AusLCI

The Australian Life Cycle Inventory Database Initiative

AusLCI database manual

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V1.26

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1.0	21st November 2014	Timothy Grant	First official release document
1.1	4th March 2015	Rob Rouwette, Suphunnika Ibbotson and Tim Grant	Edit of original document
1.2	4th August 2015	Bharat Sharma and Tim Grant	Added concrete processes
1.3	20th April 2016	Tim Grant	Added Asphalt and geopolymer data
1.26	30th September 2016	Tim Grant	Corrections to Ecoinvent documented. Report numbering changed to match database numbering

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1 Introduction

1.1 Purpose of this document

The purpose of this document is to provide information to users of the database. It will describe the source of data and methodology behind the development of the datasets contained in AusLCI. It also contains a description of how gaps in the AusLCI database has been filled with a shadow database developed from ecoinvent data.

1.2 AusLCI project

The Australian National Life Cycle Inventory Database (AusLCI) is a major initiative delivered by the Australian Life Cycle Assessment Society (ALCAS). The aim is to provide and maintain a national, publicly accessible database with easy access to authoritative, comprehensive and transparent environmental information on a wide range of Australian products and services, covering a range of life cycle stages. It is an invaluable tool for those involved in environmental assessment and particularly life cycle assessment (LCA), as it provides consistent guidelines, principles and methodologies for the collection of life cycle inventory (LCI) data, along with protocols for LCA processes for different sectors.

The project has brought together stakeholders from industry, government and academia to develop a methodology to standardise the interpretation of ISO 14040 in Australia. The LCI database enables suppliers to use LCA to reduce environmental impacts and to appropriately promote the environmental attributes of their products and services to their clients and stakeholders.

The initiative delivers substantial benefits to manufacturers and retailers, who may be able use it to demonstrate product credentials and increase sales, provide enhanced disclosure to consumers and obtain market advantage for individual products over competitors.

The database also provides a consistent source of information to support and provide benchmarks for eco-labelling and environmental product declarations (EPDs), and underpin the development of LCA-based policies and design tools for buildings and infrastructure.

AusLCI assists with:

- setting metrics and processes for comparing the environmental impact of products and services
- levelling the playing field for LCA-based product comparison
- fostering innovation in design and manufacturing
- promoting education and consensus-building processes
- providing LCA processes that can integrate with existing environmental tools and applications.

It enables industry users to:

- benchmark process and product performance against industry standards
- make informed decisions in driving process efficiencies, new purchases, furthering environmental goals and quantifying impacts
- proactively assess, mitigate and quantify the effort required to offset CO_2 emissions

- demonstrate product credentials and increase sales
- provide enhanced disclosure to consumers and the ability to respond to public criticism of products
- obtain market advantage in the anticipated low impacts and carbon sequestering benefits for individual products over competitors.

It enables governments to:

- guide policy direction and promote sustainable practices within the Australian economy
- provide a strong platform for funding, education, policy-making and legislation
- assist in decision-making, such as analysis of investment or purchasing decisions
- provide enhanced educational resources.

1.3 AusLCI data collection, review and publication process

The AusLCI data collection, review and publication process has been broken down into seven main stages. Figure 1 shows these different stages.

1. Different organisations and companies (data owner or data supplier) contribute data for a variety of reasons. Sometimes the company that produces the material or service develops the data, but third parties also develop data for other purposes. AusLCI has been structured to utilise data from a variety of initial sources.

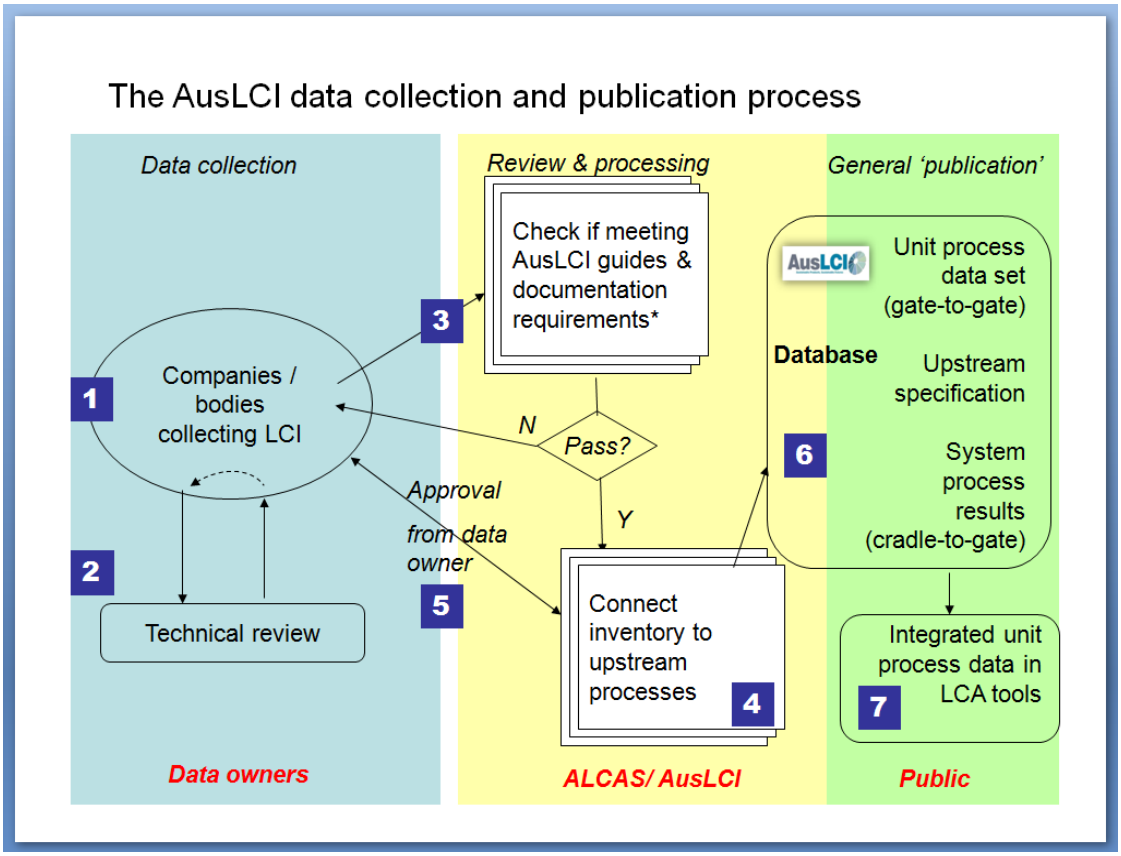


Figure 1: Summary process/flowchart for AusLCI data publication

2. All data submitted to AusLCI is expected to be reviewed for technical quality prior to submission to AusLCI. This may be a formal peer review or can be other types of review, such as review via journal publication.
3. Data is then submitted to the ALCAS AusLCI Database Committee to consider for inclusion in the AusLCI database. Information provided will then be checked against the ALCAS document ***"Requirements for the Development of AusLCI Data sets".*** If the information provided does not meet the requirements then the data owner will be advised of the identified concerns.
4. If the data meets the requirements, the ALCAS AusLCI database manager then works with the data owner to connect their data to relevant upstream processes (and where relevant to determine average industry data for that sector).
5. The ALCAS AusLCI Database Committee will formally seek approval from the data owner for publishing.
6. The data will then be published in the AusLCI national database.
7. It is expected that software suppliers will continue to integrate AusLCI data into their tools providing integrated unit process view of the data.

1.4 Structure of the AusLCI database

The AusLCI database is effectively one fully connected unit process database made of four different types of data:

1. Submitted and verified AusLCI unit processes – This is referred to as AusLCI data, which are published on the AusLCI website.
2. Unit processes from the "shadow database". The shadow database is a modified version of an international LCI database – ecoinvent (currently version 2.2) – into which key background processes (e.g. energy and transport) have been substituted with Australian data. Currently, around 80 processes of the 4000 processes in ecoinvent 2.2 have been replaced with Australian data. While this sounds small, they are many of the most important electricity, fuels and transport processes that are used throughout the 4000 processes.
3. External data sources that are used either because they represent the most appropriate supply, for example overseas product supply – vinyl chloride monomer from the United States into Australian PVC production, or because they are considered the best approximation for Australian supply. Any missing upstream processes for this data are taken from AusLCI or the shadow database.
4. Unreviewed supporting processes used for minor flows. Where a process contributes less than 5% of the environmental significance of a verified AusLCI process, the flow can be estimated with an unreviewed AusLCI process.

Shadow data, external data and unreviewed data will be gradually replaced as stakeholders submit more verified AusLCI data, driving an inherent continuous improvement procedure.

1.5 Constructing the AusLCI database

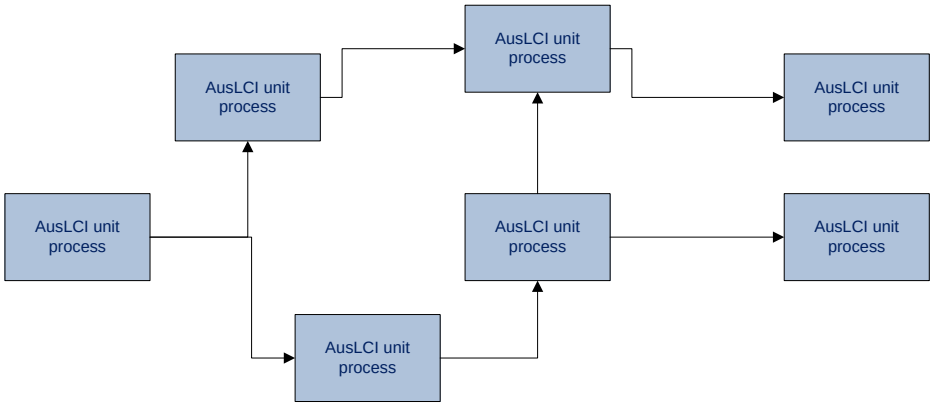
AusLCI data comes in many different forms covering different parts of the supply chain because some organisation only have access to their own production data, while others may control or have studied the full supply chain. . . **Error! Reference source not found.** depicts data set showing connection unit p rocesses and shows how some datasets are almost complete supply chains (for example, electricity). For these processes, the only missing flows are generally capital equipment (for example, the physical power plant construction). For other datasets (for example, PVC) a single supply chain is provided but there are a significant number of ancillary materials that are required as well as the main ingredient (for example, vinyl chloride monomer). For other materials, only a single unit process in available (such as polypropylene) where data is for the one and only manufacturing facility.

Figure 3 demonstrates how the upstream gaps in the database are filled with the external data from the ecoinvent database. Ecoinvent is a complete unit process database developed in Switzerland with a European bias but increasingly global scope. Figure 4 shows the final step where AusLCI data are linked back into the ecoinvent database where appropriate. When this is done, the original input of the ecoinvent processes are deleted and the links are replaced by AusLCI data. Currently, there are more than 100 such linkages back into ecoinvent. These are specified in Appendix B.

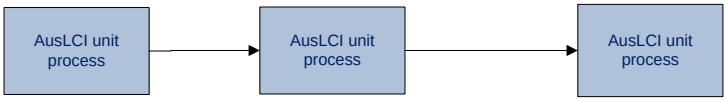
If data is available from other external databases that are a better fit for AusLCI inputs, such data may also be used as long as its scope and boundary conditions are compatible with AusLCI database as is shown in Figure 5. For example, the Australian PVC producer sources vinyl chloride monomer from the United

States and the US Life Cycle Inventory (USLCI) database has good quality disaggregated data on vinyl chloride monomer.

Complex data sets where most of the supply chain has been collected – e.g. electricity supply



Simple data sets when one supply chain has been collected – e.g. PVC



Single data sets where data is collected for one process – e.g. Polypropylene

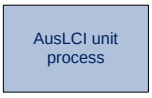


Figure 2: Different forms of AusLCI datasets

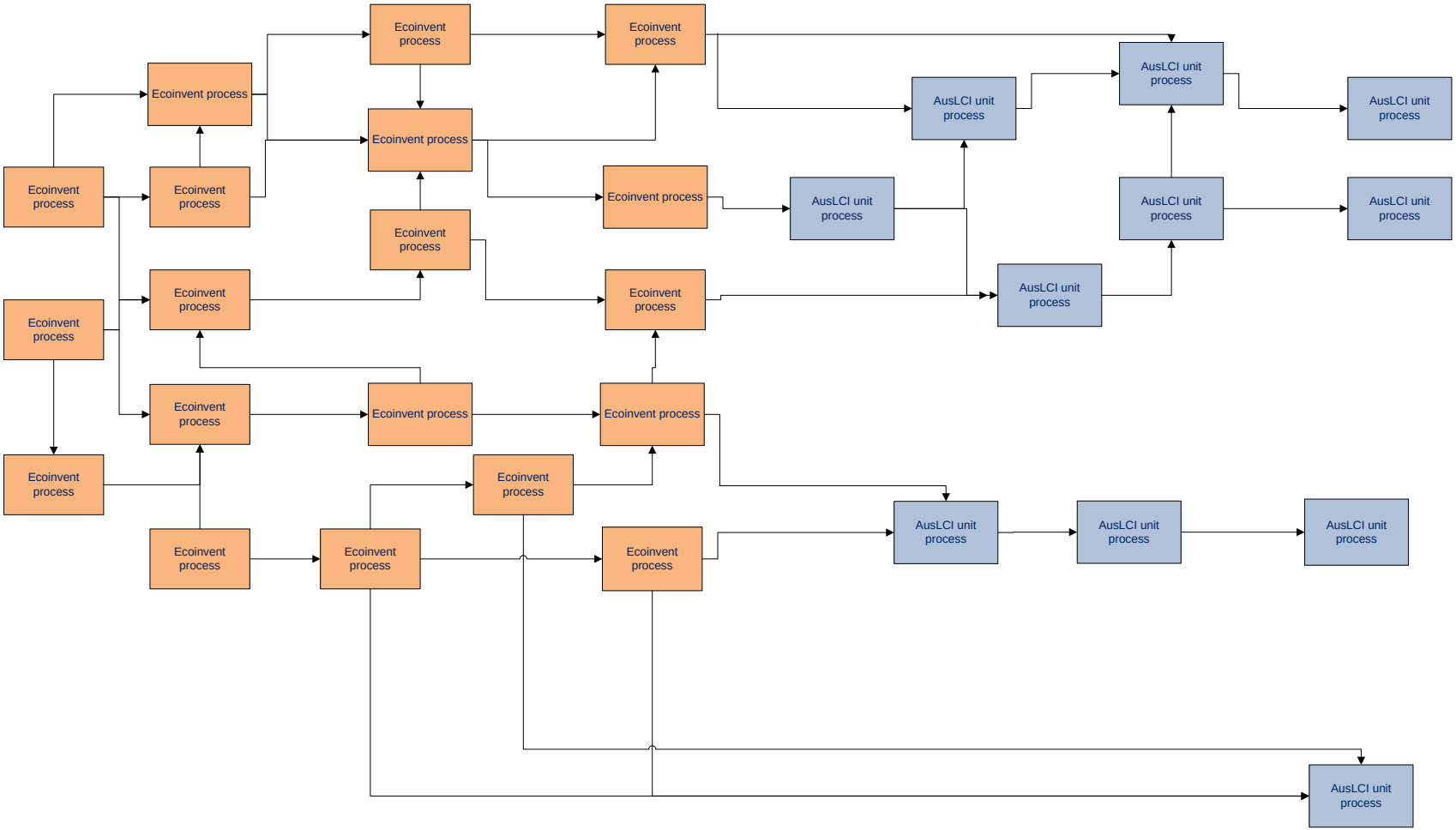


Figure 3: Ecoinvent (brown processes) is used to fill upstream gaps in AusLCI (Blue processes)

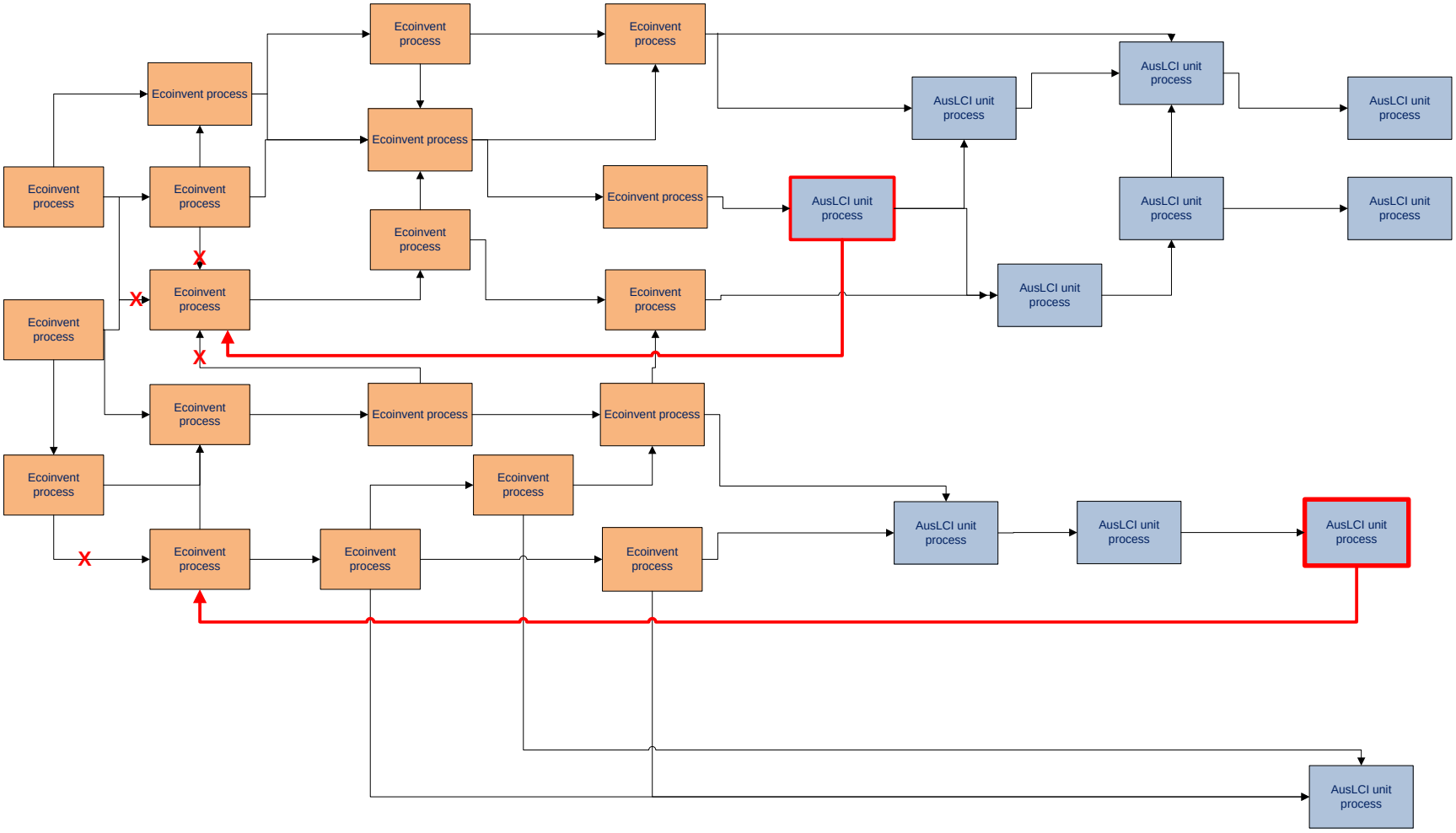


Figure 4: The red arrows show how AusLCI is linked back into key processes in ecoinvent, which are unlinked from their original inputs (red crosses)

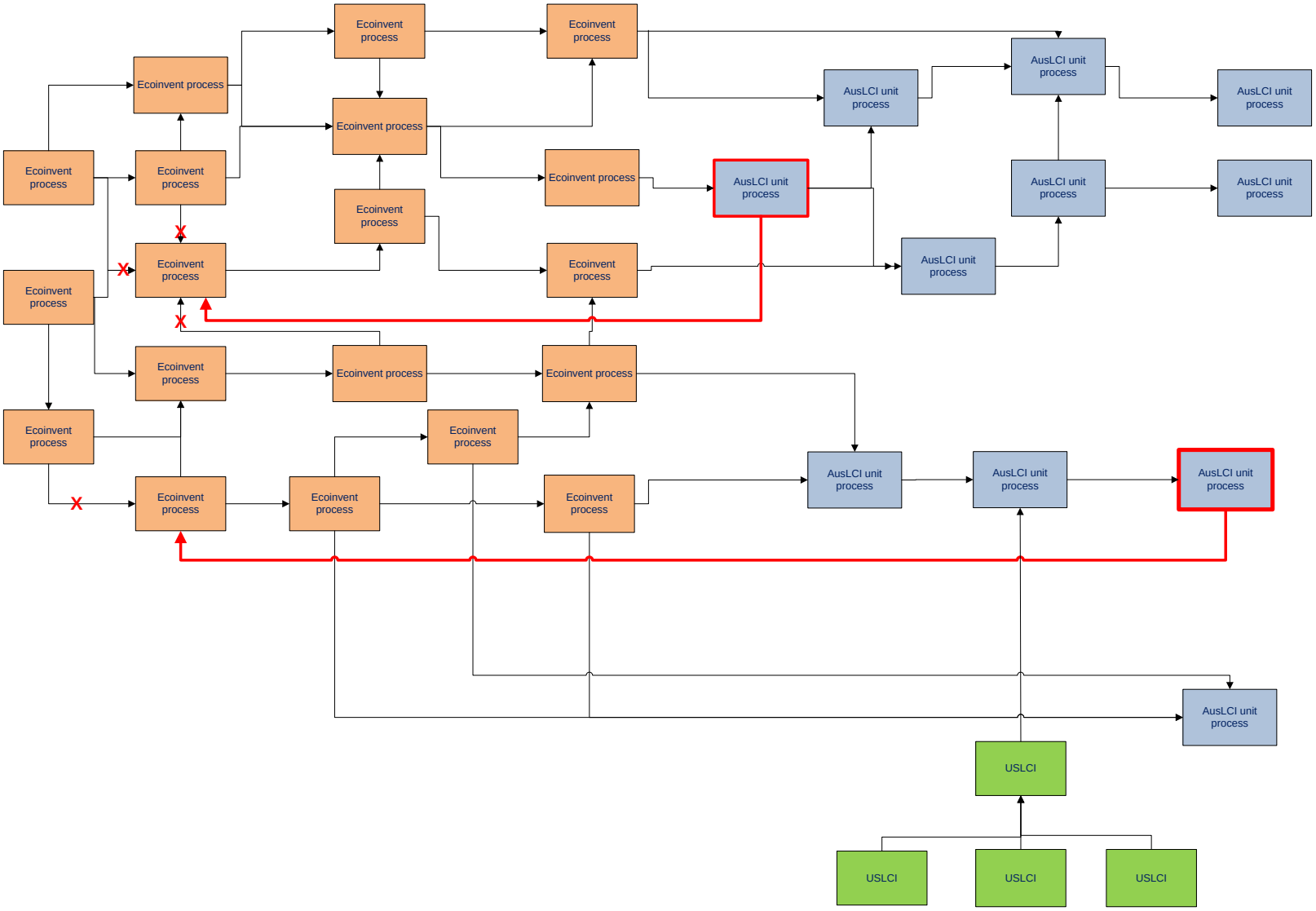


Figure 5: Other external databases (e.g. USLCI in green) may be used when they are more appropriate than ecoinvent

1.6 Publication of the AusLCI database

Only the first group of data outlined in the previous section are published under the AusLCI banner as:

- standalone unit process data
- system process (aggregated) results through calculation of elementary flows along the supply chain using data from the second and third categories.

Because the shadow database contains licensed datasets it cannot be published as such. However, a complete specification on how it is to be constructed (every alteration to the original datasets documented) is published. This will allow licensed users to be able to reconstruct the shadow database. External unmodified datasets will simply be referenced so that they can be linked to again by licensed users.

For users without access to these licensed databases, fully calculated, cradle to gate system process LCIs will be published providing the complete elementary flow LCI results but without the full disaggregation of the underlying unit process structure.

For transparency, the unreviewed AusLCI processes are published on the AusLCI website but are labelled as unreviewed AusLCI data.

This structure maintains usefulness for both professional and casual users while respecting data licensing rights.

The management of the AusLCI database and the shadow database is the responsibility of the AusLCI data manager under direction of the AusLCI Database Committee.

Data owners can update their data at any point and its suggested that data is check for currency every 5 years.

1.7 Attributional and consequential modelling

The data developed in a generic inventory are modelled based on an “attributional” approach, which seeks to establish the burdens associated with the production and use of a product, or with a specific service or process, at a point in time (typically in the recent past). The modules will not be developed as “consequential” LCAs, which seek to identify the environmental consequences of a decision or a proposed change in a system under study. However, through the development of disaggregated and transparent models, the data will support consequential LCA.

2 Summary of datasets

Below, in Table 1, is a brief description of the data sectors for the AusLCI dataset. Some data has separate reports, which describe the data collection and modelling, while other data have all the documentation embedded into the data format. A full list of unit processes in AusLCI is shown in Appendix A.

Table 1: Overview of data in AusLCI

Sector	
Agriculture	173
Transport	28
Energy	49
Fuels	36
Materials	91
Chemicals	5
Waste treatment	33
Total	379

2.1 Agricultural data

The agricultural datasets were developed as part of an AusAgLCI project. AusAgLCI was financially supported by industry via the Rural Industries Research and Development Corporation (RIRDC) in conjunction with the Cotton Research and Development Corporation (CRDC); Dairy Australia (DA); Grains Research and Development Corporation (GRDC); Forest and Wood Products Australia (FWPA); Horticulture Australia Limited (HAL); Meat and Livestock Australia (MLA); Sugar Research Australia (SRA); and project partners Department of Agriculture Fisheries and Forestry, Queensland (DAFF Qld); University of Southern Queensland (USQ); CSIRO; and Life Cycle Strategies Pty Ltd.

The datasets developed are shown in Table 2 and the methodology is available from the RIRDC **https://rirdc.infoservices.com.au/items/14-046**.

Additional Agriculture data on maize production and the production of residues including bagasse, cotton seed and wheat straw were developed as part of a bio-based materials project undertaken by Life Cycle Strategies for ALCAS with funding from the commonwealth government. The report for this project is available at **http://www.alcas.asn.au/AusLCI/index.php/Biobased**.

Table 2: Overview of agriculture data in AusLCI

Subcategory	Product inventory	Supporting processes	Author	Documentation
Cotton	5	15	AusAgLCI project	AusAgLCI methodology report
Sugar	7	10	AusAgLCI project	AusAgLCI methodology report

Subcategory	Product inventory	Supporting processes	Author	Documentation
Grain	19	19	AusAgLCI project	AusAgLCI methodology report
Horticulture	14	16	AusAgLCI project	AusAgLCI methodology report
Irrigation	19	19	AusAgLCI project	AusAgLCI methodology report
Animal feeds/ processes	17	13	AusAgLCI project	AusAgLCI methodology report
Residues	3		Bio-based materials project	**http://www.alcas.asn.au/AusLCI/Documents/Residues_LCI_V1.pdf**

2.2 Electricity data

Electricity data was developed based on the emission data reported (DIICCSRTE 2013) and using specific information on grid mixes from Electricity Gas Australia (Energy Supply Association Australia 2012). Other air and water pollution data were taken from the National Pollutant Inventory (Department of Environment and Heritage and Water 2011). Table 3 lists the datasets for electricity.

Table 3: Electricity datasets

Subcategory	Unit processes	Author	Documentation
High voltage	**10**	Life Cycle Strategies	Contained in processes
Low voltage	**10**	Life Cycle Strategies	Contained in processes
Electricity by fuel	**17**	Life Cycle Strategies	Contained in processes
Electricity mixes at generation	**10**	Life Cycle Strategies	Contained in processes

2.3 Fuels

Fuel data was developed for coal mine reports from selected Australian coal mines and from National Greenhouse Gas data (DIICCSRTE 2013). Natural gas inventories were developed using energy data from ABARE (ABARE 2011) and emissions data from (DIICCSRTE 2013). Biofuels data on ethanol was developed as part of a bio-based materials project and the report is available on the AusLCI website. Coal seam methane data was taken from a report by Worley Parsons (Clark, Hynes et al. 2011). Table 4 lists the datasets for fuel.

Table 4: Fuel datasets

Subcategory	Unit processes	Author	Documentation
Coal	6	Life Cycle Strategies	Contained in processes
Natural gas	21	Life Cycle Strategies	Contained in processes
Biofuels	8	Life Cycle Strategies	Contained in processes
Coal seam gas	1	Life Cycle Strategies	Contained in processes

2.4 Materials

Polypropylene and PVC data were developed by the manufacturing companies in Australia. An inventory report is available for PVC on the Australian Vinyls website **http://vinyl.org.au/images/PVC_LCI/PVC_LCI_Reportv1_6.pdf**. The timber data was developed as part of the bio-based materials project based on published data by CSIRO (England, May et al. 2013) and the report on the inventory is on the AusLCI website. The textile data is based on cotton and cotton linters and are part of the AusAgLCI project. The only mineral process currently is vermiculite, which is an unreviewed process used in agriculture inventories. Table 5 lists the datasets for materials.

Table 5: Datasets for materials

Subcategory	Unit processes	Author	Documentation
Polypropylene	1	RMIT/ Lyondell Basel	Contained in processes
PVC	2	Australian vinyls	http://vinyl.org.au/images/PVC_LCI/PVC_LCI_Reportv1_6.pdf
Softwood	6	Life Cycle Strategies	http://www.alcas.asn.au/AusLCI/Documents/Timber_LCI_v1.pdf
Hardwood	6	Life Cycle Strategies	http://www.alcas.asn.au/AusLCI/Documents/Timber_LCI_v1.pdf
Textiles	2	AusAgLCI project	AusAgLCI methodology report
Minerals	1	AusAgLCI project	Unreviewed processes

2.5 Chemicals

The organic chemicals included in the database are starch production, starch waste and gluten from wheat, which are adapted unreviewed processes. The inorganic chemical is zinc oxide, which is also an unreviewed process used in fertiliser mixes in the agricultural inventories. Table 6 lists the datasets for chemicals.

Table 6: Datasets for chemicals

Subcategory	Unit processes	Author	Documentation
Organic	4	Life Cycle Strategies	Unreviewed processes
Inorganic	1	AusAgLCI project	Unreviewed processes

2.6 Waste treatment

Waste treatment processes are for organic waste treatment and are based on organic degradation models published in the National Greenhouse Gas Accounts (DIICCSRTE 2013) with supplementary data on landfill operation from waste treatment LCA studies (Grant, James et al. 2003). A report of this data is provided on the AusLCI website **http://www.alcas.asn.au/AusLCI/Documents/Landfill_LCI_V1.pdf**. Two recycling and waste collection processes are unreviewed processes used for metal recycling of agricultural infrastructure. The incineration is methane gas combustion, which is adapted from ecoinvent with assumptions from the National Greenhouse Gas Accounts (DIICCSRTE 2013). The three other processes are to do with land application of materials from the sugar industry as part of the AusAgLCI project. Table 7 lists the datasets for waste treatment.

Table 7: Waste treatment datasets

Subcategory	Unit processes	Author	Documentation
Incineration	9	Life Cycle Strategies	**http://www.alcas.asn.au/AusLCI/Documents/Landfill_LCI_V1.pdf**
Landfill	16	Life Cycle Strategies	**http://www.alcas.asn.au/AusLCI/Documents/Landfill_LCI_V1.pdf**
Others	3	AusAgLCI project	Part of AusAgLCI project
Recycling	2	Life Cycle Strategies	Unreviewed processes
Waste collection	2	Life Cycle Strategies	Unreviewed processes

2.7 Transport

Transport inventories on road, air and rail freight were developed based on National Transport Model data produced by Adam Pekol consulting (Adam Pekol Consulting Pty Ltd 2011) with emission data taken from ecoinvent and (DIICCSRTE 2013). Transport infrastructure was specifically developed for sugar cane transport, while infrastructure for all other transport is taken directly from the ecoinvent shadow database. Given the international nature of shipping, Australian data were developed for general freight, however two inventories were developed for transport of vinyl chloride monomer as part of the PVC inventory because of the availability of primary data. Table 8 lists the datasets for transport.

Table 8: Transport datasets

Subcategory	Unit processes	Author	Documentation
Road	13	Life Cycle Strategies	Contained in processes
Infrastructure	4	Life Cycle Strategies	Contained in processes
Air	9	Life Cycle Strategies	Contained in processes
Water	2	Life Cycle Strategies	http://vinyl.org.au/images/PVC_LCI/PVC_LCI_Reportv1_6.pdf

2.8 Concrete

Concrete inventories have been developed based on data provided by Cement Industry Federation, Australia (CIF) and ecoinvent processes. The emissions have been adopted from National Pollutant Inventory database and ecoinvent wherever not available. Considerable amount of clinker is imported for making of cement therefore inventories have been developed keeping for cement made from domestic, imported and Australian average. The variation in transport modes and distance for the plants from mines have been considered. Concrete inventories have been modelled for various grades using cement quantity directly from BPIC. Table 9 lists the datasets for concrete.

Table 9: Concrete datasets

Subcategory	Unit processes	Author	Documentation
Concrete	15	Life Cycle Strategies	Concrete & Cement LCA report
Cement	6	Life Cycle Strategies	Concrete & Cement LCA report
Recycling	4	Life Cycle Strategies	Contained in processes
Others	11	Life Cycle Strategies	Contained in processes
Asphalt	6	Start-2-See	Contained in processes
Geopolymer	1	Start-2-See	Contained in processes

2.1 Water

Datasets on water supply have been developed by Lifecycles based on energy use data from CSIRO in 2002 Table 8 lists the datasets for transport.

Table 10: Transport datasets

Subcategory	Unit processes	Author	Documentation
State based	8	Life Cycle Strategies	Contained in processes
Catchment based	35	Life Cycle Strategies	Contained in processes

3 References

ABARE (2011). Energy in Australia 2011. Canberra ACT, ABARE, Australian Bureau of Agricultural Reseach Economics.

Adam Pekol Consulting Pty Ltd (2011). Australian Transport Facts 2011, Data tables.

CIF. "Cement Industry Federation website." Retrieved 14 March 2015, from http://www.cement.org.au/AustraliasCementIndustry/LocationofCementPlants.aspx.

Clark, T., R. Hynes, et al. (2011). Greenhouse Gas Emissions Study of Australian CSG to LNG, Worley Parsons.

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DIICCSRTE (2013). National Greenhouse Accounts Factors. Canberra, Department of Industry Innovation Climate Change Science Research and Tertiary Education, Commonwealth of Australia.

DIICCSRTE (2013). National Inventory Report (NIR) 2011; The Australian Government Submission to the United Nations Framework Convention on Climate Change April 2013. Canberra, Commonwealth of Australia, Department of Industry Innovation Climate Change Science Research and Tertiary Education.

Energy Supply Association Australia (2012). Energy Gas Australia 2012. Canberra, Energy Supply Association Australia.

England, J. R., B. May, et al. (2013). "Cradle-to-gate inventory of wood production from Australian softwood plantations and native hardwood forests: Carbon sequestration and greenhouse gas emissions." Forest Ecology and Management **302**(0): 295-307.

Grant, T., K. James, et al. (2003). Life Cycle Assessment of Waste and Resource Recovery Options (including energy from waste) - Final Report for EcoRecycle Victoria. Melbourne, Victoria, Centre for Design at RMIT University (www.cfd.rmit.edu.au).

Appendix A : Full list of unit processes

Unit process	Category	Sub category
almond hulls and shells, at huller and sheller	Agriculture	Animal foods
cotton, seed, at gin	Agriculture	Animal foods
cottonseed hulls, at mill	Agriculture	Animal foods
dry season mix, 30% urea, 5,4% P, with protein meal, at production	Agriculture	Animal foods
dry season mix, 8% urea, 2,8% P, with protein meal, at production	Agriculture	Animal foods
forage sorghum, irrigated, Darling Downs QLD	Agriculture	Animal foods
forage sorghum, irrigated, northern Victoria	Agriculture	Animal foods
health treatment and growth promotant, per feeder steer, NT	Agriculture	Animal foods
lucerne hay establishment, dryland, northern zone NSW	Agriculture	Animal foods
lucerne hay, dryland, northern zone NSW	Agriculture	Animal foods
maize, silage irrigated, northern Victoria	Agriculture	Animal foods
maize, silage, average, on farm	Agriculture	Animal foods
mineral block, 30% urea 3,6% P, at production	Agriculture	Animal foods
molasses, from sugar, at sugar mill, QLD	Agriculture	Animal foods
oaten hay, export, medium rainfall zone SA	Agriculture	Animal foods
pasture establishment, SE QLD	Agriculture	Animal foods
pasture establishment, top end, NT	Agriculture	Animal foods
pre-mix trace element, ruminant mineral supplement, at production	Agriculture	Animal foods
straw, from wheat, central east, NSW, at farm	Agriculture	Animal foods
vaccination and anthelmintic, herd requirement per breeder, northern cattle	Agriculture	Animal foods
weaner Block, 7,1% Urea 0,5% P, at production	Agriculture	Animal foods
wet season mix, 0% N 21% P, at production	Agriculture	Animal foods
bran, wheat, conventional	Agriculture	Food
cottonseed oil, at oil mill	Agriculture	Food
flour milling, wheat, conventional	Agriculture	Food
flour, wheat, conventional	Agriculture	Food
germ, wheat, conventional	Agriculture	Food
sugar cane milling, QLD	Agriculture	Food
sugar, raw, at mill, QLD	Agriculture	Food
peat, imported	Agriculture	Infrastructure
plastic bag, banana bunch cover	Agriculture	Infrastructure
plastic mulch, 25micron, at plant	Agriculture	Infrastructure
potting mix production and application, for seedlings	Agriculture	Infrastructure
shed, bare floor	Agriculture	Infrastructure
water pump, irrigation, 25kg	Agriculture	Infrastructure

Unit process	Category	Sub category
wire, for fencing, trellis, gates, at regional storehouse	Agriculture	Infrastructure
irrigation, centre pivot irrigation system	Agriculture	Irrigation
irrigation, drip irrigation system	Agriculture	Irrigation
irrigation, hose move sprinkler system	Agriculture	Irrigation
irrigation, pipe irrigation system	Agriculture	Irrigation
irrigation, solid set irrigation system	Agriculture	Irrigation
irrigation, travel spray boom irrigation system	Agriculture	Irrigation
irrigation, under tree irrigation system	Agriculture	Irrigation
irrigation, flood or furrow irrigation	Agriculture	Irrigation
irrigation, travelling gun irrigation system	Agriculture	Irrigation
centre pivot irrigation system, production, per ha	Agriculture	Irrigation infrastructure
drip irrigation system (sugarcane), production, per ha	Agriculture	Irrigation infrastructure
drip irrigation system, production, per ha	Agriculture	Irrigation infrastructure
hose move sprinkler irrigation system, production, per ha	Agriculture	Irrigation infrastructure
pipe irrigation system, production, per ha	Agriculture	Irrigation infrastructure
solid set sprinkler irrigation system, production, per ha	Agriculture	Irrigation infrastructure
travel spray boom irrigation system (sugarcane), production, per ha	Agriculture	Irrigation infrastructure
travel spray boom irrigation system, production, per ha	Agriculture	Irrigation infrastructure
travelling gun irrigation system (sugarcane), production, per ha	Agriculture	Irrigation infrastructure
under tree irrigation system, production, per ha	Agriculture	Irrigation infrastructure
pumping, irrigation, 10m pumping depth, 100% electricity, QLD	Agriculture	Irrigation pumping
pumping, irrigation, 10m pumping depth, 50% electricity, NSW	Agriculture	Irrigation pumping
pumping, irrigation, 15m pumping depth, 100% diesel	Agriculture	Irrigation pumping
pumping, irrigation, 15m pumping depth, 100% electricity, SA	Agriculture	Irrigation pumping
pumping, irrigation, 15m total pumping head, 100% diesel	Agriculture	Irrigation pumping
pumping, irrigation, 20m pumping depth, 100% electricity, QLD	Agriculture	Irrigation pumping
pumping, irrigation, 25m total pumping head, 100% diesel	Agriculture	Irrigation pumping
pumping, irrigation, 40m total pumping head, 100% diesel	Agriculture	Irrigation pumping
pumping, irrigation, 40m total pumping head, 100% electricity	Agriculture	Irrigation pumping
pumping, irrigation, 40m total pumping head, 100% electricity, QLD	Agriculture	Irrigation pumping
pumping, irrigation, 40m total pumping head, 100% electricity, SA	Agriculture	Irrigation pumping
pumping, irrigation, 45m pumping depth, 0% electricity, NSW	Agriculture	Irrigation pumping
pumping, irrigation, 45m total pumping head, 100% electricity, SA	Agriculture	Irrigation pumping
pumping, irrigation, 50m total pumping head, 100% electricity, QLD	Agriculture	Irrigation pumping
pumping, irrigation, 5m total pumping head, 100% diesel	Agriculture	Irrigation pumping
pumping, irrigation, 65m total pumping head, 100% electricity, QLD	Agriculture	Irrigation pumping
pumping, irrigation, 70m total pumping head, 100% diesel	Agriculture	Irrigation pumping
pumping, irrigation, 80m total pumping head, 100% electricity, NSW	Agriculture	Irrigation pumping
air blast spraying, orchards	Agriculture	Operations
bed forming, cotton	Agriculture	Operations
bed forming, horticulture	Agriculture	Operations

Unit process	Category	Sub category
boom spraying, cotton	Agriculture	Operations
boom spraying, horticulture	Agriculture	Operations
bulldozer operation, medium load factor	Agriculture	Operations
cattle transport, km per head, prime mover + b-double	Agriculture	Operations
control of brigalow suckers, Graslan aerial application	Agriculture	Operations
cotton, ginning	Agriculture	Operations
cultivating, broadacre crop	Agriculture	Operations
cultivating, cotton	Agriculture	Operations
cultivating, large implement, horticulture	Agriculture	Operations
cultivating, medium implement, horticulture	Agriculture	Operations
Dipping cattle for external parasites, per head through plunge dip	Agriculture	Operations
disc ploughing, broadacre crop	Agriculture	Operations
discing, cotton	Agriculture	Operations
fertiliser application, cotton	Agriculture	Operations
fertiliser side dressing, horticulture	Agriculture	Operations
fertiliser spreading, cotton	Agriculture	Operations
fertiliser spreading, horticulture	Agriculture	Operations
fertilizing, broadacre crop, pre & post-emergence	Agriculture	Operations
grader operation, broadacre crop, medium load factor	Agriculture	Operations
grain collection, broadacre, in-field with tractor and bin	Agriculture	Operations
harrowing, horticulture	Agriculture	Operations
harvest and haulout, burnt cane	Agriculture	Operations
harvest and haulout, green cane	Agriculture	Operations
harvesting, broadacre crop, combine less than 200kW	Agriculture	Operations
harvesting, cotton	Agriculture	Operations
harvesting, specialised machine, horticulture, 150kW combine	Agriculture	Operations
hay baling, large square bales, broadacre crop	Agriculture	Operations
hay baling, round bales, broadacre crop	Agriculture	Operations
hay baling, small square bales, broadacre crop	Agriculture	Operations
hay mowing, broadacre crop	Agriculture	Operations
hay raking, broadacre crop	Agriculture	Operations
inter-row cultivation, horticulture	Agriculture	Operations
inter-row tractor, horticulture	Agriculture	Operations
levelling, cotton	Agriculture	Operations
liming, broadacre crop, pre & post-emergence	Agriculture	Operations
mulching, cotton	Agriculture	Operations
offset disc harrowing, horticulture	Agriculture	Operations
picking, cotton	Agriculture	Operations
planting, broadacre crop, soil clay content greater than 20%	Agriculture	Operations
planting, broadacre crop, soil clay content 0 to 10%	Agriculture	Operations
planting, broadacre crop, soil clay content 10 to 20%	Agriculture	Operations
planting, cotton	Agriculture	Operations

Unit process	Category	Sub category
precision planting, horticulture	Agriculture	Operations
ripping, large implement, horticulture	Agriculture	Operations
ripping, medium implement, horticulture	Agriculture	Operations
rolling, cotton	Agriculture	Operations
root cutting, cotton	Agriculture	Operations
rotary hoeing, medium implement, horticulture	Agriculture	Operations
savanna burning, northern Australia woodland, QLD & NT	Agriculture	Operations
savanna burning, open eucalypt woodland, late dry season, QLD & NT	Agriculture	Operations
scarifying, broadacre crop	Agriculture	Operations
seedling transplanting, horticulture	Agriculture	Operations
spraying, aerial, broadacre crop	Agriculture	Operations
spraying, aerial, cotton	Agriculture	Operations
spraying, broadacre crop, pre & post-emergence	Agriculture	Operations
windrowing, broadacre crop	Agriculture	Operations
bagasse, at mill	Agriculture	Others
canola meal, at oil mill	Agriculture	Plant oils
canola oil pressing, at oil mill	Agriculture	Plant oils
canola oil, at oil mill	Agriculture	Plant oils
cottonseed meal, at oil mill	Agriculture	Plant oils
cottonseed oil production, at oil mill	Agriculture	Plant oils
almond kernels, at huller and sheller	Agriculture	Plant production
almonds, unshelled, South Australia	Agriculture	Plant production
avocado, hass, Brisbane Moreton, growing	Agriculture	Plant production
avocado, hass, Brisbane Moreton, harvested, at farm	Agriculture	Plant production
avocado, hass, Brisbane Moreton, orchard establishment	Agriculture	Plant production
banana, cavendish, wet tropics, harvested, at farm	Agriculture	Plant production
banana, cavendish, wet tropics, plant cycle	Agriculture	Plant production
banana, cavendish, wet tropics, ratoon cycle	Agriculture	Plant production
barley, feed grade, no-till, northern east NSW, at farm	Agriculture	Plant production
barley, malt grade, short fallow, no-till, central west NSW, at farm	Agriculture	Plant production
broccoli, winter, Lockyer Valley, harvested, at farm	Agriculture	Plant production
canola, average, at farm	Agriculture	Plant production
canola, no-till, great southern WA, at farm	Agriculture	Plant production
canola, no-till, north east NSW, at farm	Agriculture	Plant production
capsicum, Burdekin, harvested, at farm	Agriculture	Plant production
chickpeas, no-till, north east NSW, at farm	Agriculture	Plant production
cotton, seed cotton, Australia, at farm	Agriculture	Plant production
cotton, seed cotton, dryland, central zone, at farm	Agriculture	Plant production
cotton, seed cotton, irrigated, central zone, at farm	Agriculture	Plant production
cotton, seed cotton, irrigated, northern zone, at farm	Agriculture	Plant production
cotton, seed cotton, irrigated, southern zone, at farm	Agriculture	Plant production

Unit process	Category	Sub category
lettuce, winter, Lockyer Valley, harvested, at farm	Agriculture	Plant production
lupins, medium rainfall zone SA, at farm	Agriculture	Plant production
maize, grain, average, on farm	Agriculture	Plant production
maize, grain, irrigated, northern NSW, on farm	Agriculture	Plant production
maize, grain irrigated, Darling Downs QLD, on farm	Agriculture	Plant production
maize, grain, dryland, QLD, on farm	Agriculture	Plant production
maize, grain, irrigated, northern Victoria, at farm	Agriculture	Plant production
maize, silage irrigated, Darling Downs QLD	Agriculture	Plant production
potato, Lockyer Valley, harvested, at farm	Agriculture	Plant production
seedling, for transplant, at nursery	Agriculture	Plant production
sorghum, dryland north west NSW, on farm	Agriculture	Plant production
sorghum, irrigated, northern zone NSW, on farm	Agriculture	Plant production
sorghum, no-till, north east NSW, at farm	Agriculture	Plant production
strawberry, Brisbane Moreton, harvested, at farm	Agriculture	Plant production
sugarcane, harvested, at mill, average QLD	Agriculture	Plant production
sugarcane, harvested, at mill, Bundaberg	Agriculture	Plant production
sugarcane, harvested, at mill, Burdekin	Agriculture	Plant production
sugarcane, harvested, at mill, Herbert	Agriculture	Plant production
sugarcane, harvested, at mill, Mackay	Agriculture	Plant production
sugarcane, harvested, at mill, wet tropics	Agriculture	Plant production
sweet corn, Lockyer Valley, harvested, at farm	Agriculture	Plant production
tomato, trellis, Burdekin, harvested, at farm	Agriculture	Plant production
wheat, central east, NSW, at farm	Agriculture	Plant production
wheat, Darling Downs, QLD, at farm	Agriculture	Plant production
wheat, grain, average, at farm	Agriculture	Plant production
wheat, high rainfall zone, SA, at farm	Agriculture	Plant production
wheat, Kellerberrin region, WA, at farm	Agriculture	Plant production
wheat, low rainfall zone, SA, at farm	Agriculture	Plant production
wheat, medium rainfall zone, SA, at farm	Agriculture	Plant production
wheat, Narrogin region, WA, at farm	Agriculture	Plant production
wheat, North West NSW, at farm	Agriculture	Plant production
wheat, no-till, Central QLD, at farm	Agriculture	Plant production
zinc nitrate	Chemicals	Inorganic
gluten, from wheat starch production	Chemicals	Organic
starch plant operation, from wheat flour	Chemicals	Organic
starch waste, from wheat starch production	Chemicals	Organic
starch, from wheat	Chemicals	Organic
electricity brown coal SA, at power plant	Electricity	Electricity by fuel
electricity brown coal VIC, at power plant	Electricity	Electricity by fuel
electricity from bagasse, at mill	Electricity	Electricity by fuel
electricity, black coal NSW, at power plant	Electricity	Electricity by fuel
electricity, black coal QLD, at power plant	Electricity	Electricity by fuel

Unit process	Category	Sub category
electricity, black coal WA, at power plant	Electricity	Electricity by fuel
electricity, coal seam methane, at power plant	Electricity	Electricity by fuel
electricity, natural gas, CC, at power plant	Electricity	Electricity by fuel
electricity, natural gas, CC, NT, at power plant	Electricity	Electricity by fuel
electricity, natural gas, CC, SA, at power plant	Electricity	Electricity by fuel
electricity, natural gas, CC, TAS, at power plant	Electricity	Electricity by fuel
electricity, natural gas, CC, WA, at power plant	Electricity	Electricity by fuel
electricity, natural gas, GT, at power plant	Electricity	Electricity by fuel
electricity, natural gas, GT, NT, at power plant	Electricity	Electricity by fuel
electricity, natural gas, GT, WA, at power plant	Electricity	Electricity by fuel
electricity, natural gas, steam, at power plant	Electricity	Electricity by fuel
electricity, natural gas, steam, SA, at power plant	Electricity	Electricity by fuel
electricity mix, Australia	Electricity	Electricity mixes at generation
electricity mix, coal and lignite	Electricity	Electricity mixes at generation
electricity mix, eastern Australian	Electricity	Electricity mixes at generation
electricity mix, New South Wales	Electricity	Electricity mixes at generation
electricity mix, Northern Territory	Electricity	Electricity mixes at generation
electricity mix, Queensland	Electricity	Electricity mixes at generation
electricity mix, South Australia	Electricity	Electricity mixes at generation
electricity mix, Tasmania	Electricity	Electricity mixes at generation
electricity mix, Victoria	Electricity	Electricity mixes at generation
electricity mix, western Australia	Electricity	Electricity mixes at generation
electricity, high voltage, Australian	Electricity	High voltage
electricity, high voltage, coal Australian average	Electricity	High voltage
electricity, high voltage, eastern Australian	Electricity	High voltage
electricity, high voltage, New South Wales	Electricity	High voltage
electricity, high voltage, Northern Territory	Electricity	High voltage
electricity, high voltage, Queensland	Electricity	High voltage
electricity, high voltage, South Australia	Electricity	High voltage
electricity, high voltage, Tasmania	Electricity	High voltage
electricity, high voltage, Victoria	Electricity	High voltage
electricity, high voltage, Western Australia	Electricity	High voltage
electricity, low voltage, Australian	Electricity	Low voltage
electricity, low voltage, coal Australian average	Electricity	Low voltage
electricity, low voltage, eastern Australia	Electricity	Low voltage
electricity, low voltage, New South Wales	Electricity	Low voltage
electricity, low voltage, Northern Territory	Electricity	Low voltage

Unit process	Category	Sub category
electricity, low voltage, Queensland	Electricity	Low voltage
electricity, low voltage, South Australia	Electricity	Low voltage
electricity, low voltage, Tasmania	Electricity	Low voltage
electricity, low voltage, Victoria	Electricity	Low voltage
electricity, low voltage, Eestern Australia	Electricity	Low voltage
DDGS, from soghum, at plant	Fuels	Biofuels
DDGS, from wheat and starch waste, at plant	Fuels	Biofuels
ethanol, average, at plant	Fuels	Biofuels
ethanol, from molasses, at plant	Fuels	Biofuels
ethanol, from sorghum, at plant	Fuels	Biofuels
ethanol, from wheat and starch waste	Fuels	Biofuels
sorghum to ethanol distillery operation	Fuels	Biofuels
wheat and starch waste to ethanol distillery operation	Fuels	Biofuels
black coal, average, at mine	Fuels	Coal
black coal, NSW, at mine	Fuels	Coal
black coal, QLD, at mine	Fuels	Coal
black coal, WA, at mine	Fuels	Coal
lignite, South Australia, at mine	Fuels	Coal
lignite, Victoria, at mine	Fuels	Coal
coal seam methane production and compression	Fuels	Coal seam gas
natural gas products, at separation plant	Fuels	Natural gas
natural gas products, at separation plant, bass strait	Fuels	Natural gas
natural gas products, at separation plant, central Australia	Fuels	Natural gas
natural gas products, at separation plant, Queensland	Fuels	Natural gas
natural gas products, at separation plant, Western Australia	Fuels	Natural gas
natural gas, high pressure, Australia	Fuels	Natural gas
natural gas, high pressure, New South Wales	Fuels	Natural gas
natural gas, high pressure, Northern Territory	Fuels	Natural gas
natural gas, high pressure, Queensland	Fuels	Natural gas
natural gas, high pressure, South Australia	Fuels	Natural gas
natural gas, high pressure, Tasmania	Fuels	Natural gas
natural gas, high pressure, Victoria	Fuels	Natural gas
natural gas, high pressure, Western Australia	Fuels	Natural gas
natural gas, low pressure, Australia	Fuels	Natural gas
natural gas, low pressure, New South Wales	Fuels	Natural gas
natural gas, low pressure, Northern Territory	Fuels	Natural gas
natural gas, low pressure, Queensland	Fuels	Natural gas
natural gas, low pressure, South Australia	Fuels	Natural gas
natural gas, low pressure, Tasmania	Fuels	Natural gas
natural gas, low pressure, Victoria	Fuels	Natural gas
natural gas, low pressure, Western Australia	Fuels	Natural gas
asphalt, 2% virgin bitumen, at plant/AU U	Materials	Asphalt

Unit process	Category	Sub category
asphalt, 3% virgin bitumen, at plant/AU U	Materials	Asphalt
asphalt, 4% virgin bitumen, at plant/AU U	Materials	Asphalt
asphalt, 5% virgin bitumen, at plant/AU U	Materials	Asphalt
asphalt, Recycled Asphalt Product (RAP), at point of origin/AU U	Materials	Asphalt
asphalt, standard mix, 5.5% virgin bitumen, at plant/AU U	Materials	Asphalt
concrete 20 MPa 30% fly ash, at batching plant/AU U	Materials	Concrete
concrete 20 MPa 30% GGBFS, at batching plant/AU U	Materials	Concrete
concrete 20 MPa, at batching plant/AU U	Materials	Concrete
concrete 25 MPa 30% fly ash, at batching plant/AU U	Materials	Concrete
concrete 25 MPa 30% GGBFS, at batching plant/AU U	Materials	Concrete
concrete 25 MPa, at batching plant/AU U	Materials	Concrete
concrete 32 MPa 30% fly ash, at batching plant/AU U	Materials	Concrete
concrete 32 MPa 30% GGBFS, at batching plant/AU U	Materials	Concrete
concrete 32 MPa, at batching plant/AU U	Materials	Concrete
concrete 40 MPa 30% fly ash, at batching plant/AU U	Materials	Concrete
concrete 40 MPa 30% GGBFS, at batching plant/AU U	Materials	Concrete
concrete 40 MPa, at batching plant/AU U	Materials	Concrete
concrete 50 MPa 30% fly ash, at batching plant/AU U	Materials	Concrete
concrete 50 MPa 30% GGBFS, at batching plant/AU U	Materials	Concrete
concrete 50 MPa, at batching plant/AU U	Materials	Concrete
concrete pipes, geopolymer, at plant, AU U	Materials	Concrete
fly ash, delivered to plant/AU U	Materials	Cement
general purpose cement, at plant/AU U	Materials	Cement
general purpose cement, Australian average/AU U	Materials	Cement
general purpose cement, imported clinker/AU U	Materials	Cement
ground granulated blast furnace slag, at cement plant/AU U	Materials	Cement
ordinary portland cement, at plant/AU U	Materials	Cement
ordinary portland cement, Australian average/AU U	Materials	Cement
ordinary portland cement, imported clinker/AU U	Materials	Cement
blast furnace slag allocation, at steel plant/AU U	Materials	Cement
expanded vermiculite, at plant	Materials	Minerals
polypropylene, PP, at factory gate	Materials	Plastics
cotton, lint, at gin	Materials	Textiles
cottonseed linters, at mill	Materials	Textiles
hardwood poles	Materials	Wood
hardwood pulp log, low quality	Materials	Wood
hardwood sawlog, high quality	Materials	Wood
hardwood sawlog, low quality	Materials	Wood
hardwood timber production	Materials	Wood
hardwood veneer log	Materials	Wood
softwood pole	Materials	Wood
softwood pulp log	Materials	Wood

Unit process	Category	Sub category
softwood sawlog, high quality	Materials	Wood
softwood sawlog, low quality	Materials	Wood
softwood timber production	Materials	Wood
softwood, woodchips	Materials	Wood
air freight domestic	Transport	Air
air freight, general aviation	Transport	Air
air freight, international	Transport	Air
air passenger travel, domestic	Transport	Air
air passenger travel, international	Transport	Air
air passenger, general aviation	Transport	Air
aircraft engine, domestic	Transport	Air
aircraft engine, domestic, aviation gasoline	Transport	Air
aircraft engine, international	Transport	Air
locomotive, cane train	Transport	Infrastructure
rail bins, cane transport	Transport	Infrastructure
railway track, cane transport	Transport	Infrastructure
transport, cane, rail	Transport	Infrastructure
operation, freight train	Transport	Rail
transport, freight, rail	Transport	Rail
operation, truck 16 to 28t, fleet average	Transport	Road
operation, truck 28t, fleet average	Transport	Road
operation, truck 3,5 to 16t, fleet average	Transport	Road
operation, van, diesel less than 3,5t	Transport	Road
operation, van, LPG less than 3,5t	Transport	Road
operation, van, petrol less than 3,5t	Transport	Road
transport, truck, 16 to 28t with 11t load	Transport	Road
transport, truck, 16 to 28t, fleet average	Transport	Road
transport, truck, 28t, fleet average	Transport	Road
transport, truck, 3,5 to 16t with 12t load	Transport	Road
transport, truck, 3,5 to 16t, fleet average	Transport	Road
transport, truck, 40t load	Transport	Road
transport, van 3,5t	Transport	Road
operation, VCM freight ship	Transport	Water
transport, VCM freight ship	Transport	Water
combustion, bagasse, in mill, QLD	Waste treatment	Incineration
methane, combustion for power generation	Waste treatment	Incineration
methane, combustion for power generation, NSW	Waste treatment	Incineration
methane, combustion for power generation, NT	Waste treatment	Incineration
methane, combustion for power generation, QLD	Waste treatment	Incineration
methane, combustion for power generation, SA	Waste treatment	Incineration
methane, combustion for power generation, TAS	Waste treatment	Incineration
methane, combustion for power generation, VIC	Waste treatment	Incineration

Unit process	Category	Sub category
methane, combustion for power generation, WA	Waste treatment	Incineration
waste treatment, coated paper, at landfill	Waste treatment	Landfill
waste treatment, corrugated containers, at landfill	Waste treatment	Landfill
waste treatment, cotton oil production waste, at landfill	Waste treatment	Landfill
waste treatment, food, at landfill	Waste treatment	Landfill
waste treatment, garden and green, at landfill	Waste treatment	Landfill
waste treatment, inert waste, at landfill	Waste treatment	Landfill
waste treatment, mixed paper, at landfill	Waste treatment	Landfill
waste treatment, municipal waste average, at landfill	Waste treatment	Landfill
waste treatment, nappies, at landfill	Waste treatment	Landfill
waste treatment, newsprint, at landfill	Waste treatment	Landfill
waste treatment, office paper, at landfill	Waste treatment	Landfill
waste treatment, rubber and leather, at landfill	Waste treatment	Landfill
waste treatment, sludge, at landfill	Waste treatment	Landfill
waste treatment, textiles, at landfill	Waste treatment	Landfill
waste treatment, wood and wood-waste, at landfill	Waste treatment	Landfill
waste treatment, wood and wood-waste, low degradation assumption, at landfill	Waste treatment	Landfill
disposal, silage from molasses fermentation	Waste treatment	Others
land application of bagasse boiler ash to cane fields	Waste treatment	Others
land application of mill mud to cane fields	Waste treatment	Others
recycling aluminium	Waste treatment	Recycling
recycling steel	Waste treatment	Recycling
collection and processing of aluminium scrap	Waste treatment	Waste collection
collection and processing of steel scrap	Waste treatment	Waste collection
tap water, at user, Australia/AU U	Water supply	State averages
tap water, at user, New South Wales/AU U	Water supply	State averages
tap water, at user, Northern Territory/AU U	Water supply	State averages
tap water, at user, Queensland/AU U	Water supply	State averages
tap water, at user, South Australia/AU U	Water supply	State averages
tap water, at user, Tasmania/AU U	Water supply	State averages
tap water, at user, Victoria/AU U	Water supply	State averages
tap water, at user, Western Australia/AU U	Water supply	State averages
tap water, at user, Barwon-Darling, NSW/AU U	Water supply	By catchment
tap water, at user, Border Rivers, NSW and QLD/AU U	Water supply	By catchment
tap water, at user, Burdekin River, QLD/AU U	Water supply	By catchment
tap water, at user, Burnett and Brisbane River, QLD/AU U	Water supply	By catchment
tap water, at user, Campaspe, VIC/AU U	Water supply	By catchment
tap water, at user, Condamine-Balonne, NSW and QLD/AU U	Water supply	By catchment
tap water, at user, Eastern Mount Lofty Ranges, SA/AU U	Water supply	By catchment
tap water, at user, Esperance Coast, WA/AU U	Water supply	By catchment
tap water, at user, Fitzroy River, QLD/AU U	Water supply	By catchment

Unit process	Category	Sub category
tap water, at user, Goulburn-Broken, VIC/AU U	Water supply	By catchment
tap water, at user, Gulf of Carpentaria, NT and QLD/AU U	Water supply	By catchment
tap water, at user, Gwydir, NSW/AU U	Water supply	By catchment
tap water, at user, Indian Ocean, WA/AU U	Water supply	By catchment
tap water, at user, Lachlan, NSW/AU U	Water supply	By catchment
tap water, at user, Lake Eyre, NSW, QLD, NT and SA/AU U	Water supply	By catchment
tap water, at user, Loddon-Avoca, VIC/AU U	Water supply	By catchment
tap water, at user, Macquarie-Castlereagh, NSW/AU U	Water supply	By catchment
tap water, at user, Moonie, QLD/AU U	Water supply	By catchment
tap water, at user, Moore Hill rivers, WA/AU U	Water supply	By catchment
tap water, at user, Murray, NSW, VIC and SA/AU U	Water supply	By catchment
tap water, at user, Murrumbidgee, NSW/AU U	Water supply	By catchment
tap water, at user, Namoi, NSW/AU U	Water supply	By catchment
tap water, at user, NE Coast other than Burd., Fitz.,..., QLD/AU U	Water supply	By catchment
tap water, at user, North Western Plateau, WA and NT/AU U	Water supply	By catchment
tap water, at user, Ovens, VIC/AU U	Water supply	By catchment
tap water, at user, Paroo, NSW and QLD/AU U	Water supply	By catchment
tap water, at user, South Australian Gulf, SA/AU U	Water supply	By catchment
tap water, at user, South East Coast, NSW, VIC and SA/AU U	Water supply	By catchment
tap water, at user, South Western Plateau, WA/AU U	Water supply	By catchment
tap water, at user, SW Coast other than Esp., Avon, ..., WA/AU U	Water supply	By catchment
tap water, at user, Swan Coast, WA/AU U	Water supply	By catchment
tap water, at user, Tasmania, TAS/AU U	Water supply	By catchment
tap water, at user, Timor Sea, NT and WA/AU U	Water supply	By catchment
tap water, at user, Warrego, NSW and QLD/AU U	Water supply	By catchment
tap water, at user, Wimmera, VIC/AU U	Water supply	By catchment

Processes removed from AusLCI

The following processes have been removed from the database as PVC is no longer produced in Australia

polyvinylchloride, granulate, at plant	Materials	Plastics
ethylene dichloride-vinyl chloride monomer, at plant	Chemicals	Organic

Appendix B : Modifications applied to ecoinvent 2.2 to produce the shadow database

The following is a list of ecoinvent processes which have been replaced by AusLCI data. Unless otherwise specified the link is on a one to one basis.

Ecoinvent 2.2 process	AusLCI process(es)
barley grains extensive, at farm/kg/CH	barley, feed grade, no-till, northern east NSW, at farm/AU U
barley grains IP, at farm/kg/CH	barley, malt grade, short fallow, no-till, central west NSW, at farm/AU U
cotton fibres, at farm/kg/US	cotton, lint, at gin/AU U
cotton fibres, ginned, at farm/kg/CN	cotton, lint, at gin/AU U
cotton seed, at farm/kg/CN	cotton, seed cotton, Australia, at farm/AU U
cotton seed, at farm/kg/US	cotton, seed cotton, Australia, at farm/AU U
electricity, low voltage, at grid/kWh/CH	electricity, low voltage, Australian/AU U
electricity, medium voltage, at grid/kWh/BE	electricity, low voltage, Australian/AU U
electricity, medium voltage, at grid/kWh/CH	electricity, low voltage, Australian/AU U
electricity, medium voltage, at grid/kWh/DE	electricity, low voltage, Australian/AU U
electricity, medium voltage, production NORDEL, at grid/kWh/NORDEL	electricity, low voltage, Australian/AU U
electricity, medium voltage, production UCTE, at grid/kWh/UCTE	electricity, low voltage, Australian/AU U
ethanol, 99.7% in H2O, from biomass, at distillation/kg/BR	ethanol, average, at plant/AU U
ethanol, 99.7% in H2O, from biomass, at distillation/kg/CH	ethanol, average, at plant/AU U
ethanol, 99.7% in H2O, from biomass, at distillation/kg/CN	ethanol, average, at plant/AU U
ethanol, 99.7% in H2O, from biomass, at distillation/kg/RER	ethanol, average, at plant/AU U
ethanol, 99.7% in H2O, from biomass, at distillation/kg/US	ethanol, average, at plant/AU U
grain maize IP, at farm/kg/CH	maize, grain, average, on farm/AU U
hard coal, at mine/kg/AU	black coal, NSW, at mine/AU U, (56.2%) black coal, QLD, at mine/AU U, (38.3%) black coal, WA, at mine/AU U (5.43%)
hard coal, at mine/kg/CN	black coal, average, at mine/AU U
hard coal, at mine/kg/CPA	black coal, average, at mine/AU U
hard coal, at mine/kg/EEU	black coal, average, at mine/AU U
hard coal, at mine/kg/RLA	black coal, average, at mine/AU U
hard coal, at mine/kg/RNA	black coal, average, at mine/AU U
hard coal, at mine/kg/RU	black coal, average, at mine/AU U
hard coal, at mine/kg/WEU	black coal, average, at mine/AU U

Ecoinvent 2.2 process	AusLCI process(es)
hard coal, at mine/kg/ZA	black coal, average, at mine/AU U
lignite, at mine/kg/RER	lignite, Victoria, at mine/AU U
logs, hardwood, at forest/m3/RER	hardwood sawlog, high quality/AU U
logs, mixed, at forest/m3/RER	hardwood sawlog, high quality/AU U
logs, softwood, at forest/m3/RER	softwood sawlog, high quality/AU U
molasses, from sugar beet, at sugar refinery/kg/CH	molasses, from sugar, at sugar mill, QLD/AU U
natural gas, at production offshore/m3/GB	natural gas products, at separation plant/AU U
natural gas, at production offshore/m3/NL	natural gas products, at separation plant/AU U
natural gas, at production offshore/m3/NO	natural gas products, at separation plant/AU U
natural gas, at production onshore/m3/DE	natural gas products, at separation plant/AU U
natural gas, at production onshore/m3/DZ	natural gas products, at separation plant/AU U
natural gas, at production onshore/m3/NL	natural gas products, at separation plant/AU U
natural gas, at production onshore/m3/RU	natural gas products, at separation plant/AU U
natural gas, at production/m3/NG	natural gas products, at separation plant/AU U
natural gas, at production/m3/RNA	natural gas products, at separation plant/AU U
natural gas, high pressure, at consumer/MJ/AT	natural gas, high pressure, Australia/AU U
natural gas, high pressure, at consumer/MJ/BE	natural gas, high pressure, Australia/AU U
natural gas, high pressure, at consumer/MJ/CH	natural gas, high pressure, Australia/AU U
natural gas, high pressure, at consumer/MJ/CZ	natural gas, high pressure, Australia/AU U
natural gas, high pressure, at consumer/MJ/DE	natural gas, high pressure, Australia/AU U
natural gas, high pressure, at consumer/MJ/DK	natural gas, high pressure, Australia/AU U
natural gas, high pressure, at consumer/MJ/ES	natural gas, high pressure, Australia/AU U
natural gas, high pressure, at consumer/MJ/FI	natural gas, high pressure, Australia/AU U
natural gas, high pressure, at consumer/MJ/FR	natural gas, high pressure, Australia/AU U
natural gas, high pressure, at consumer/MJ/GB	natural gas, high pressure, Australia/AU U
natural gas, high pressure, at consumer/MJ/GR	natural gas, high pressure, Australia/AU U
natural gas, high pressure, at consumer/MJ/HU	natural gas, high pressure, Australia/AU U
natural gas, high pressure, at consumer/MJ/IE	natural gas, high pressure, Australia/AU U
natural gas, high pressure, at consumer/MJ/IT	natural gas, high pressure, Australia/AU U
natural gas, high pressure, at consumer/MJ/JP	natural gas, high pressure, Australia/AU U
natural gas, high pressure, at consumer/MJ/NL	natural gas, high pressure, Australia/AU U
natural gas, high pressure, at consumer/MJ/RER	natural gas, high pressure, Australia/AU U
natural gas, high pressure, at consumer/MJ/SE	natural gas, high pressure, Australia/AU U
natural gas, high pressure, at consumer/MJ/SK	natural gas, high pressure, Australia/AU U
operation, passenger car/km/RER	Petrol, low-sulphur, at regional storage/CH U/AusSD U
polypropylene, granulate, at plant/kg/RER	polypropylene, PP, at factory gate/AU U
rape meal, at oil mill/kg/CH	canola meal, at oil mill/AU U
rape meal, at oil mill/kg/RER	canola meal, at oil mill/AU U
rape oil, at oil mill/kg/CH	canola oil, at oil mill/AU U

Ecoinvent 2.2 process	AusLCI process(es)
rape oil, at oil mill/kg/RER	canola oil, at oil mill/AU U
rape seed conventional, at farm/kg/DE	canola, average, at farm/AU U
rape seed extensive, at farm/kg/CH	canola, average, at farm/AU U
rape seed IP, at farm/kg/CH	canola, average, at farm/AU U
round wood, hardwood, under bark, u=70%, at forest road/m3/RER	hardwood sawlog, high quality/AU U
round wood, Scandinavian softwood, under bark, u=70% at forest road/m3/NORDEL	softwood sawlog, high quality/AU U
round wood, softwood, under bark, u=70% at forest road/m3/RER	softwood sawlog, high quality/AU U
roundwood, eucalyptus ssp. (SFM), under bark, u=50%, at forest road/m3/TH	hardwood pulp log, low quality/AU U
silage maize IP, at farm/kg/CH	maize, silage, average, on farm/AU U
sugar, from sugar beet, at sugar refinery/kg/CH	sugar, raw, at mill, QLD/AU U
sugar, from sugarcane, at sugar refinery/kg/BR	sugar, raw, at mill, QLD/AU U
tap water, at user/kg/CH	tap water, at user/RER U/adapted/AU U
tap water, at user/kg/RER	tap water, at user/RER U/adapted/AU U
transport, aircraft, freight, Europe/tkm/RER	air freight domestic/AU U
transport, aircraft, freight, intercontinental/tkm/RER	air freight, international/AU U
transport, aircraft, freight/tkm/RER	air freight, international/AU U
transport, aircraft, passenger, Europe/personkm/RER	air passenger travel, domestic/AU U
transport, aircraft, passenger, intercontinental/personkm/RER	air passenger travel, international/AU U
transport, aircraft, passenger/personkm/RER	air passenger travel, domestic/AU U
transport, freight, rail/tkm/CH	transport, freight, rail/AU U
transport, freight, rail/tkm/RER	transport, freight, rail/AU U
transport, lorry >16t, fleet average/tkm/RER	transport, truck, 16 to 28t, fleet average/AU U
transport, lorry >28t, fleet average/tkm/CH	transport, truck, 28t, fleet average/AU U
transport, lorry >32t, EURO4/tkm/RER	transport, truck, 28t, fleet average/AU U
transport, lorry 20-28t, fleet average/tkm/CH	transport, truck, 16 to 28t, fleet average/AU U
transport, lorry 3.5-20t, fleet average/tkm/CH	transport, truck, 3,5 to 16t, fleet average/AU U
transport, passenger car/personkm/RER	Operation, passenger car/RER U/AusSD/Link U
transport, van <3.5t/tkm/CH	transport, van 3,5t/AU U
wheat grains extensive, at farm/kg/CH	wheat, grain, average, at farm/AU U
wheat grains IP, at farm/kg/CH	wheat, grain, average, at farm/AU U
wheat grains, at farm/kg/US	wheat, grain, average, at farm/AU U
wheat straw extensive, at farm/kg/CH	straw, from wheat, central east, NSW, at farm/AU U
wheat straw IP, at farm/kg/CH	straw, from wheat, central east, NSW, at farm/AU U
Cement, unspecified, at plant/CH U/AusSD U	general purpose cement, Australian average/AU U
Portland cement, strength class Z 42.5, at plant/CH U/AusSD U	general purpose cement, at plant/AU U
Portland cement, strength class Z 52.5, at plant/CH U/AusSD U	general purpose cement, at plant/AU U

Ecoinvent 2.2 process	AusLCI process(es)
Clinker, at plant/CH U/AusSD U	clinker, at plant/AU U
Blast furnace slag cement, at plant/CH U/AusSD U	al purpose cement, Australian average/AU U - 50%
	ground granulated blast furnace slag, at cement plant/AU U - 50%
Concrete, exacting, at plant/CH U/AusSD U	concrete 32 MPa, at batching plant/AU U
Concrete, exacting, with de-icing salt contact, at plant/CH U/AusSD U	concrete 25 MPa, at batching plant/AU U
Concrete, normal, at plant/CH U/AusSD U	concrete 25 MPa, at batching plant/AU U
Concrete, sole plate and foundation, at plant/CH U/AusSD U	concrete 25 MPa 30% GGBFS, at batching plant/AU U
Portland slag sand cement, at plant/CH U/AusSD U	ordinary portland cement, Australian average/AU U - 80%
	ground granulated blast furnace slag, at cement plant/AU U - 20%
Portland calcareous cement, at plant/CH U/AusSD U	ordinary portland cement, Australian average/AU U - 85%
	fly ash, delivered to plant/AU U - 15%
Cement, unspecified, at plant/CH U/AusSD U	general purpose cement, Australian average/AU U
Portland cement, strength class Z 42.5, at plant/CH U/AusSD U	general purpose cement, at plant/AU U
Portland cement, strength class Z 52.5, at plant/CH U/AusSD U	general purpose cement, at plant/AU U
Clinker, at plant/CH U/AusSD U	clinker, at plant/AU U
Blast furnace slag cement, at plant/CH U/AusSD U	general purpose cement, Australian average/AU U - 50%
	ground granulated blast furnace slag, at cement plant/AU U - 50%

Eco-invent modifications

The following modification for ecoinvent flow data have been made in the understanding that the original flows had errors.

Process	Original data	Corrected data
Epoxy resin, liquid, disaggregated data, at plant/RER U/AusSD U	Input from nature	Input from nature
	Sand, in ground, 1200,kg	Sand, in ground, 1200,mg
Epoxy resin, liquid, disaggregated data, at plant/RER U/AusSD U	Input from technosphere	Input from technosphere
	Transport, lorry >16t, fleet average/RER U/AusSD/Link U, 60.6 t.km	Transport, lorry >16t, fleet average/RER U/AusSD/Link U, 0.6 t.km

Appendix C : AusLCI releases

Version No.	Date released	Content/ Comments
0.9	3 Mar 2011	29 Processes
1.0	8 Oct 2013	156 processes
1.01	7 Nov 2013	159 processes
1.1	17 July 2014	326 processes
1.13	31 July-2014	355 processes
1.16	21 Sep 2014	359 processes
1.17	06 Feb 2015	359 processes
1.23	08 April 2016	461 processes
1.25	20 Sep 2016	Fix to Eco invent epoxy inventory
1.26	26 Sep 2016	Fix to heat from LPG