



## **Life Cycle Inventory**

### **Reviewer**

### **Qualifications**

### **Applicable to**

### **Verification Reports on**

### **Life Cycle Assessment for**

### **Environmental Product Declarations**

## Life Cycle Inventory Reviewer Qualification

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## Life Cycle Inventory Reviewer Qualification

### Introduction

This report was compiled about reviewer qualifications applicable to Life Cycle Inventory (LCI) verification reports for Life Cycle Assessment (LCA) used in environmental product declarations (EPDs).

### Aim

The purpose was to document selection criteria of reviewer qualifications in verification of LCI developed by Ecquate Pty Ltd: The Evah Institute & or Global Greentag Pty Ltd & EPDs issue by either company.

### Method

Table 1 lists prerequisites for LCI data reviewers from the International Reference Life Cycle Data System (ILCD) Handbook developed by Institute for Environment & Sustainability in the European Commission Joint Research Centre (JRC) in co-operation with the Directorate-General for the Environment <sup>1</sup>.

**Table 1 Essential Requirements for Eligible EPD Reviewers**

Topic knowledge	Criteria
1. Generally of environmental matters	Industry related
	Product-related
2. Good on process & product	Infrastructure & Industrial Operation & or Manufacture Building Product
	Property Development Expertise & or Asset Management Experience
3. in depth of ISO 14040 LCA	Experienced >5 years in ISO 14040 LCA method series related practice
4. In-depth on standards relevant to	ISO 14025:2006 & EN15804:2012+A1:2013
	Environmental labelling & EPD declarations
5. Undertaken ≥3 independent 3rd party LCA reviews compliant ISO 14044:2006 Sect 6 requirements	>1 LCA study involving assessment of multiple environmental impacts
	Shown by evidence of critical independent review of in/ external studies
	In panel review according to ISO 14044 Section 6.2 & 6.3
6. Overall regulatory framework in EPD introduced	Refer General Program Instructions, Section 5.7.3.
	Compliance with Relevant Environmental Legislation
7. In-depth International & Australasian EPD Programs	The International EPD® System
	Australasian EPD Program General Program Instructions
8. Auditing management systems	Following ISO 19011 Guidelines criteria for auditor skills & competences

Table 2 lists the eligibility scoring system also extracted from the ILCD Handbook<sup>2</sup>. It shows the minimum LCI reviewer's qualifications score of 5 points & maximum LCI reviewer's qualifications score of 32 points.

<sup>1</sup> European Commission - Joint Research Centre - Institute for Environment & Sustainability: International Reference Life Cycle Data System (ILCD) Handbook - Reviewer qualification for Life Cycle Inventory data sets. 1<sup>st</sup> Ed March 2010 EUR 24379 EN Luxembourg Publications Office of the European Union; 2010 page 10 [http://eplca.jrc.ec.europa.eu/?page\\_id=86](http://eplca.jrc.ec.europa.eu/?page_id=86)

<sup>2</sup> ILCD Handbook: First edition 3 Reviewer qualification for Life Cycle Inventory data sets page 10

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These two preceding qualification tables were compared to professional attributes of professionals currently involved in LCA related work in global supply chain assessment of submissions for attainment of 3<sup>rd</sup> party certified ecolabels & to develop 3<sup>rd</sup> party certified Environmental Product Declarations (EPDs).

**Table 2 LCI Data Reviewer Qualifications Scoring System**

Topic		Experience Criteria	Barrier to	score				Max	Min
Metrics	Scoring	minimum	Pass entry	1	2	3	4	score	score
1. Verification & Audit Practice	Mandatory	Years' work <sup>3</sup>	3 years	3-4	5-8	9-14	>14	4	1
		Number Reviews <sup>4</sup>	3 reviews	3-5	6-15	16-30	>30	4	1
	Optional	Scores <sup>5</sup> for EPD Scheme, ISO14001 or other EMS	Accredited 3rd party reviewer for >1 EPD Scheme				2		
			Attended courses on environmental audits >40 hrs				1		
			Chair >1 review panel for LCA study or Enviro app				1		
			Qualified trainer in environmental audit course				1		
2. LCA methodology & Practice work	Mandatory	Years' work <sup>6</sup>	3 years	3-4	5-8	9-14	>14	4	1
		LCI datasets <sup>7</sup>	5*(10 LCI)	5-8	9-15	16-30	>30	4	1
	Optional	LCA projects & papers	> 5 articles in peer-review journals or books				1		
			Worked >3 research projects on issue/case study				1		
3. Technology <sup>8</sup> & experience represented by LCI datasets	Mandatory	Recent years <sup>9</sup>	3 years	3-5	6-10	11-20	>20	4	1
	Optional	Formal Scientific Qualification	At least one PhD obtained				1		
			≥1 Master thesis or equivalent completed				0.5		
		Ex Private Sector	≥ 3 years' experience in professional work				1.0		
In Private Sector	0.5 point for each added industry sector up to 5				2.5	0.5			
Point Score			Overall Maximum Possible				32	5	

<sup>3</sup> Years of experience in the field of review & audit in the environmental field

<sup>4</sup> Number of reviews as a reviewer, or ISO 14025 compliant verifications of EPDs, or LCI data sets

<sup>5</sup> Additional scores are complementary & scores are maxima unless otherwise stated e.g. 1 point not 5 for peer-reviewed LCA papers

<sup>6</sup> Years of experience in LCA work, starting from University Masters or Bachelor degree if Master thesis on LCA

<sup>7</sup> Participant in LCI dataset development/modelling in LCI database as verified or documented. 10 data sets = 1 \*experience

<sup>8</sup> Qualification of technologies or activities knowledge is according to NACE code classes (*Regulation (EC) No 1893/2006 of the European Parliament & of the Council of 20 December 2006*). Equivalent classifications may be used. Experience in sub-sector is valid for whole sector

<sup>9</sup> Years of professional production, R&D or environmental work in private sector, technology or system of LCI under review

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**Murray Jones**

Table 3 lists Murray Jones LCI data reviewer eligibility score of 23.5 out of a maximum 32 points.

**Table 3 Murray Jones LCI Reviewer Eligibility Score 2016**

	Score Topic	metrics	Minimum Experience Criteria	Score		
Mandatory	Verification & Audit Practice in last 20 years	Year's work <sup>10</sup>	>9 <14 years in BIM LCA software audit at CRC CI <sup>11</sup> , CSIRO <sup>12</sup> & Ecquate Pty Ltd <sup>13</sup> , also PCR Moderator for Global GreenTag EPD Program Operator, ISO 14024 Type 1 Ecolabelling, & ISO 140040, 14044 & 14067 compliant LCA	3.0		
		Number of Reviews <sup>14</sup>	>16 <30 reviews of LCA software documented for CRC CI & Ecquate; of LCA BAU product for The Evah Institute, as PCR Moderator for Global GreenTag Program Operator ISO 14025, 21930 & EN 15804 compliant EPDs	3.0		
	LCA methodology & Practice work	Year's work in last 20 years <sup>15</sup>	>14 years LCA software development at CRC CI & CSIRO; LCA practice at Ecquate & Evah on LCA Buildings & Business as Usual (BAU) products	4.0		
		LCI recipes done <sup>16</sup>	50-80 building product LCI modelled at Ecquate with Evah for whole building LCA in Greenhouse Emission Reports Compiled >30 LCA reports on BAU products including scoping, supply chain mapping for all key LCI recipes. All are recorded in LCI databases the system operator has evidence of them	2.0		
	Technology or activity	Year in recent years <sup>17</sup>	>6 <10 years participant in LCI >30 BAU product in Global GreenTag LCI databases	2.0		
Optional	Verification & Environmental Audit Practice	EPD, EMS or ISO14001 Schem	Chaired >1 LCA BIM environmental app study review panel for CRC CI	1.0		
			Audits Evah LCA reports & EPDs. Audits of LCIA algorithm in software development. Audit of BIM LCA software malfunctions & user issues	1.0		
	LCA method & Practice	LCA projects & papers in last 10 years	Experience>9 <14 Years in LCI database & LCIA Software development	3.0		
			Participant in >3 LCADesign research projects & issues & Project on whole building greenhouse gas emissions & product LCA case studies	1.0		
	Technology <sup>18</sup> or experience represented by LCI datasets	Ex Private Sector 3 year	CRC CI & CSIRO, Taught >100 LCADesign 1&2 days courses at Universities of NSW & Wollongong: J - Information & communication. ALCAS member.		1.0	
			Company	LCA Study of	NACE Codes	
		Ecquate Pty Ltd	Dormitory Buildings	P – Education O - Government,		0.5
			Hospital Buildings	Q – Health		
		Evah Institute	Global Aluminium	F - Construction		0.5
			National Concrete Market	B - Mining & quarrying		
			Building Products	I – Accommodation,		0.5
			National Building Sector	E – Water & waste, H: Transport & storage		
		For Global GreenTag Pty Ltd	BAU Products	C – Manufacturing		0.5
Victorian Power			D - Electricity, gas & air supply			
Fitout of Timber	A - Agriculture, forestry & fishing		0.5			
National Steel Supply	B - Mining & quarrying					
Total		Point Score	23.5			

<sup>10</sup> Years of experience in the field of review & audit in the environmental field

<sup>11</sup> Australian National Cooperative Research Centre for Construction Innovation

<sup>12</sup> Australian Commonwealth Science & Industrial Research Organisation

<sup>13</sup> LCA Software Licensee & developer of LCIA automated off Building Information Modelling (BIM) & LCI databases

<sup>14</sup> Number of reviews as a reviewer, or ISO 14025 compliant verifications of EPDs, or LCI data sets

<sup>15</sup> Years of experience in LCA work, starting from University Masters or Bachelor degree if Master thesis on LCA.

<sup>16</sup> Participant in LCI dataset development documented in private database. 10 sets = 1 "experience". The system operator has seen evidence.

<sup>17</sup> Years of professional experience in the private sector, technology or system of LCI unit process dataset to be reviewed.

<sup>18</sup> Qualification of technologies or activities knowledge is according to NACE code classes

## Life Cycle Inventory Reviewer Qualification

### Mathilde Vlieg

Table 4 summarises Mathilde Vlieg's LCI data reviewer eligibility score of 25 out of 32 points.

**Table 4 Mathilde Vlieg LCI Reviewer Eligibility Score Jan 2016**

	Score Topic	metrics	Minimum Experience Criteria	Score	
Mandatory	Verification & Audit Practice in last 20 years	Years' work <sup>19</sup>	8 years in last 10 in The Netherlands for clients & in Australia at: <ul style="list-style-type: none"> <li>• Certifier Global GreenTagCert™ EPD Program Operator, ISO 14024 Type 1 Ecolabelling, &amp; ISO 140040, 14044 &amp; 14067 compliant LCA;</li> <li>• The Evah Institute review of certifier &amp; 3rd party audited LCI allocation.</li> <li>• VliegLCA 3rd party reviewer whole building LCA report for Ecquate</li> </ul>	2.0	
		Number Reviews	>30 reviews in Australia at: <ul style="list-style-type: none"> <li>• Global GreenTag of PCRs &amp; methods for EPDs &amp; client LCI recipes</li> <li>• The Evah Institute LCI, LCIA &amp; PCR methods for ISO compliant EPDs.</li> <li>• VliegLCA reviewer of 7 story building &amp; greenhouse LCA for Ecquate<sup>21</sup>.</li> </ul>	4.0	
	LCA methodology Practice work	Years' work in last 20	8 years from The Netherlands for clients & in Australia working at: <ul style="list-style-type: none"> <li>• ecospecifier in Life Cycle Thinking (LCT);</li> <li>• Global GreenTag in LCA, Type 1 Ecolabeling and ISO 14025, 21930 &amp; EN 15804 compliant EPDs;</li> <li>• Evah Institute: LCI, LCIA &amp; Life Cycle Benefit Assessment plus PCR and EPD standards and method. Contributor to LCI &amp; LCIA software coding for OpenLCA OzLCI database &amp; Intern training</li> <li>• VliegLCA on methodology for building &amp; greenhouse gas modelling.</li> </ul>	2.0	
		LCI recipes done	Developer >900 LCI recipes for product & supply chains at The Evah Institute South African, VliegLCA global & OpenLCA OzLCI databases.	4.0	
	Technology or action	Recent year	8 years' work in NL, ecospecifier, Global GreenTag & The Evah Institute	2.0	
Optional	Verification & Environmental	EPD, EMS or ISO14001 Scheme	Accredited 3rd party reviewer for Global GreenTag & Evah EPD Scheme Audits Dormitory Buildings LCA reports & EPDs.	2.0 1.0	
	LCA method & Practice	LCA projects & papers	Participant in >30 LCARate case studies @ The Evah Institute in last 7 years. Written papers & platform presentations of new forest LCA methods	4.0	
	Technology <sup>22</sup> or experience represented by LCI datasets	Formal Scientific Qualification	Master thesis in The Netherlands & internships at Global GreenTag & The Evah Institute in Australia on LCI database development. NACE: J - ICT	0.5	
		Ex Private Sector ≥ 3 years	e.g Kistkrak stool in social workshops. Australasian OpenLCA facilitator & recoded LCI population; co-develop Life Cycle Benefit Assessment, LCADesignStudio NACE: M - Professional, scientific & technical.	1.0	
		Company	LCA Study of	NACE Codes	
		Evah Institute	South Africa Coal	B - Mining & quarrying	0.5
			South Africa Power Supply	D - Electricity, gas & air supply	
		VliegLCA Consultant & Evah Associate for GG	South African Carpet	C – Manufacturing	0.5
			Insulation	H - Transport & storage	
			Australian Forestry 4 states	A - Agriculture, forestry & fishing	0.5
			Australian MDF 3 states	F - Construction	
			Compactus & Shelving	N - Administrative & support service	0.5
	Ceiling Tiles		P – Education Q – Health O – Government		
Hot & chill Water Urn	I : Accommodation & food service	0.5			
Waste Diverter	E - Water; sewerage; waste,				
Total		Point Score	25		

<sup>19</sup> Years of experience in the field of review & audit in the environmental field

<sup>20</sup> Number of reviews of ISO 14025 compliant LCI data sets

<sup>21</sup> LCI database & LCA method developer, Division of Ecquate Software developer LCIA automated off Building Information Modelling (BIM)

<sup>22</sup> Qualification of technologies or activities knowledge is according to NACE code classes

## Life Cycle Inventory Reviewer Qualification

**Shloka Ashar**

Table 5 lists Shloka's LCI data reviewer eligibility score of 30 out of a possible 32 points.

**Table 5 Shloka Ashar LCI Reviewer Eligibility Score 2016**

	Score Topic	metrics	Minimum Experience Criteria	Score		
	Mandatory	Verification & Audit Practice in last 20 years	Years' work <sup>23</sup>	>5 <8 years in last 10 as Verifier & Lead Auditor at Global GreenTag (GGT) Product verification Program & standard operating procedures	2.0	
Number Reviews <sup>24</sup>			>30 LCA Rate, Streamlined LCA & EPD Reviews, Manages team in GGT: Externally verified compliant ISO 170665 Conformance Assessment Body	4.0		
LCA methodology & Practice work		Years' work in last 10 years	>9 years e.g manages team using GGT LCA Rate; ISO 14024 Type 1 Ecolabelling program standards; ISO 14004, 14044 & 14067 compliant LCA program standards & applies EPD Program Operator General Program Rules	2.0		
		LCI recipes done	Reviewed & signed >300 product LCA Rate reports e.g Best Available Technology (BAT) & ecolabelled building, fitout, personal & cleaning products	4.0		
Technology or activity		Recent years	>6 <10 years in LCI dataset Global GreenTag ecolabelling e.g participant in: LCI >300 product LCA Global, Australia, South Africa & Malaysia Complies, Assesses & Reviews ISO 14025 compliant PCR & EPDs	2.0		
Optional	Verification & Environmental Audit Practice	EPD, ISO14001 or EMS Scheme	Accredited 3rd party reviewer for GGT EPD Scheme. Applies Program Rules	2.0		
			Attended courses on environmental audits >40 hrs. Environmental Management Systems Lead Auditor SIA Global RABQSA	1.0		
			Chair of LCA study review research team of Certified Ecolabellers	1.0		
			qualified Certified Type 1 ecolabelling program in-house audit trainer	1.0		
	LCA method & Practice	LCA projects & papers in last 10 years	>5 <8 Years' Experience in LCA Rate	2.0		
			Reviewed >300 LCI recipe LCA Rate in Streamlined LCA	4.0		
			Participant in >3 research projects on issues or case studies including: Biomass & Solar Project reports on water, energy & greenhouse emissions	1.0		
	Technology or experience represented by LCI datasets <sup>25</sup>	Formal Scientific Qualification	2 Master thesis completed in Environmental Science; Master of Environmental Protection Sardar Patel University India & Master of Environmental Science & Technology Sardar Patel University		0.5	
		Ex Private Sector	≥ 3 years: Joint Government Industry Funded Clean energy Projects for Greenhouse gas under Kyoto Protocol; Social Resilience Projects.		1.0	
		Company	LCA Studies of	NACE Codes		
		Abellon Clean Energy Ltd	Greenhouse Gas	Biomass & solar D - Electricity, gas & air supply	0.5	
		Global GreenTag Pty Ltd	Buildings all types	C – Manufacturing, F - Construction		0.5
			Built Fitout all types including Offices	H - Transport & storage, O - Government, P – Education, N - Administrative & support service		0.5
			LCI Australia, South Africa global all primary sectors	A - Agriculture, forestry & fishing, B - Mining & quarrying, E - Water; sewerage; waste,		0.5
			Personal Care & Cleaning for all asset types	I – Accommodation, Pharmaceuticals Q - Human health, R – Arts, entertainment,		0.5
Total		Point Score	30			

<sup>23</sup> Years of experience in the field of review & audit in the environmental field

<sup>24</sup> Number of reviews as a reviewer, or ISO 14025 compliant verifications of EPDs, or LCI data sets

<sup>25</sup> Qualification of technologies or activities knowledge is according to NACE code classes. Experience in sub-sector is valid for whole sector.

## Life Cycle Inventory Reviewer Qualification

**Delwyn Jones**

Table 6 summarises Delwyn Jones' LCI data reviewer score of 31 points out of the maximum 32 points.

**Table 6 Delwyn Jones LCI Reviewer Eligibility Score 2021**

	Score Topic	metrics	Experience Criteria in last 20 years	Score	
	Mandatory	Verification & Audit Practice	Years' work	Industry, Government & CASE studies >21yr environmental review & site audit	4
No. Review			>100 LCARate >30 reviews of ISO1400 compliant EPDs & LCAs Public & Private	4	
LCA method & Practice work		Years' work	Government Principal Scientist & private specialist in LCA >21 Years since 199y	4	
		LCI recipes	>8,000 recipes done building LCI database developer 20 years' experience	4	
Technology or activity		Recent years	40 years Scientific advisor on built environment Property issues including: 14yrs Principal LCA Consultant @ Olympics & construction industry. >20 years senior scientist resolving environmental issues: industry & market.	4	
Optional	Verification & Environmental Audit Practice	EPD, ISO14001 or EMS Scheme	1 year Auditor of EMS & LCA for NSW Govt Supply ISO14001	2	
			1 year Auditor for NSW Govt Olympics 2000 Development ISO14001 LCA		
			10 years verify EMS, building & procurement QLD Govt Public Works		
			1 year verify ecolabelling: Australasian Procurement & Construction Council		
			4 years 3 <sup>rd</sup> party reviewer for Global GreenTag (GGT) certified EPD & PCR Schemes		1
	LCA method & Practice	LCA projects papers	15 years Guest Lecturer in environmental audit & LCT courses at 4 Universities	1	
			5 yr Chair GGT PCR review panel & 4 yr BHP Research Chair ISO14001 E&OHMS	1	
			5 years University course lecturer in year 4 built environment & LCT verification		
			>5 articles written for & published in peer-review journals	1	
			>5 Chapters written & published in peer-review books & National Guideline		
	Technology <sup>26</sup> experience represented by LCI datasets	Qualification	Public service	>3 Government & CSIRO research projects on issues or case studies	1
				≥1 Master's thesis equivalent completed at the University of Wollongong	0.5
		Private Sector		>20 year Global Academic, Professional Body & Government LCA practitioner	1
				Global building sector @ BHPI, NSWDPW, CRC CI, CSIRO & Evah: Steels, polymers refractories, cements, concrete, enamels, ceramics, alkalis, acids, water treatment, waste treatment, scrap recovery, power supply & control, IT, coal industry, freight.	0.5
				BHPI Global refractory, metal & inductor industry inventor & author: Aluminium. Copper, Ceramics, Zinc, Lead, Brass, Steel, Iron, Electromagnetic Levitation, Radio frequency	
Global polymer & metal coating R&D analysis, inventor & author @ BHPI: all elements solids, non conductors, powders, metals, ceramics, fibres, fractures, microstructure. Author global material GDOES handbook & quantification algorithm: surface elemental environmental & forensic analysis of contaminants, substrates, enamels, complex organic & metallic coatings, gas phase contaminants plus metals & river shells.				0.5	
Pacific Rim food technology, canning & tinsplate industry @ AI&S: Vegetables, fruit, meat, beer, soft drink, ice cream, corrosion resistance & shelf life.				0.5	
State Public Works LCA Developer, State Supply, Sydney 2000 Olympics LCA Auditor Public Works Asset Capital Works & National Fitout & Procurement Guideline & Policy				0.5	
CRCI Software developed for building LCA with Stanford U USA, Salford U UK, CSTB France, Finland, Slavenburg, Dutch, German, Californian supply chain LCI. CSIRO CRCI Federal Govt funded software development for Commercial building LCA with Australian, Queensland, New South Wales & Victorian Supply chain LCI.				0.5	
Total		Pont Score	31		

<sup>26</sup> Qualification of technologies or activities knowledge scoring is also according to NACE code classes 1.



## Life Cycle Inventory Reviewer Qualification

### Results

In the following sections qualifications are tabled for each of the following people to act as LCI reviewers. Table 7 lists practitioners scores and contact details.

**Table 7 LCI Data Reviewer Qualification Scores**

Professional	Email Contact	<a href="https://www.linkedin.com/in/">https://www.linkedin.com/in/</a>	Score	%
Murray Jones	murrayjones@ecquate.com	murrayj/	23.5/32	73
Mathilde Vlieg	mathilde@evah.com.au	mathildevlieg/	25/32	78
Shloka Ashar	shloka@evah.com.au	shloka-ashar-89878223	30/32	94
Delwyn Jones	delwyn@evah.com.au	delwyn-jones-42473a29	31/32	97

### Discussion of Results

Qualifications & experience of the following people were compared. All were found to exceed the minimum ILCD Handbook prerequisites for LCI data reviewers. Out of a maximum of 32 possible points:

- Murray Jones scored 23.5,
- Mathilde Vlieg scored 25.0,
- Shloka Ashar scored 30.0,
- Delwyn Jones scored 31.0.

The lowest score exceeded the minimum score of 5 points by >18 points. All other scores were  $\geq 5$  times greater than the minimum. The following parties have reviewed the required evidence and accepted the validity of these scores:

- Program Operator: Global GreenTag<sup>Cert™</sup>,
- PCR Moderator: Ecquate Pty Ltd and
- LCA Methodology Developer: The Evah Institute.

All persons nominated herein as reviewers have reviewed evidence required and accepted the veracity of these scores. Therefore, their names are to be posted & scores declared on the World Wide Web.

### Conclusions

Murray Jones, Mathilde Vlieg, Shloka Ashar and Delwyn Jones are each considered eligible to be commissioned to submit verifier reports on the LCA used to develop 3<sup>rd</sup> party certified EPDs.

### Recommendations

Each is eligible to submit verifier reports on the LCA used to develop 3<sup>rd</sup> party certified EPDs. To facilitate program & system transparency the name, score & resume of Murray Jones, Mathilde Vlieg, Shloka Ashar and Delwyn Jones are to be posted & declared on the World Wide Web. Stakeholders may then examine them & respond to all concerned & interested parties as deemed fit.