

HIDDEN COSTS: Product Selection with Life Cycle Assessment in Mind

1.0 LCA and LCCA Defined

Life Cycle Assessment or Analysis (LCA):

An assessment of the environmental impacts associated with all stages of a product's life and death (or rebirth).

LCA Considerations:

- Material Extraction or Harvest
- Processing and Manufacturing
- Transportation
- Installation
- Operations and Maintenance
- Disposal/Reuse/Recycling



Life Cycle Cost Analysis (LCCA):

An assessment of the total cost of owning a product over its lifetime.

LCCA Considerations:

- Cost of Purchase/Installation
- Cost of Operations
- Cost of Maintenance/Repairs
- Cost of Disposal

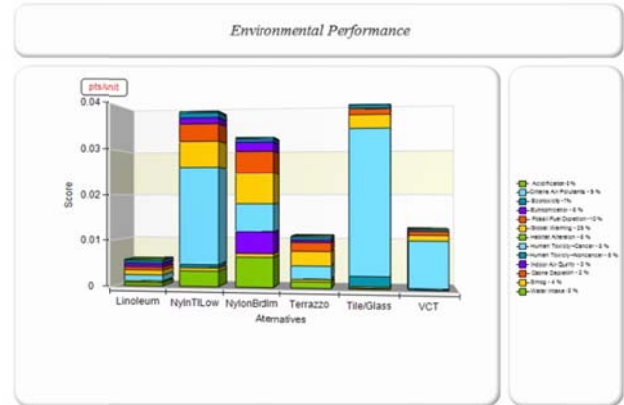


2.0 LCA/LCAA Techniques and Resources

There are several techniques and resources available for engaging in LCA and LCCA as a tool for product selection. Each resource is going to have its own set of criteria that it incorporates into LCA/LCCA as well as its own method of weighting each criterion in the analysis. Many of these LCA tools are available for free use and can help designers consider a wide variety of environmental and economic issues when selecting products.

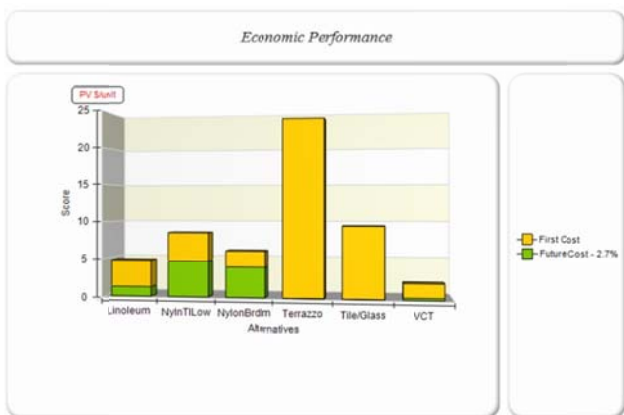
Building for Environmental and Economic Sustainability (BEES)

- Uses the LCA approach specified in ISO 14040 to address environmental performance which addresses all stages of product life: harvest/extraction, manufacture, transportation, installation, use and disposal/recycling.
- Uses the ASTM standard LCCA method to assess economic performance which covers initial cost, replacement, operation, maintenance and repair, and disposal.
- Allows you to select numerous products from within a category to compare.
- Creates graphs that chart economic and environmental attributes.
- Allows you to assign different weights to the environmental factors that are being analyzed.



Note: Lower values are better

Category	Linoleum	NylonTilLow	NylonBrdm	Terrazzo	Tile/Glass	VCT
Acidification - 1%	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Criteria Air Pollutants - 3%	1.0001	0.0003	0.0003	0.0002	0.0001	0.0001
Ecotoxicity - 7%	1.0006	0.0011	0.0007	0.0006	0.0007	0.0003
Eutrophication - 1%	1.0007	0.0013	0.0028	0.0005	0.0001	0.0001
Fossil Fuel Depletion - 1%	1.0007	0.0038	0.0048	0.0019	0.0012	0.0008
Global Warming - 29%	1.0011	0.0057	0.0067	0.0030	0.0029	0.0012
Habitat Alteration - 6%	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Human Toxicity-Cancer - 8%	1.0013	0.0213	0.0060	0.0028	0.0115	0.0099
Human Toxicity-Noncancer - 5%	1.0001	0.0006	0.0001	0.0001	0.0022	0.0002
Indoor Air Quality - 3%	1.0000	0.0001	0.0047	0.0000	0.0000	0.0000
Ozone Depletion - 2%	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Smog - 4%	1.0001	0.0007	0.0008	0.0005	0.0003	0.0001
Water Intake - 6%	1.0007	0.0034	0.0064	0.0014	0.0002	0.0000
Sum	1.0056	0.0303	0.0325	0.0110	0.0302	0.0127



Category	Linoleum	NylonTilLow	NylonBrdm	Terrazzo	Tile/Glass	VCT
First Cost	3.56	3.83	2.10	23.59	9.55	1.88
Future Cost - 2.7%	1.29	4.77	4.68	0.50	0.00	0.28
Sum	4.85	8.60	6.78	23.59	9.55	2.16

Graphics from BEES Online: ws680.nist.gov/Bees/

BRE Green Guide to Specification

- Uses the LCA approach specified in ISO 14040 to address environmental performance which addresses all stages of product life: harvest/extraction, manufacture, transportation, installation, use and disposal/recycling.
- The thirteen environmental issues that are included are very diverse and include things like material resource extraction, human toxicity, waste disposal and fossil fuel depletion.
- Product ratings are available based on building type such as commercial, educational or domestic and then by component or category, such as floor finishes.
- The guide grades each of the products in a category relative to each other. The ranking scales may vary by building type and category.
- Rankings are given on a scale of A+ (best) to E (worst).
- The Green Guide is a British system that is part of the BREEAM (BRE Environmental Assessment Method), which is a sustainability rating system for buildings.

Green Guide 2008 ratings

Building type >	Commercial
Category >	Floor Finishes
Element type >	Hard Floor Finishes

	Element number	Summary rating
Cement based terrazzo tiles.	821580007	E
Ceramic floor tiles.	821580001	B
Ceramic mosaic tiles.	821580011	A+
Imported Chinese granite floor tiles.	821580015	B
Imported Italian Marble tiles.	821580004	D
in situ cement based terrazzo.	821580012	B
Porcelain Floor Tile (40% recycled content), 11mm thick, ISO13006 Type B1A	1021580001	A
Porcelain Floor Tile, 4mm thick, ISO13006 Type B1A	1021580002	A
Printed laminate flooring (6mm) on acoustic underlay.	821580016	B
Quarry tiles.	821580005	B
Resin based terrazzo/agglomerated stone/composite tiles (10% resin content).	821580018	E
Resin based terrazzo/agglomerated stone/composite tiles (2% resin content).	821580008	C
Solid hardwood flooring (14mm) with underlay.	821580003	A+
Solid hardwood flooring (22mm) on underlay.	821580002	A+
Timber veneered laminate flooring (8mm) on acoustic underlay.	821580019	A+
UK produced limestone floor tiles.	821580009	A
UK produced Slate floor tiles.	821580010	E

Green Guide 2008 ratings

Building type >	Commercial
Category >	Floor Finishes
Element type >	Hard Floor Finishes

Element	Ceramic floor tiles.
Element Number	821580001
Summary Rating	B
Climate Change	C
Water Extraction	A
Mineral Resource Extraction	A+
Stratospheric Ozone Depletion	A
Human Toxicity	B
Ecotoxicity to Freshwater	B
Nuclear Waste (higher level)	D
Ecotoxicity to Land	A
Waste Disposal	A
Fossil Fuel Depletion	B
Eutrophication	A+
Photochemical Ozone Creation	A
Acidification	A
Kg of CO ₂ eq. (60 years)	100.0

Graphics from BRE Green Guide: www.bre.co.uk/greenguide/

3.0 LCA/LCAA Certifications

Recently, some product certifications have come onto the market that aim to help consumers identify products that address all phases of a product's lifecycle. While there are many available certifications or labels, a few have begun to stand out in the building products industry.



- Uses five criteria: Material Health, Material Reutilization, Renewable Energy Use, Water Stewardship, and Social Responsibility
- Applicable to products from any industry.
- Four levels of certification available: Certified, Silver, Gold and Platinum.



- Type I Environmental Label as defined by ISO 14024.
- Addresses multiple environmental aspects throughout the life of the product.
- Different standards are available for different product types.
- Goes far beyond building products into other types of consumer goods.



- The EU Eco-Label is the official environmental product certification for the European Union.
- Available for all product types except food, beverages, pharmaceuticals and medical devices.
- Criteria exists for energy consumption, toxicity, recyclability and waste prevention.
- All aspects of the product's creation and use including extraction, manufacturing, distribution, use, and disposal are examined.

4.0 Industry Examples

The interior design industry is catching on to the benefits of LCA and LCCA as rapidly as any industry. Product manufacturers are quickly adopting already existing LCA/LCCA tools or certifications; Shaw and Carnegie are using Cradle to Cradle Certification on many products, while others, like Maharam, are certifying under the EU Flower label. Some companies are even developing their own tools. For instance, Antron Carpet Fiber has developed their own online Life Cycle Impact Calculator to show consumers how much energy and emissions they can save by using Antron fiber instead of a competitor's fiber. Meanwhile, DIRTT's ICEberg® data tool contains economic and environmental data to help consumers compare their panelized system to conventional wall framing from an LCA point of view.

5.0 Applying LCA/LCCA

First costs will always be a crucial element in product selection, but efforts by organizations to develop tools for LCA and LCCA analysis and willingness by product manufacturing companies to use these LCA tools and data will make it much easier for designers to keep life cycle economic and environmental considerations in mind as well. The interior design industry is primed to really take the lead in applying LCA to product selection since so many interiors product companies are laying the groundwork by providing data and certified products.



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