



Bio Xorel® X-Protect Wall



Figure 1 Bio Xorel® X-Protect Wall Covering

Baresque is the Australian distributor of Bio Xorel products.

Bio Xorel X-Protect Wall is a solution dyed woven textile with a proprietary paper backing.

This product has 88% to 96% biomass content, with yarn sources from sugar cane and paper from forestry. It's weaving runs on 100% renewable energy.

Design techniques including jacquard weaving, embossing, embroidery and graphic printing expand the range of creative possibilities.

Bio Xorel is used as wall covering, panel wrapping or upholstery.

Bio Xorel has won many awards and earned the rare Cradle to Cradle Gold Certification.

These Bio Xorel fabrics are manufactured in Belgium by Carnegie based in the United States of America.

Carnegie is a Certified B Corporation certified to meet rigorous standards of social and environmental performance, accountability and transparency.

As a Be Americas organization Carnegie is committed to influencing manufacturers and designers on environmental, ethical and economic values.

More information is at <http://www.baresque.com.au> and <http://www.carnegiefabrics.com>

This Environmental Product Declaration (EPD) discloses potential environmental outcomes compliant with ISO 14025 for business to business communication. The declared product Bio Xorel X-Protect Wall covering was made by Carnegie in Belgium in 2014-2015 for sale under a 7 year warranty for interior applications in the commercial and residential sectors.



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Different program EPDs may not be comparable as e.g. Australian transport is more than elsewhere. **Further explanatory information is found at <http://www.globalgreentag.com/>** or contact: certification1@globalgreentag.com © This EPD remains the property of Global GreenTag Pty Ltd.



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1. Details of This Declaration

Program Operator	GreenTag Global Pty Ltd hereafter called Global GreenTag noted at www.globalgreentag.com	EPD Number	BAF-003-2015
		Date issue	08 July 2016
		Validity	08 July 2019
Reference PCR	Compliant with PCR T: 2014		
Time	Made in 2014-2015, sold from 2015 for 20 years use		
Geography	Made in Belgium. Uses are assumed as for Australasia.		
Application	Commercial and residential building interiors		
Declared unit	Bio Xorel® X-Protect Wall covering 0.417 kg/m ²		
Functional unit	Bio Xorel® X-Protect manufacture 20 year use as wall covering and disposal/m ² Cradle to Fate.		
Ecolabel Global GreenTag^{Cert™}	LCARate Gold Streamlined GreenRate Level C		



2. Product Characterisation

Definition	Bio Xorel X-Protect Wall made by Carnegie for interior wall covering
Standard	ISO 105-B02:2014 Textiles Tests for colour fastness Part B02: Colour fastness to artificial light: Xenon arc fading lamp test ISO 105-X12:2016 Textiles -- Tests for colour fastness -- Part X12: Colour fastness to rubbing

3. Base Material Origin and Detail

Table 1 lists key components by function, type, key operation, source and mass % share.

Table 1 Base Material

Function	Component	Production	Origin	Amount %
Yarn	HDPE	Farm, Distil, Extract, Mill, Polymerise	Americas	>65 <71
Backing	Kraft paper	Forest, Fell, Cut, Soak, Pulp, Mill	Europe	>20 <25
Bond Fibre	CDHM ¹ copolymer	Drill, Farm, Extract, Mill, Polymerise	Europe	>10 <15
Colour	Pigment	Mine, Farm, Extract, Mill, Blend	Global	>0.5 <1.0
Colour	Dye	Mine, Farm, Extract, Mill, Blend	Europe	>0.5 <1.0
Condition	Chemistry	Mine, Farm, Extract, Mill, Blend	Global	>0.01 <0.1

¹ CycloHexane DiMethanol



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4. Packaging, Installation, Use & Disposal

Packaging	Cardboard forms & cartons, plastic wrap & strapping on reused pallets.
Service life	Residential and commercial refits vary but 20 year life is assumed typical.
Health Safety & Environment	Apart from compliance to occupational and workplace health safety and environmental laws no additional personal protection is considered essential.
Residual Scrap	Mill off-cuts are reused. Installation scrap of 5% is assumed to landfill.
Cleaning & Maintenance	The recommended cleaning and maintenance raises no ecosystem or human health concerns. Care and maintenance guides are on company websites.
Scenario	Weekly detergent spray, light mop, monthly wet machine scrub and cloth dry.
Recycling	Home mill, fabrication and installation scrap is not reworked into new product.
Re-use	This study assumes 60% product is serviceable for reuse over 40 more years.
Disposal	It assumes 30% is recycled. Incineration is rare in Australia so none is modelled.

5. Whole of life Performance

Health Protection	The product does not contain levels of carcinogenic, toxic or hazardous substances that warrant ecological or human health concern cradle to grave. It passed the Ecospecifier Cautionary Assessment Process (ESCAP) and no issues or red light concerns existed for product human or ecological toxicity.
Effluent Waste	The LCI results and ESCAP raised no red light concerns in emissions to water ² . Cradle to grave waste to landfill was 100% non-hazardous.
Environmental Protection	Continuous improvement under the maker's uncertified EMS aims to avoid toxics, waste and pollution plus reduce their material and energy use.
Environmental Health Effects	Installed products are certified as having VOC's compliant with Green Star® IEQ VOC credits for indoor environment ³ quality credits. No other potential in-use impacts on environment or health are known.

6. Green Star® Certified Credits

Products are relevant to the Green Building Council of Australia's (GBCA) Green Star® scheme. If required this EPD is evidence the declared product meets the following Green Star® credits. It may be used as evidence in Green Star® submissions for those credits. The product is certified by GBCA recognised Global GreenTag GreenRate to meet the following credits of Green Star®:

- Interiors V1.1: Sustainable Products
- Design and As Built V1.1: Sustainable Product
- Performance V1: Procurement and Purchasing: Refurbishment Materials
- Office Interiors V1.1: Mat-3 Walls and Partitions (as a component)
- Healthcare V1: Mat-14 Ceilings, Walls and Partitions (as a component)
- Multi Unit Residential V1: Mat-14 Internal Walls (as a component)

GBCA Disclaimer

Green Star® is a registered mark of the Green Building Council of Australia (GBCA). Assessments shall not be reproduced in part at any time. Rating Tools and Technical Manuals are subject to change by the GBCA. This EPD provides Technical Opinion and as such is not endorsed by the GBCA or its agents. Green Star® Technical Manuals give technical details of credit requirements.

² According with national standards in ANZECC Guideline For Fresh & Marine Water Quality (2000)

³ in accordance with national standards and practice



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7. Results

Table 2 shows the product Life Cycle Assessment (LCA) Eco-Indicator 99 results for 20 years of use.

Table 2 Potential Impact Results

Evaluation Category	Unit	Result
Product mass	kg/m ²	0.417
EcoIndicator 99	ecopoint	0.12
Embodied Water	kl	174
Carbon Dioxide Equivalent Emissions ⁴	kg CO _{2e}	1.10
Gross Energy and Feedstock	MJ	81.3
Gross Recoverable Feedstock	MJ	26.5
Renewable Primary Energy	MJ	26.3
Ecosystem Quality Damages	PDF*m ² *yr	9E-6
Human Health Damages	DALY	1.0E-4
Ozone Depletion	kg R11 _e	3E-11
Fossil Fuel Depletion	MJ _{surplus}	2.55
Mineral Resource	MJ _{surplus}	0.08

Table 3 lists product Global GreenTag Sustainability Assessment Criteria (SAC) scores prior to weighting and then used to determine the GreenTag EcoPOINT⁵. Lower scores show greater environmental and social outcome benefits with fewer impacts and damages for sustainability. SAC scores are normalised against products that perform the same function and results with:

- 1.0 = worst base business as usual (BAU)
- 0.0 = neutral no improvement and
- -1.0= net positive benefit

Table 3 Normalised GreenTag EcoPOINT & SAC Scores

Category Potential	Results (-1 to +1)
Building Synergy	1
Health & Ecotoxicity	0.25
Biodiversity	0.45
LCA Score	0.03
Greenhouse Emission	0.25
Social Responsibility	0.65
GreenTag EcoPOINT	0.39

8. Verification of this Declaration

This EPD was approved on 08 07 2016 according to requirements of ISO14025 8.1.3b.

Role	Signature	Name	Position
LCA Review		Shloka Ashar	Global GreenTag Lead Auditor
PCR Review Chair		Delwyn Jones	Evah Institute CEO & Assessment Director
Internal EPD Review		David Baggs	Global GreenTag CEO & Program Director

⁴ Stocker et al (eds.) Climate Change 2013: The Physical Science Basis, CH8, IPCC AR5, Cambridge U Press, UK.
⁵ <http://www.ecospecifier.com.au/knowledge-green/glossary.aspx#greentagecopoint>



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9. Life Cycle Assessment Method

LCA Author	The Evah Institute as described at www.evah.com.au
Study Period	Factory data was collected from 2014 to 2015
Scope	Cradle to grave
LCA Method	Compliant with ISO 14040 and ISO 14044 Standards
LCIA method	Ecolindicator 99 Life Cycle Impact (LCIA) Assessment
System Boundaries	The LCA covers all operations in the system boundary depicted in Figure 2. It includes water, waste and emissions for all intermediates used to make and pack product as well as after sale delivery. Some background operations are not shown but all known operations were tracked to the cradle and included.
Phases	The study covered all known stages and phases including resource acquisition, fuel use, power generation, scrap recovery, manufacture, packing, freight, installation, use, disposal plus dispatch for reuse, recycling, landfill and recovery.
Processes	All known processes are included for water, fuel & energy use, resource acquisition, power generation, manufacture, transport, installation and landfill. All waste and emissions for depicted product intermediates and supply chain operations shown in Figure 3 are included.
Scenarios	Use, cleaning, maintenance plus disposition and re-use were scenario-based using Facility Management Association denoted and published typical operations.
Assumptions	Use is to typical Australian Facility Management professional practice.



10. LCA System Phases

All cradle to grave phases and stages that the LCA covered are depicted in Figure 2.

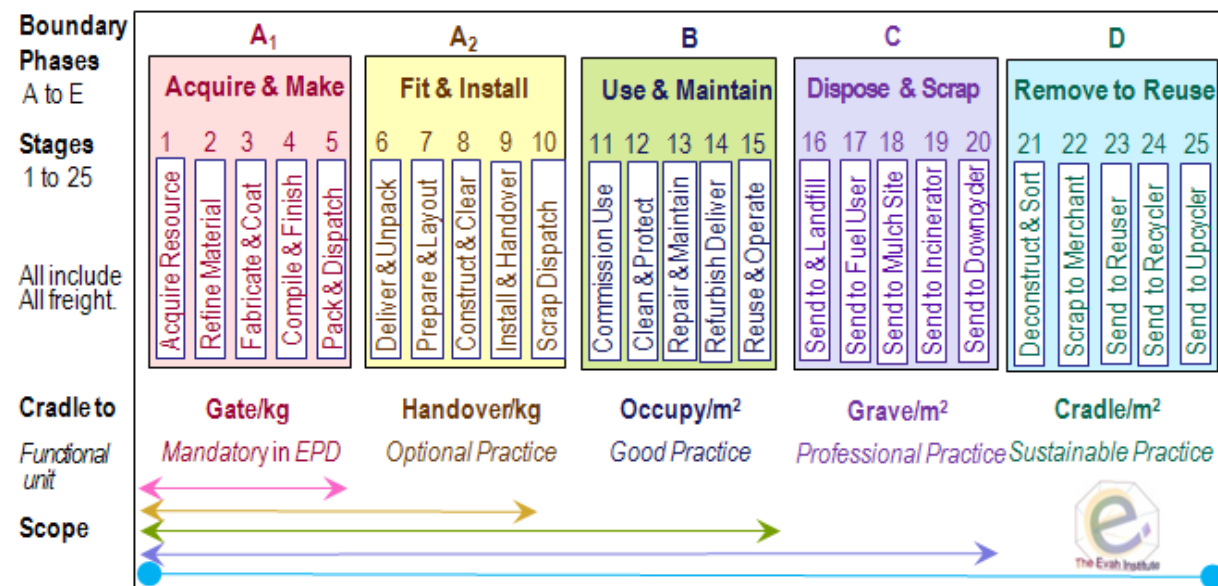


Figure 2 Phases and Stages Cradle to Grave



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11. Supply Chain Modelling

Industry supply chain databases cover all known domestic and global scope 1 and 2 operations. Processes to acquire, refine, transport, fabricate, coat, use, clean, repair, reuse and dispose of metal, masonry, ceramic, timber, glass, plastic and composites are modelled. These include those of:

- Mining, extracting and refining resources to make commodities and packaging;
- Acquiring, cultivating, harvesting, extracting, refining produce and biomass;
- Fuel production to supply power and process energy and freight;
- Chemicals use in processing resources, intermediates and ancillaries;
- Process energy, fuel and freight of resources, intermediates and ancillaries;
- Use, cleaning, recoating, repair, recycling, re-use and landfill, as well as
- Infrastructure process energy transformed and material wear loss e.g. tyres.

They exclude scope 3 burdens from:

- Building capital facilities, churn updates and equipment; Noise and dehydration as well as
- Incidental activities and travel of employees engaged on-site in production facilities.

A flow chart in Figure 3 shows key product supply chain operations from cradle to disposition.

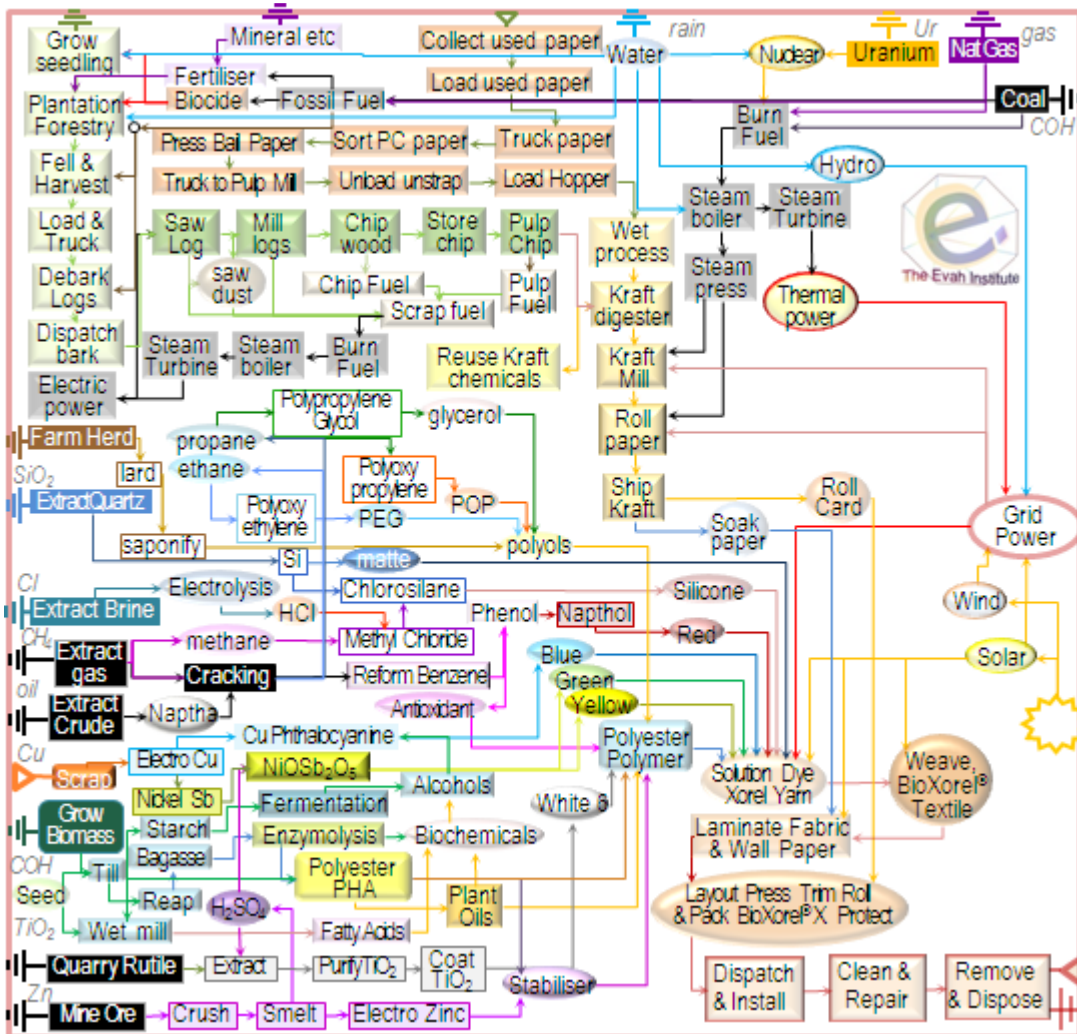


Figure 3 Major Product Operations



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12. Data Sources Representativeness and Quality

Metadata on corporate locations, logistics and technology used is documented along with market share, management systems, standards and commitment to improved environmental performance. The data employed for modelling the state of art of each operation including all known process:

- Technology sequences;
- Energy and water use;
- Landfill and effluent plus
- Reliance on raw and recycled material;
- High and reduced process emissions;
- Freight and distribution systems.

Primary data has been sourced from clients, their Annual Reports and research papers since 1995. Background data is sourced from the International Energy Agency, IBISWorld, USGS Minerals, Franklin Associates, Boustead 6, Plastics Europe, CML2, Simapro 8, Ecolnvent 3 and NREL USLCI model databases. Information about manufacturers' operations is also sourced from:

- Supply chain mills, their technical manuals, corporate annual reports and sector experts;
- Manufacturers development license applications, specifications, websites;
- Library, document, NPI and web searches, review papers, building manuals and
- Global Industry Association and Government reports on Best Available Technology (BAT).

As most sources do not provide estimates of accuracy a pedigree matrix of uncertainty estimates to 95% confidence levels of Geometric Standard Deviation² (σ_g) is used to define quality as in Table 4⁶. Data sets with uncertainties in any of these qualities greater than $\pm 30\%$ are not used.

Table 4 Data Quality Uncertainty (U) for 2015

Metric σ_g	U ± 0.01	U ± 0.05	U ± 0.10	U ± 0.20	U ± 0.30
Temporal	Post 2014	Post 2010	Post 2005	Post 2000	Pre 2000
Duration	>3yr	3yr	2yr	1yr	<1yr
Data Source	Process	Line	Plant	Corporate	Sector
Technology	Actual	Comparable	Within Class	Conventional	Within Sector
Reliability on	Site Audit	Expert verify	Region Report	Sector Report	Academic
Precision to	Process	Line	Plant	Company	Industry
Geography	Process	Line	Plant	Nation	Continent
True of the	Process	Mill	Company	Group	Industry
Sites cover of	>50%	>25%	>10%	>5%	<5%
Sample size	>66% trend	>25% trend	>10% batch	>5% batch	Academic
Cut-off mass	0.01%	0.05%	0.1%	0.5%	1%
Consistent to	± 0.01	$< \pm 0.05$	$< \pm 0.10$	$< \pm 0.20$	$< \pm 0.30$
Reproducible	>98% confidence	>95%	>90%	>80%	<70%
Certainty	Very High	High	Typical	Poor	$\geq \pm 0.30$ unused

The Evah databases exist in top zones of commercial global modelling and calculating engines. Quality control methods are applied to ensure:

- Coverage of place in time with all information⁷ for each dataset noted, checked and updated;
- Consistency to Evah guidelines⁸ for all process technology, transport and energy demand;
- Completeness of modelling based on in-house reports, literature and industry reviews;
- Plausibility in 2 way checks of LCI input and output flows of data checked for validity, plus
- Mathematical correctness of all calculations in mass and energy balance cross checks.

Electricity supply and new data in the databases are updated and audited by external certifiers.

⁶ Evah Institute data quality control system accords with UNEP SETAC Global LCI Database Quality 2010 Guidelines

⁷ Jones D G (2004) LCI Database for Commercial Building Report 2001-006-B-15 Icon.net, Australia

⁸ Evah Tools, Databases and Methodology Queensland, Australia at <http://www.evah.com.au/tools.html>



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13. Assumptions for Supply Chain Modelling

Industry sector inventory data is also developed to represent business as usual as well as BAT practices with operations covering industry supply chains and infrastructure in Australia and overseas. Environmental performance is evaluated across sectors by mining, farming, fishery, forestry, freight, infrastructure, manufacture and other process technology type plus their license conditions. Australian building sector rules and Evah assumptions applied are defined in Table 5.

Table 5 Scope Boundaries Assumptions and Metadata

Quality/Domain	National including Import and Export
Process Model	Typical industry practice with currently most common or best (BAT) technology
Resource flows	Regional data for resource mapping, fuels, energy, electricity and logistics
Temporal	Project data was collated from 2012 to 2015
Geography	Designated client, site, regional, national, Pacific Rim then European jurisdiction
Representation	Designated client, their suppliers and energy supply chains back to the cradle
Consistency	Model all operations by known given operations with closest proximity
Technology	Pacific Rim Industry Supply Chain Technology typical of 2012 to 2015
Functional Unit	Typical product usage with cleaning & disposal/m ² over the set year service life
System Control	
Primary Sources	Clients and suppliers mills, publications, websites, specifications & manuals
Other Sources	IEA 2015 , GGT 2015 , Boustead 2013 , Simapro 2015 , IBIS 2015 , EcolInvent 2015 ,
Data mix	Power grid and renewable shares updated to latest IEA 2015 reports
Operational	Company data for process performance, product share, waste and emissions
Logistics	Local data is used for power, fuel mix, water supply, logistics share & capacity
New Data Entry	Evah Institute 2016; Global Green Tag Researchers 2016; IBIS 2015
Data Generator	Manufacturers, Evah Institute 2016; GGT 2016 ; Meta: IBIS 2015, Other pre 2016
Data Publisher	The Evah Institute Pty Ltd to Global GreenTag and designated client only
Persons input	All contributors cited in Evah & Global GreenTag records or websites
Data Flow & Mix	
System Boundary	Earth's cradle of all resource & emission flows to end of use, fitout or build life
System flows	All known from and to air, land, water and community sources & sinks
Capital inclusions	Natural stocks Δ , industry stockpiles Δ , capital wear Δ , system losses and use
Arid Practice	Dry technology adopted, Water use is factored by 0.1 as for e.g. Mining
Transportation	Distance >20% than EU; >20% fuel efficient larger vehicles, load & distance
Industrial	Company or industry sector data for manufacturing and minerals involved
Mining	All raw material extraction is based on Australian or Pacific Rim technology
Imported fuel	Mix is from nearest sources is e.g. UAE, SE Asia, Canada or New Zealand
Finishes	Processing inputs with finishing burdens are factored in. If not that is denoted
Validation	
Accuracy	10 th generation study is ± 5 to 15% uncertain due to some background data
Completeness	All significant operations are tracked and documented from the cradle to grave
Precision	Tracking of >90% flows applies a 90:10 rule sequentially to 99.9% and beyond
Allocation	%100 to co products on reaction stoichiometry by energetic or mass fraction
Burdens	All resource use from & emissions to community air land, water are included
Plausibility	Results are checked and benchmarked against BAT, BAU & worst practice
Sensitivity	Calculated U is reported & compared to libraries of Bath U RICE & EcolInvent 3
Validity Checks	Are made versus Plastics Europe, Ecobilan, GaBi & or Industry LCA Literature



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Bio Xorel® X-Protect Wall**14. References for this LCA & EPD**

Australian & New Zealand (ANZECC) Guidelines For Fresh & Marine Water Quality (2000)
<http://www.environment.gov.au/water/quality/national-water-quality-management-strategy>

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<http://www.basel.int/portals/4/basel%20convention/docs/text/baselconventiontext-e.pdf>

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Evah (2015) LCA Tools, Databases & Methodology at <http://www.evah.com.au/tools.html>

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IBISWorld (2016) Market Research, <http://www.ibisworld.com.au/> IBISWorld Australia

International Energy Agency (2016) Energy Statistics <http://www.iea.org/countries/membercountries/>

ISO 9001:2008 Quality Management Systems Requirements

ISO 14001:2004 Environmental management systems: Requirements with guidance for use

ISO 14004:2004 EMS: General guidelines on principles, systems & support techniques

ISO 14015:2001 EMS: Environmental assessment of sites & organizations (EASO)

ISO 14020:2000 Environmental labels & declarations — General principles

ISO 14024:2009 Environmental labels & declarations -- Type I Principles & procedures

ISO 14025:2006 Environmental labelling & declarations Type III EPDs Principles & procedures

ISO 14031:1999 EM: Environmental performance evaluation: Guidelines

ISO 14040:2006 EM: Life cycle assessment (LCA): Principles & framework

ISO 14044:2006 EM: LCA: Requirement & guideline for data review: LCI; LCIA, Interpretation results

ISO 14064:2006 EM: Greenhouse Gases: Organisation & Project reporting, Validation & verification

ISO 15392:2008 Sustainability in building construction General principles

ISO 15686-1:2011 Buildings & constructed assets Service life planning Part 1: General principles

ISO 15686-2:2012 Buildings & constructed assets Service life (SL) planning Part 2: prediction

ISO 15686-8:2008 Buildings & constructed assets SL planning Part 8: Reference & estimation

ISO 21929-1:2011 Sustainability in building construction Sustainability indicators Part 1: Framework

ISO 21930:2007 Building construction: Sustainability, Environmental declaration of building products

ISO/TS 21931-1:2010 Sustainability in building construction: Framework for assessment, Part 1:

ISO 21932:2013 Sustainability in buildings and civil engineering works -- A review of terminology

Plastics Europe (2016) Portal <http://www.plasticseurope.org/plastics-sustainability/eco-profiles.aspx>

Pre (2016) SimaPro 8 Software, The Netherlands <http://www.pre-sustainability.com/simapro-manuals>

Myhre et al, 2013, Anthropogenic and Natural Radiative Forcing Chapter 8 in Stocker et al (eds.)

Climate Change 2013, AR5 of the IPCC, Cambridge U Press UK. <http://www.ipcc.ch/report/ar5/wg1/>

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USLCI (2014) Life-Cycle Inventory Database <https://www.lcacommons.gov/nrel/search>, USA

U.S. Geological Survey National Minerals <http://minerals.usgs.gov/minerals/pubs/country/> USA

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<http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=20797> p 1-38, 6-9, USA



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Bio Xorel® X-Protect Wall



Global GreenTagCert™ EPD Program

Environmental Product Declaration

Compliant to ISO 14025

This Environmental Product Declaration (EPD) discloses potential environmental outcomes compliant with ISO 14025 for business to business communication.

Further and explanatory information is found at

<http://www.globalgreentag.com/>

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