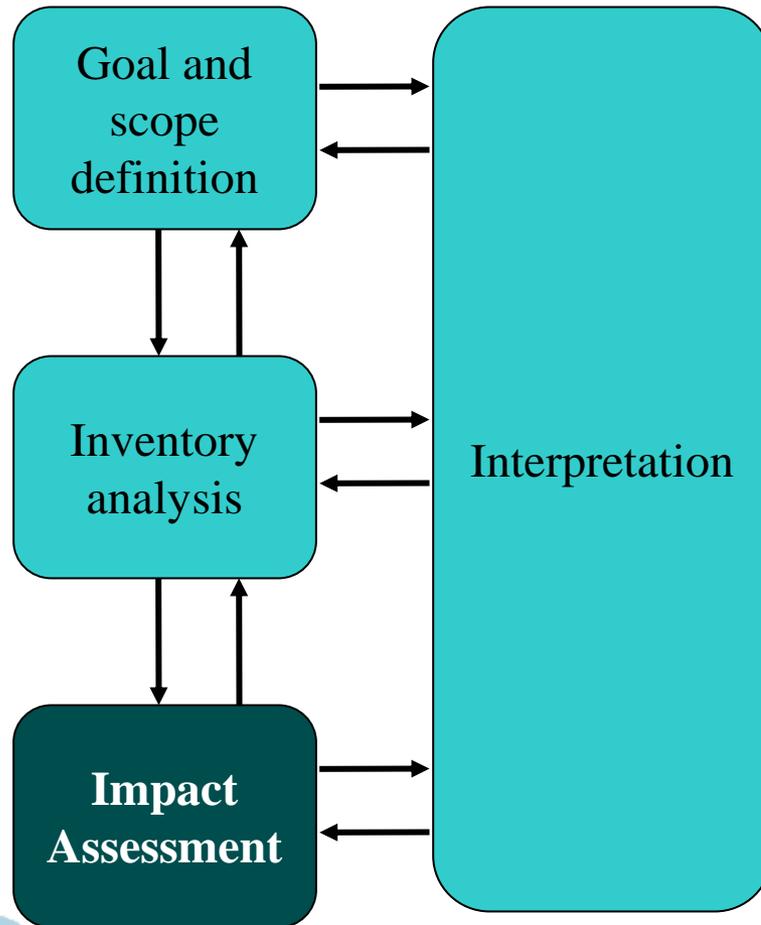
- Articulate the question
- Develop scope to answer the question by
 - Establishing functional units for the study
 - Selecting relevant system boundaries
 - Identifying indicators
 - Determining data requirements

Step 2: Data collection



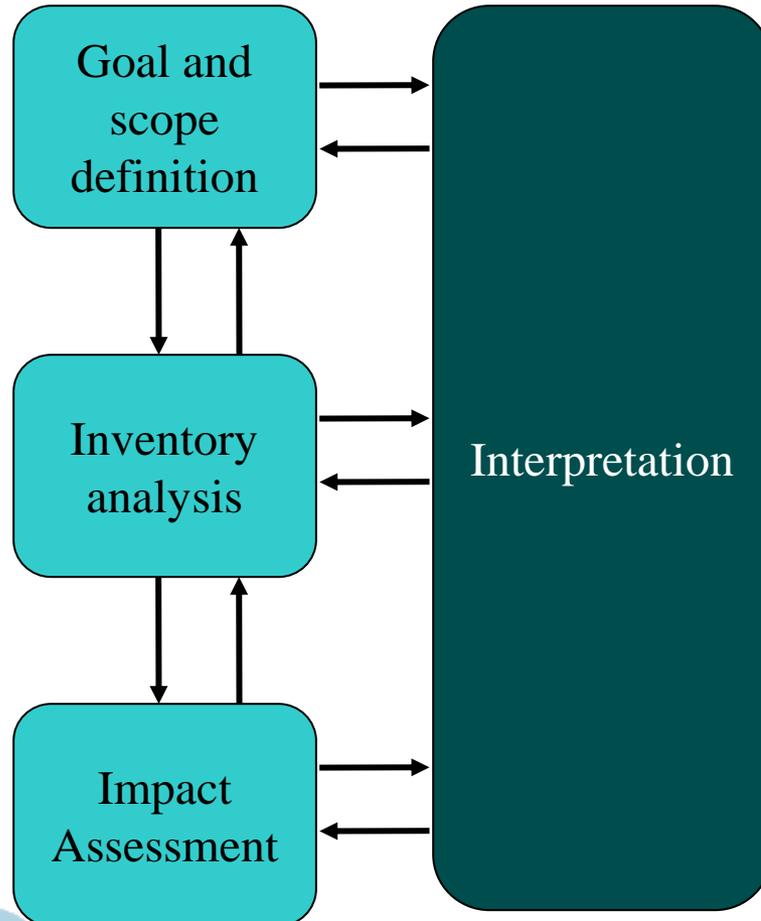
- Describe the system in terms of interconnected unit operations
- Collect data on environmental exchanges from each unit process
- Sum the environmental exchanges across whole product system

Step 3: Impact assessment



- Calculate impact assessment indicators from inventory table
- Comparison of individual indicators
- Contribution of overall national emission loads
- Weighted indicators

Step 4: Interpretation

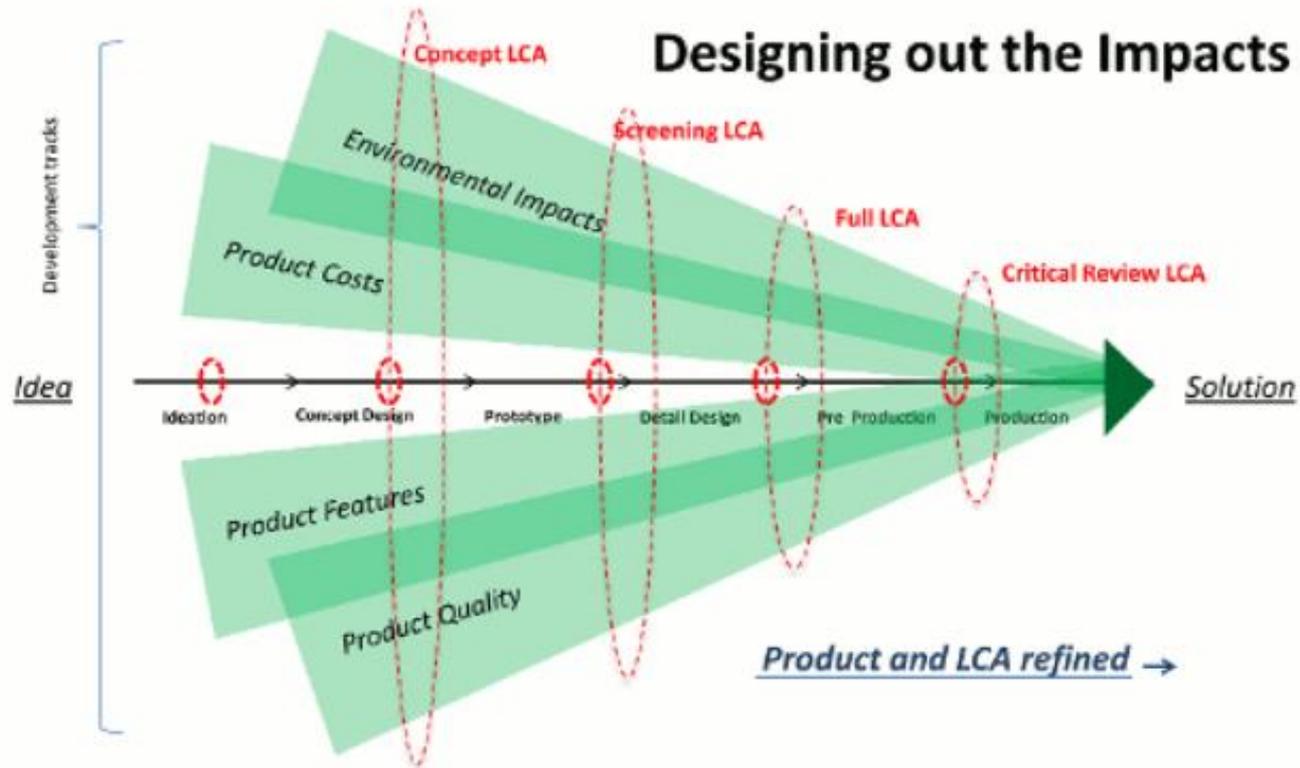


- Investigate why results are like they are
- Main contributors
- Sensitivity analysis
- Are indicator models valid?
- What may be missing from the system?
- Improvement analysis

LCA is a decision support tool

- LCA is based on models
 - Models can be adapted to answer specific questions
 - Models are created with a particular understanding of reality -> varies!
- LCA results can vary based on variations within the models
 - ISO standards provide rules and guidance for good practice
 - Critical review to increase robustness

LCA is a decision support tool



Leverage the iterative nature of LCA and product design

Drivers for considering life cycle impacts

- Participation in specific markets
 - Australian building market, government purchasing, corporate buying groups
 - Building ratings, supply chain management and procurement
- Gaining market advantage
 - EPD, Eco labels, green lists, carbon labels, carbon neutral
- Enabling efficient investment decisions

Drivers for considering life cycle impacts

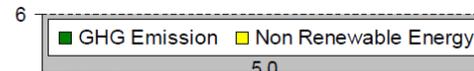
- Understanding your product and being aware of risks and potentials throughout supply chain
 - Carbon price exposure
- Improving corporate image (through environmental reporting)
 - Environmental reporting, CDP, GRI, DJSI, etc.
- Input to policy development

Commonly applied (inter)nationally

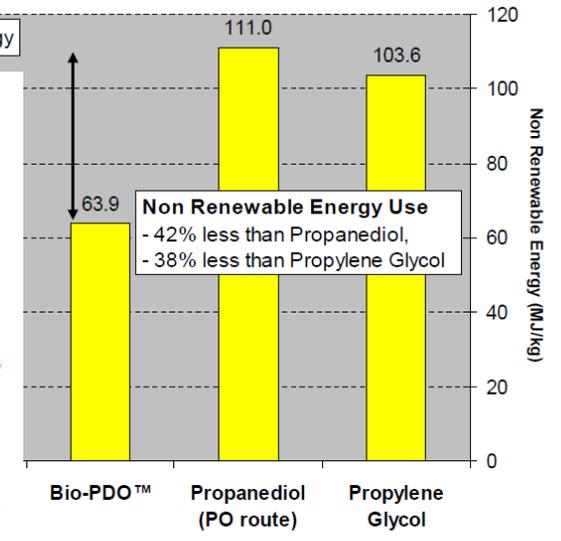
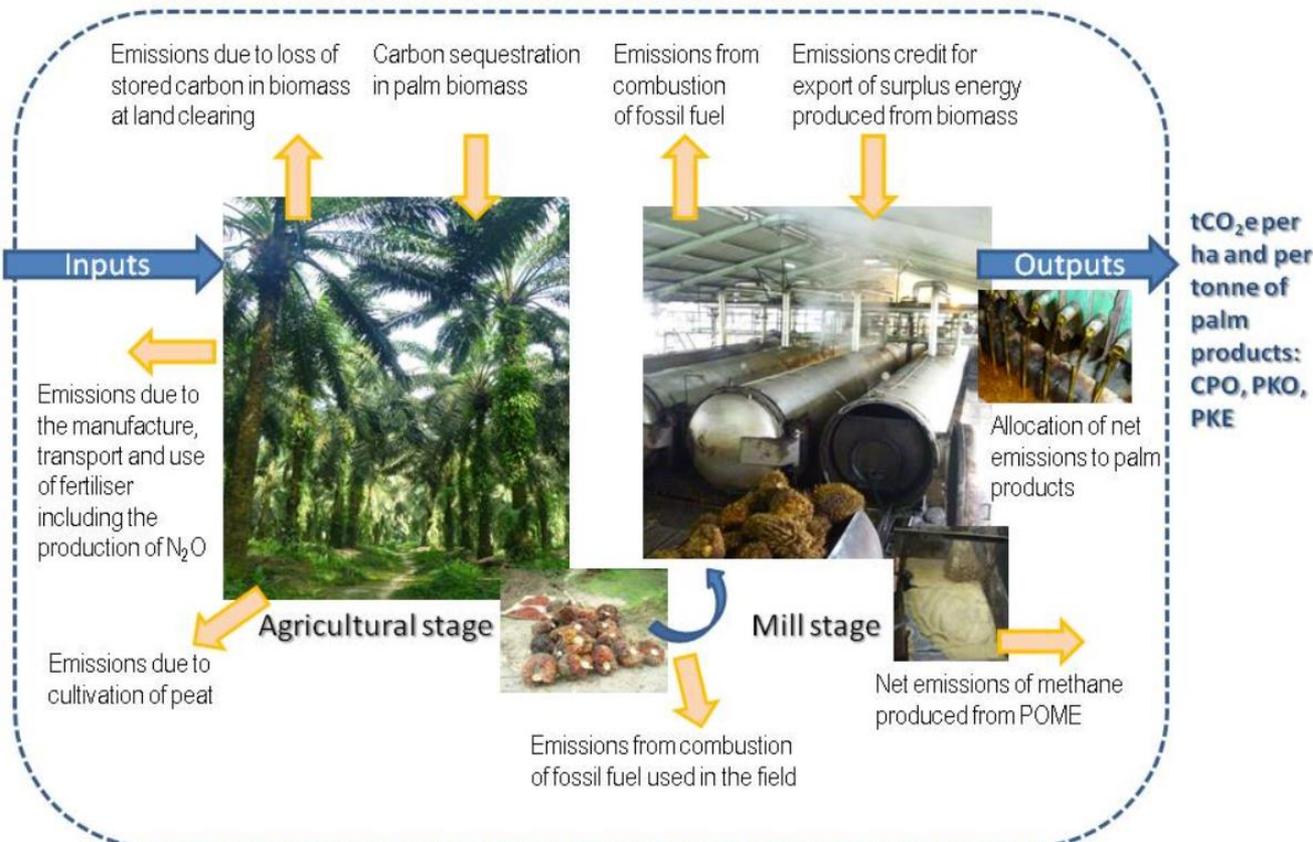


Bio-PDO™ Life Cycle Assessment* Comparison

From "cradle-to-gate," the production of Bio-PDO™ consumes 40% less energy and reduces greenhouse gas emissions by more than 40% versus petroleum-based 1,3-propanediol and propylene glycol.



System boundary for the greenhouse gas calculation in PalmGHG



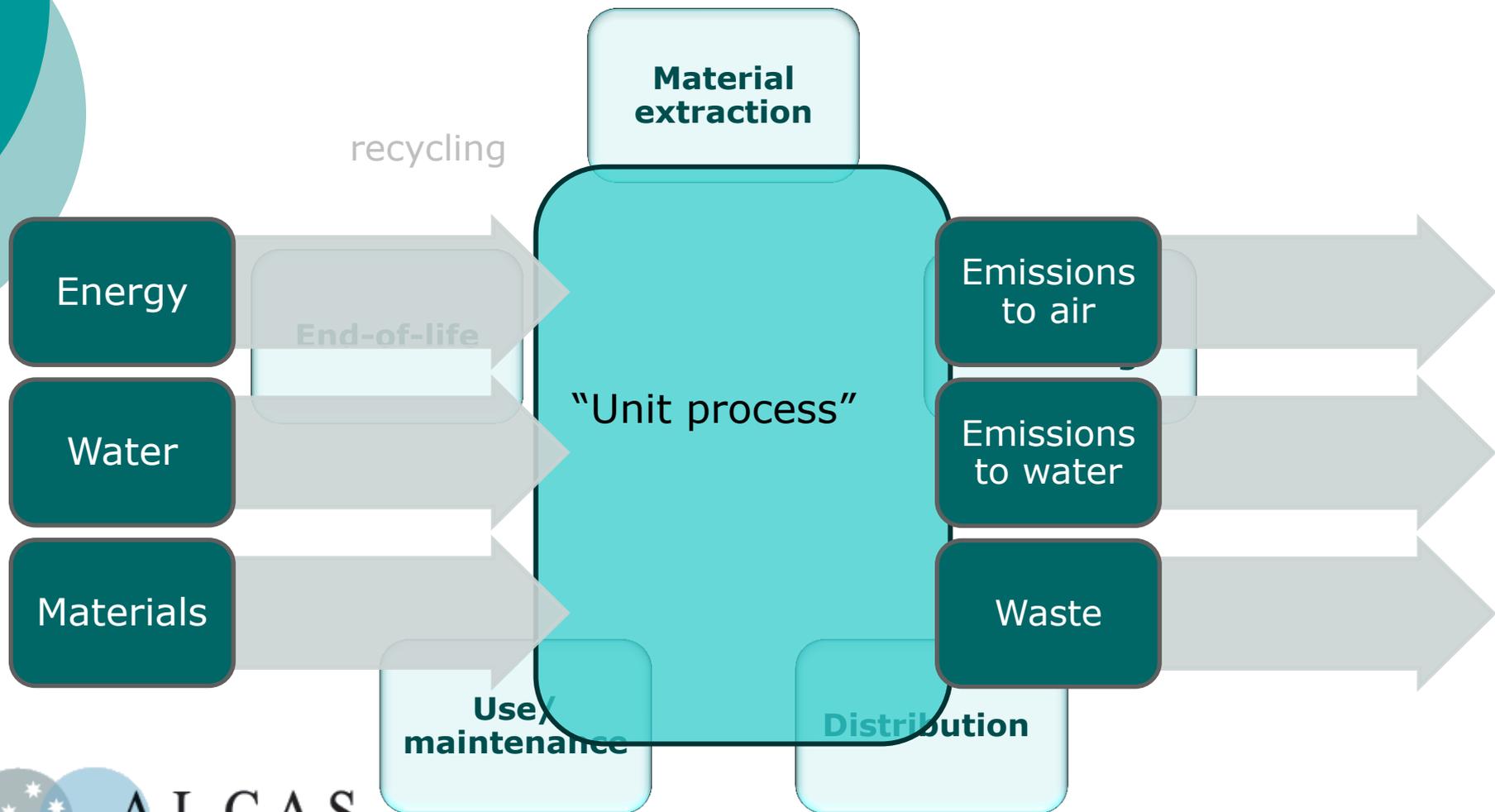
Risks for Australia

- Poor availability of LCI data strangles LCA
 - Decision-making reliant on qualitative info and political spin
 - Costs of LCA remain high
 - LCA practitioners in Australia will use disparate datasets – could lead to controversial decisions
- Environmental optimisation opportunities lost
 - Costs to business/government not avoided
- Australia left behind USA, EU, Japan in ability to engage in environmental markets

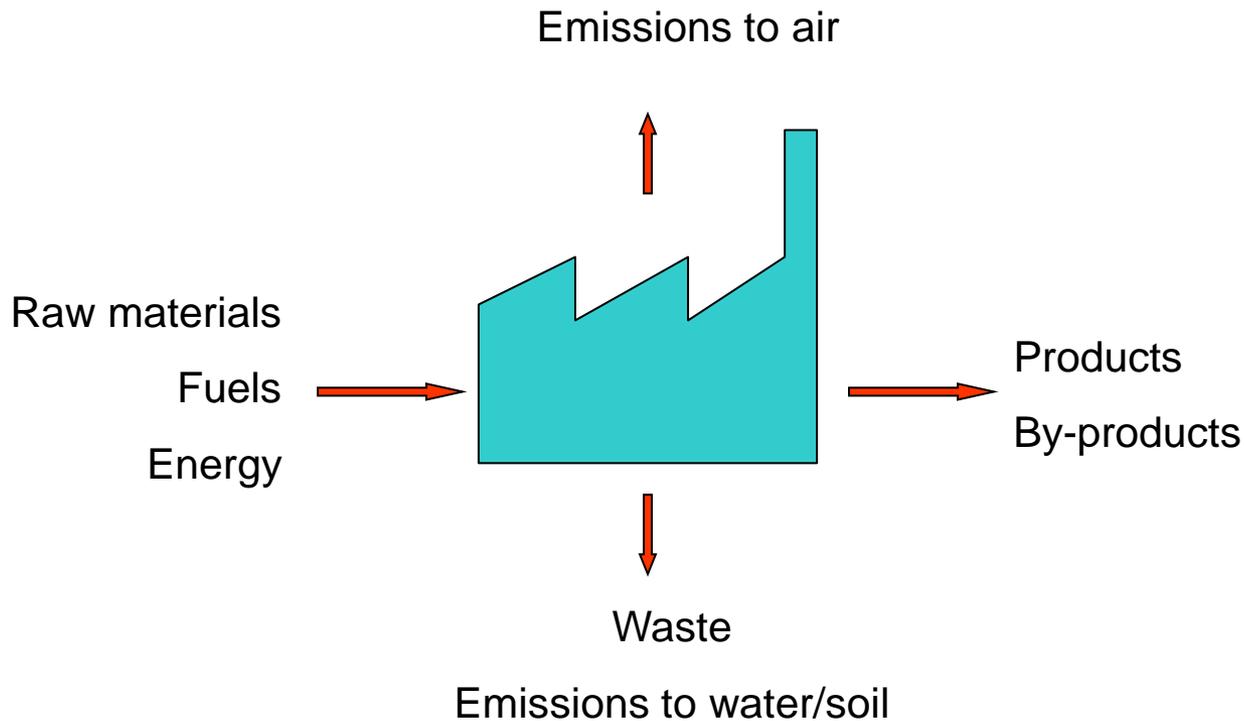
LCI – Life Cycle Inventory

What data are used in an LCA?

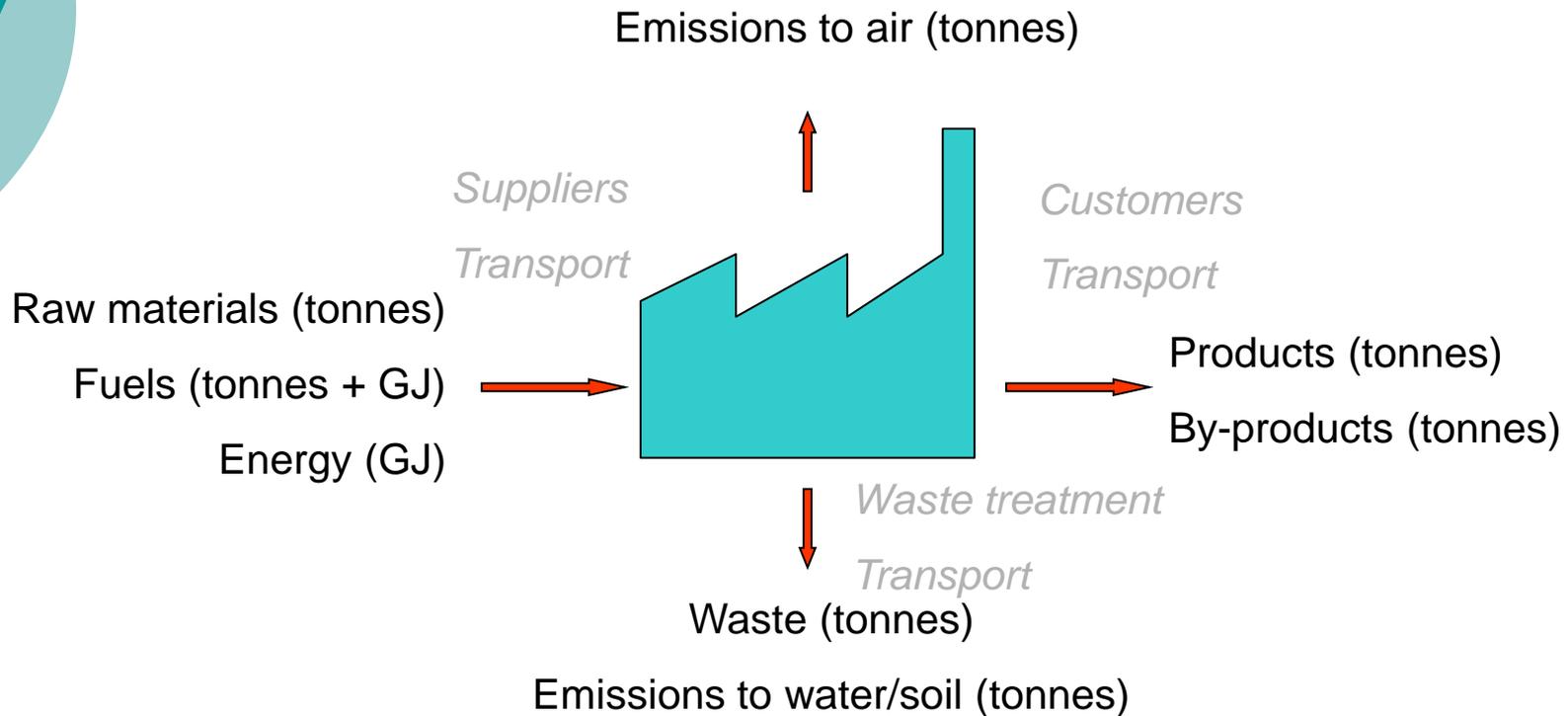
Typical Life Cycle of a Product



Life Cycle Inventory (LCI)



Life Cycle Inventory (LCI)



Not all LCI data are created equal

- When methodology, processes & documentation provide:
 - Transparency
 - Data sources
 - Assumptions
 - Boundaries
 - ...
 - 'A level playing field'
- Useful for making decisions

Data sources in Australia

- Most LCA studies are done for private organisations -> data are confidential
- Some public/published studies in Australia -> isolated data can be used in other LCAs
- Generic (European) databases fill the gaps

Imagine what can be done if we had a comprehensive Australian LCI database...

AusLCI – Australian Life Cycle Inventory Database Initiative



AusLCI Vision

To be recognised as Australia's most trusted and complete benchmark LCI data source to enable comparable LCA analysis of products, services and industries.

AusLCI Business Plan 2008 - Deloitte



**AusLCI database
launch in 2006**



A satellite with large solar panels is shown in orbit above the Earth. The sun is visible in the upper right corner, creating a bright starburst effect. The Earth's surface shows blue oceans and brown landmasses.

Where are we now?

After spending a few years in orbit....

AusLCI has landed in 2013

<http://auslci.com.au>



[View](#)

[Edit](#)

Road

Transport, van inf.3.5t

[Read More »](#)

Transport, truck, sup.28t, fleet average

[Read More »](#)

Transport, truck, 16-28t, fleet average

[Read More »](#)

Transport, truck, 3.5-16t, fleet average

[Read More »](#)

Operation, van, petrol inf. 3,5t

[Read More »](#)

Operation, van, LPG inf. 3,5t

[Read More »](#)

Browse Datasets

- ▶ Fuel
- ▶ Materials
- ▶ Energy
- ▼ Transport
 - Air
 - Rail
 - Road
- ▶ Agriculture

Dataset Manager

- Add Dataset
- Dataset Groups
- Users
- Manage Newsletters
- Create Newsletter

What's next?

We are planning our next missions...



2014: AusAgLCI

2014: Bio-based materials

Australian LCI project – key factors

- National
- International links (Europe, N America & Asia)
- Public data, transparent, consistent and well documented
- Data collected with industry involvement
- Cross-sectorial
- Utilises an open participation framework
- Flexible engagement model

AusLCI – Key Requirements

AusLCI

- methodologies
- databases and tools
- protocols
- quality assurance

Consistent

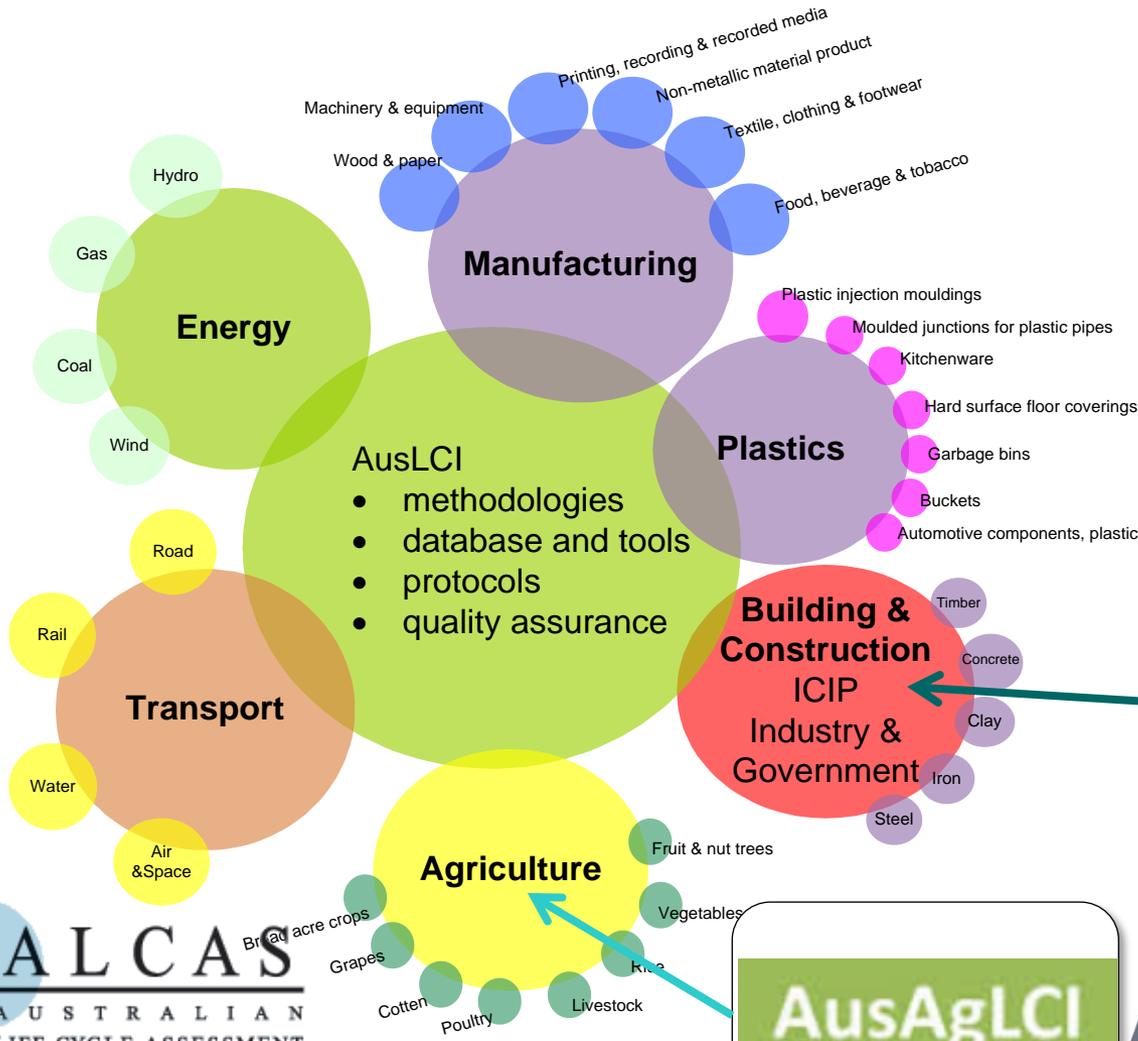
- methodology,
- processes & protocols
- documentation

'A level playing field'

Clear & transparent:

- Data sources
- Assumptions
- Boundaries

AusLCI Scope



Aim is to provide one single repository of Australian LCI information



ICIP Grant



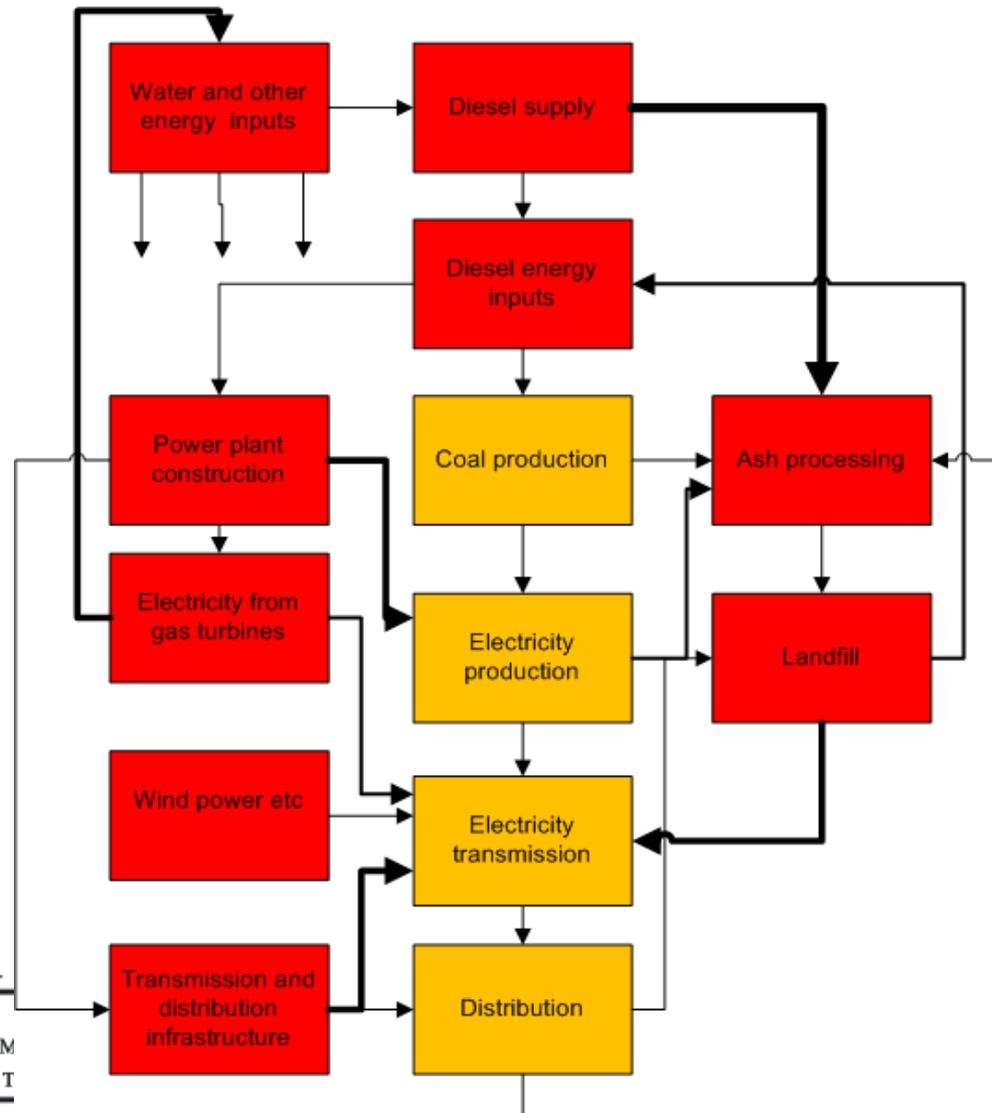
AusAgLCI



AusLCI structure

- Connected Unit Process database for all LCA users in Australia
 - AusLCI + shadow-database
- One database for many uses
 - Product declaration (EPD)
 - Eco-labels
 - Policy research
 - Internal LCA studies
 - Comparative LCA studies
 - Etc.

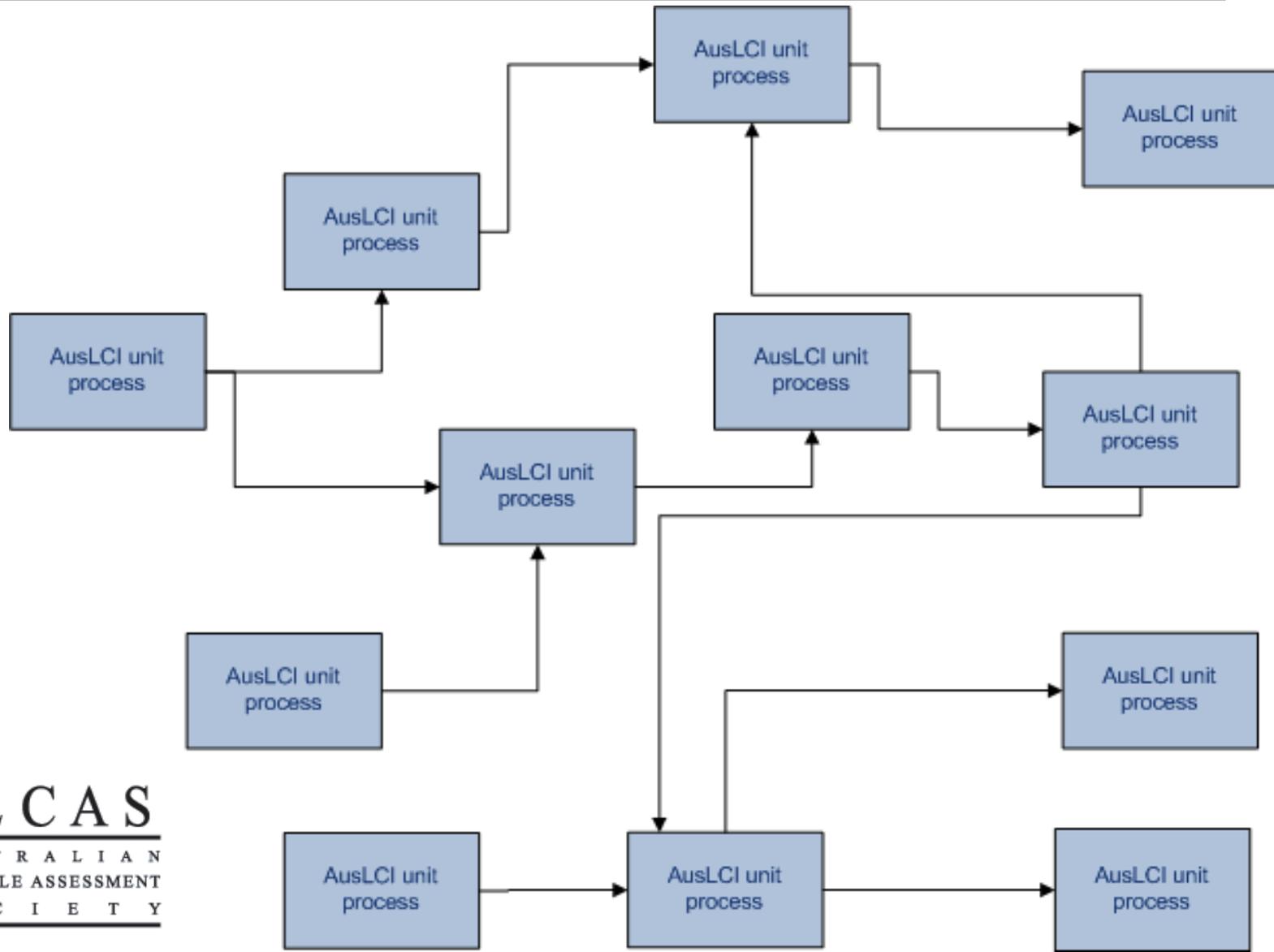
Connected unit processes



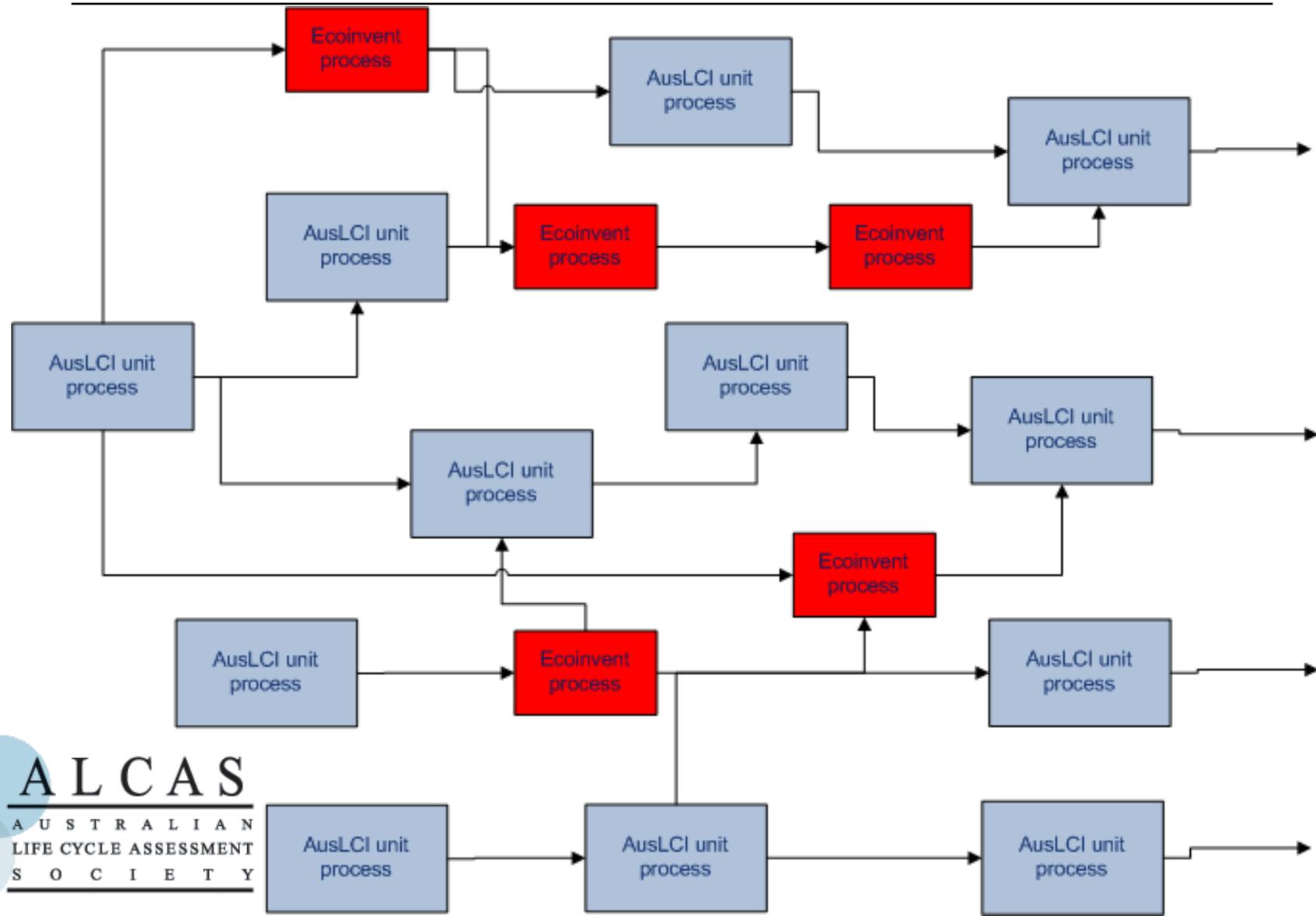
Clarification in the structure

- Data owners submit unit processes – predominantly gate-to-gate
- AusLCI connect these to upstream processes
 - to other AusLCI data where available
 - to a “shadow database” where AusLCI data are not available

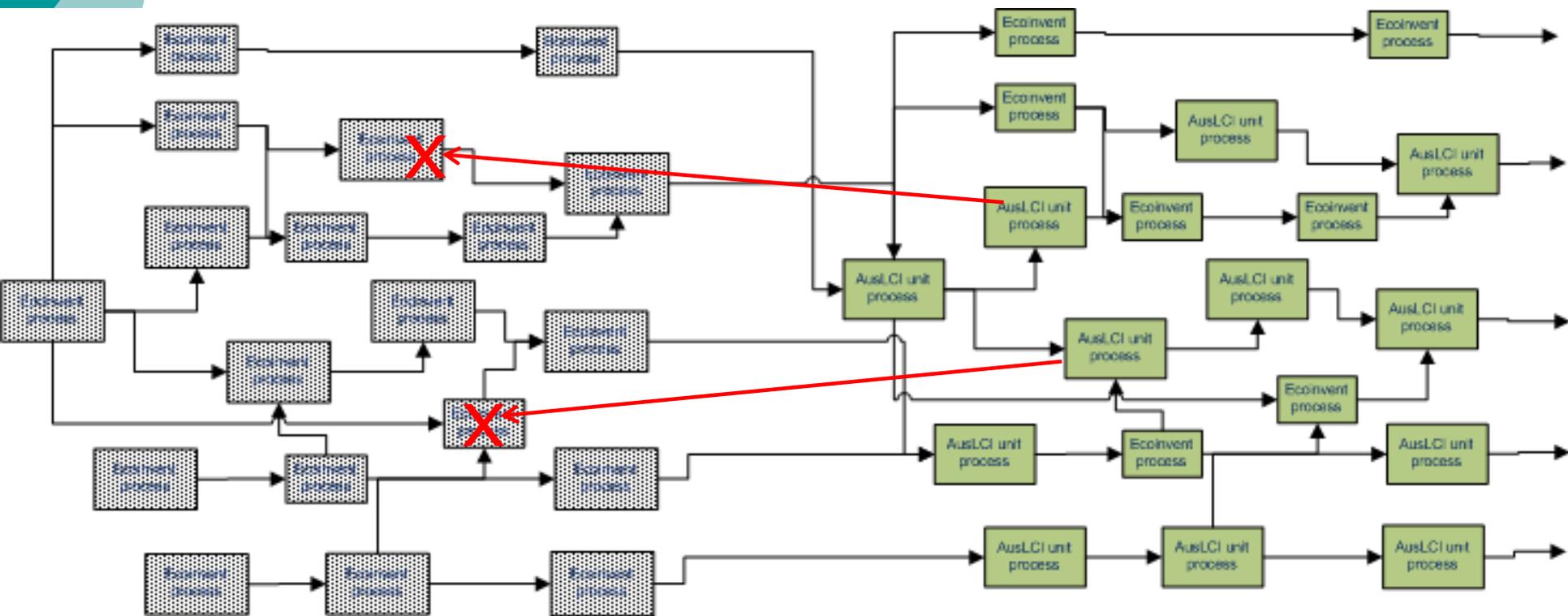
Shadow database



Shadow database – static processes



Shadow database – improving over time



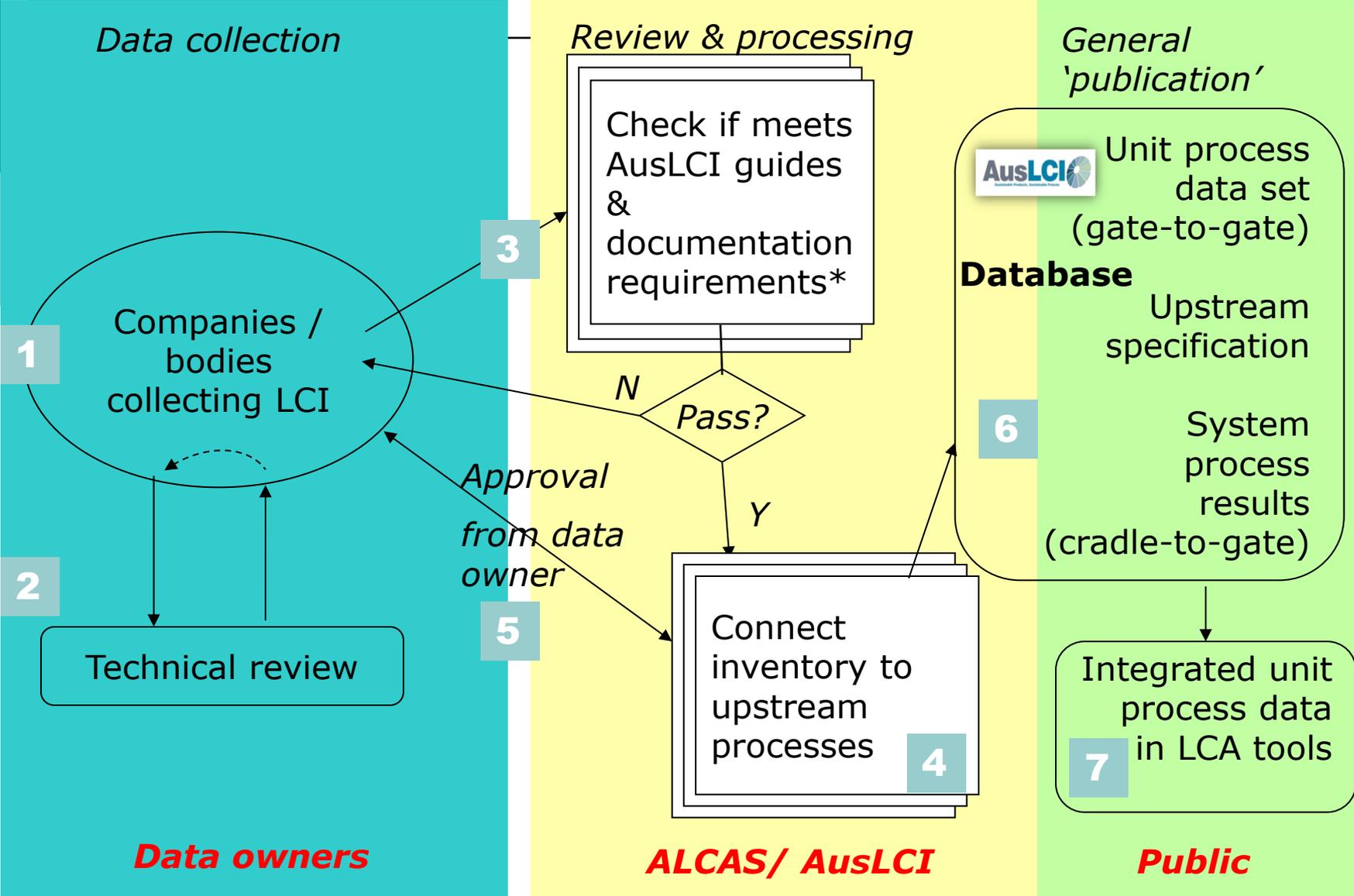
Shadow database

- Is managed by the AusLCI committee
- Incorporates any high quality international unit process data
- Has licensed data so in itself will not be published by AusLCI – but its specification will be published
- AusLCI results using the shadow database will be published

Implications for AusLCI

- Fewer tasks for people submitting data to AusLCI
- Improvements immediately ripple through the database
- Consistent and complete results from the inventory
- Data submitters do not have to have completed an LCA – from cradle to grave

The AusLCI data collection and publication process



AusLCI applications – Industry

- Obtain market advantage in promoting environmental and life cycle benefits of individual products over competitors.
 - Demonstrable product credentials are essential.
 - Enhanced disclosure to consumers allows industry to respond to public criticism
- Make informed decisions, e.g. in driving process efficiencies, managing value chains, making purchases, furthering sustainability objectives, ...
- Benchmark processes and product performance against an industry standard

AusLCI applications – Government

- Guide policy direction and promote sustainable practices within the Australian economy
- Provide a strong platform for funding, education, policy and legislation
- Assist in sustainable procurement

In summary

Life cycle approach is critical for better decisions

Good quality data are essential for good LCAs

AusLCI provides the framework and the data for Australia

Industry, consumers, government can all benefit from this approach