

BEES Online Tutorial

Welcome to BEES Online. BEES Online helps you select environmentally-preferred, cost-effective building products using a science-based, standards-driven performance rating system.

To select environmentally-preferred, cost-effective building products, follow three main steps:

1. Set your study parameters to customize key assumptions
2. Select the alternative building products for comparison. BEES Online results may be computed once alternatives are selected.
3. View the BEES Online results to compare the overall, environmental, and economic performance scores for your alternatives.

1.0 Setting Parameters

From the BEES Online home page click on Analyze Building Products. The Analysis Parameters page opens, as shown in Figure 1.1. You will set your study parameters on this page.

BEES Online uses importance weights to combine environmental and economic performance measures into a single performance score. If you prefer not to weight the environmental and economic performance measures, select the “no weighting” option. In this case, BEES Online will compute and display only disaggregated performance results.

Assuming you have chosen to weight BEES Online results, you are asked to select your relative importance weights for the environmental impact categories included in the BEES Online environmental performance score: Global Warming, Acidification, Eutrophication, Fossil Fuel Depletion, Indoor Air Quality, Habitat Alteration, Water Intake, Criteria Air Pollutants, Smog, Ecological Toxicity, Ozone Depletion, and Human Health. You are presented with four sets of alternative weights. You may choose to define your own set of weights or to select a built-in weight set derived from an EPA Science Advisory Board study, judgments by a BEES Stakeholder Panel, or a set of equal weights.¹ Click on the View Predefined Weights link to display the impact category weights for the three pre-defined weight sets, as shown in Figure 1.2. If you select the user-defined weight set, you will be asked to enter weights for all impacts, as shown in Figure 1.3. These weights must sum to 100. Next you are asked to enter your relative importance weights for environmental versus economic performance. These values must sum to 100. Enter a value between 0 and 100 for environmental performance reflecting your percentage weighting. For example, if environmental performance is all-important, enter a value of 100. The corresponding economic importance weight is automatically computed.

¹ So that the set of equal weights would appropriately sum to 100, individual weights have been rounded up or down. These arbitrary settings may be changed by using the user-defined weighting option.



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ANALYSIS PARAMETERS

Environmental Impact Category Weights

No Weighting

[View Predefined Weights](#)

BEES Stakeholder Panel

Impact	Weight
Global Warming	29
Acidification	3
Eutrophication	6
Fossil Fuel Depletion	10
Indoor Air Quality	3
Habitat Alteration	6
Water Intake	8
Criteria Air Pollutants	9
Smog	4
Ecotoxicity	7
Ozone Depletion	2
Human Health	13
Sum:	100

Performance Weights

Environmental Performance (%): 50

Economic Performance (%): 50

Discount Rate(%)(Excluding Inflation): 2.7

Building Element for Comparison

Major Group Element

Building Maintenance

Group Element

Cleaning Products

Individual Element

Bath and Tile Cleaners

[View Product List](#)

Click the Next button to select product alternatives.

Next

Figure 1.1 Setting Analysis Parameters

IMPACT	Equal Weights	EPA Science Advisory Board-based	BEEES Stakeholder Panel
Global Warming	9	16	29
Acidification	9	5	3
Eutrophication	9	5	6
Natural Resource Depletion	9	5	10
Indoor Air Quality	8	11	3
Habitat Alteration	8	16	6
Water Intake	8	3	8
Criteria Air Pollutants	8	6	9
Smog	8	6	4
Ecotoxicity	8	11	7
Ozone Depletion	8	5	2
Human Health	8	11	13
Sum:	100	100	100

Figure 1.2 Viewing Impact Category Weights

ANALYSIS PARAMETERS

Environmental Impact Category Weights

No Weighting

[View Predefined Weights](#)

User-Defined

Impact	Weight
Global Warming	0
Acidification	0
Eutrophication	0
Fossil Fuel Depletion	0
Indoor Air Quality	0
Habitat Alteration	0
Water Intake	0
Criteria Air Pollutants	0
Smog	0
Ecotoxicity	0
Ozone Depletion	0
Human Health	0
Sum:	0

Performance Weights

Environmental Performance (%): 50

Economic Performance (%): 50

Discount Rate%(Excluding Inflation): 2.7

Building Element for Comparison

Major Group Element

Building Maintenance

Group Element

Cleaning Products

Individual Element

Bath and Tile Cleaners

[View Product List](#)

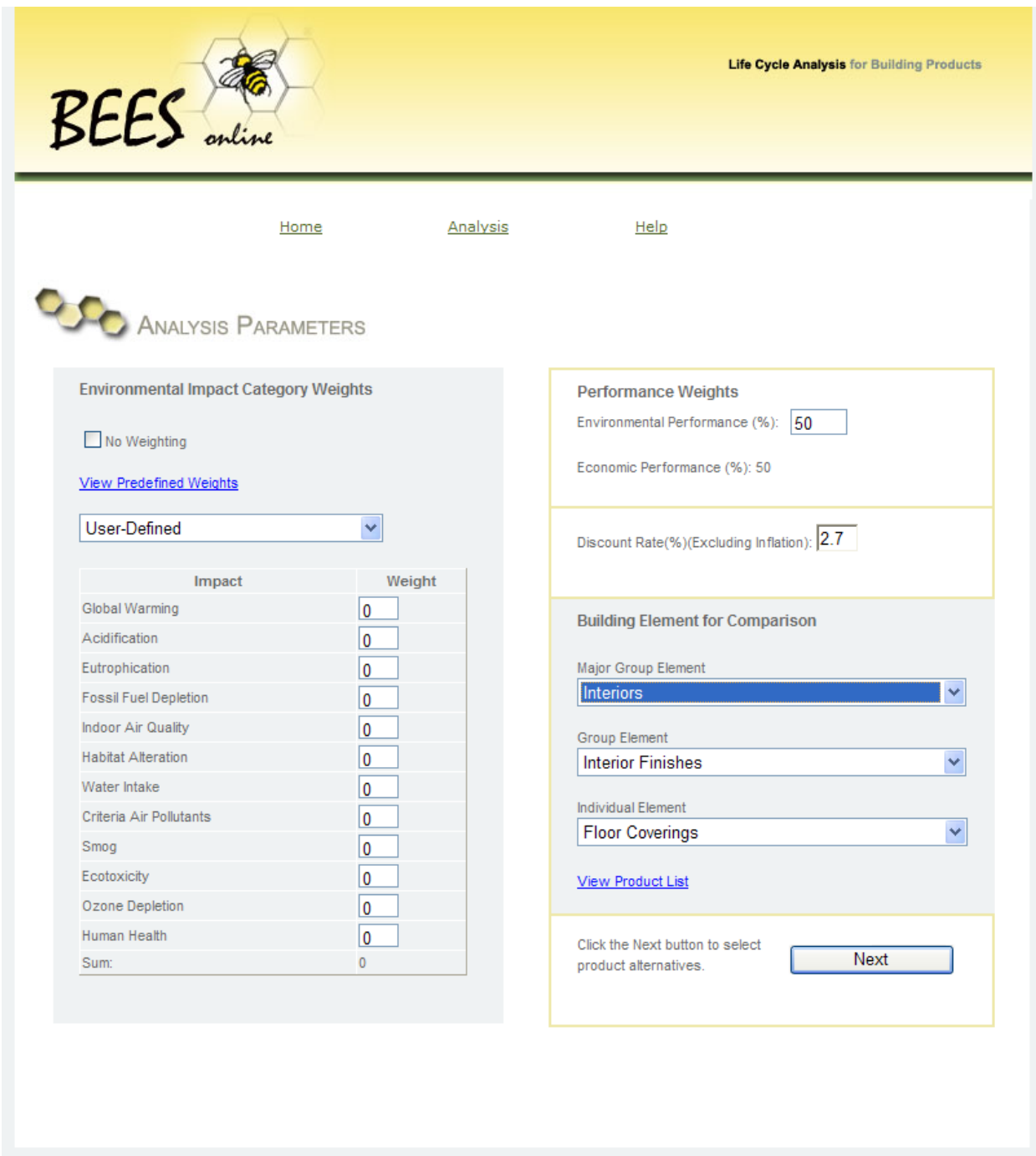
Click the Next button to select product alternatives.

Next

Figure 1.3 Entering User-Defined Weights

Next, enter the real (excluding inflation) discount rate for converting future building product costs to their equivalent present value. All future costs are converted to their equivalent present values when computing life-cycle costs. Life-cycle costs form the basis of the economic performance scores. The higher the discount rate, the less important to you are future building product costs; such as repair and replacement costs. The maximum value allowed is 20 %. A discount rate of 20 % would value each dollar spent 50 years hence as only \$0.0001 in present

value terms. The 2010 rate mandated by the U.S. Office of Management and Budget for most long-term Federal projects, 2.7 %, is provided as a default value.²



Life Cycle Analysis for Building Products

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ANALYSIS PARAMETERS

Environmental Impact Category Weights

No Weighting

[View Predefined Weights](#)

User-Defined

Impact	Weight
Global Warming	0
Acidification	0
Eutrophication	0
Fossil Fuel Depletion	0
Indoor Air Quality	0
Habitat Alteration	0
Water Intake	0
Criteria Air Pollutants	0
Smog	0
Ecotoxicity	0
Ozone Depletion	0
Human Health	0
Sum:	0

Performance Weights

Environmental Performance (%): 50

Economic Performance (%): 50

Discount Rate(%) (Excluding Inflation): 2.7

Building Element for Comparison

Major Group Element: Interiors

Group Element: Interior Finishes

Individual Element: Floor Coverings

[View Product List](#)

Click the Next button to select product alternatives. Next

Figure 1.4 Selecting Building Element for BEES Online Analysis

² U.S. Office of Management and Budget (OMB) Circular A-94, *Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs*, Washington, DC, October 27, 1992 and OMB Circular A-94, Appendix C, Washington, DC, December 2009

1.1 Selecting Alternatives

Selecting product alternatives to compare is a two-step process.

1. Select the specific building element for which you want to compare alternatives. Building elements are organized by functional use using the hierarchical structure of the ASTM standard UNIFORMAT II classification system: by Major Group Element, Group Element, and Individual Element.³ Click on the down arrows to display the complete lists of available choices at each level of the hierarchy. For a listing BEES Online products included in each building element, click View Product List.

BEES Online contains environmental and economic performance data for over 230 products across a wide range of building elements including beams, columns, roof sheathing, exterior wall finishes, wall insulation, framing, roof coverings, partitions, ceiling finishes, interior wall finishes, floor coverings, chairs, and parking lot paving. Press Next to proceed to the Select Product Alternatives page.

³ ASTM International, *Standard Classification for Building Elements and Related Sitework--UNIFORMAT II*, ASTM Designation E1557-05, West Conshohocken, PA, 2005.

 SELECT ALTERNATIVES

Select Product Alternatives

- Generic Nylon Carpet Broadloom
- Generic Nylon Carpet Tile
- Generic Nylon Carpet Tile/Low-VOC Adhsv
- Generic Terrazzo
- Generic Vinyl Composition Tile
- Generic Wool Carpet Brdlm/Low-VOC Adhsv
- Generic Wool Carpet Broadloom
- Generic Wool Carpet Tile
- Generic Wool Carpet Tile/Low-VOC Adhsv
- IFC Entropy Carpet Tile, Climate Neutral
- IFC Sabi Carpet Tile, Climate Neutral
- IFC Transformation Carpet Tile, Climate Neut
- J&J Industries Certificate Brdlm Carpet
- Mohawk Meritage Broadloom Carpet

Update Product Details

[View Product Data](#)

Generic Nylon Carpet Broadloom

Transportation distance from manufacture to use: miles

kilometers

	Product	Distance (miles)
Delete	Generic Ceramic Tile w/ Recycled Glass	500
Delete	Forbo Linoleum	500
Delete	Generic Terrazzo	500
Delete	Generic Nylon Carpet Tile	1000
Delete	Generic Nylon Carpet Broadloom	1000

All calculations are complete!

Figure 1.5 Selecting Building Product Alternatives

2. Once you have selected the building element, you are presented with a page listing product alternatives available for BEES Online scoring, such as in Figure 1.5. Click on an alternative and then press the Select Alternative

button. After selecting each alternative, you will be able to enter the distance required to transport the product from the manufacturing plant to your building site. If the product is exclusively manufactured in another country (e.g., linoleum flooring), this setting should reflect the transportation distance from the U.S. distribution facility to your building site (transport *to* the distribution facility has already been built into the BEES Online data).

Press the Compute button to calculate the BEES Online environmental and economic performance results.

1.2 Viewing Results

Once you have set your study parameters, selected your product alternatives, and computed BEES Online results, press the View Reports button to bring up the reporting page. By default, the Economic Performance summary graph illustrated in Figure 1.6 is displayed. For all BEES Online graphs, the larger the score, the *worse* the performance. Also, all BEES Online graphs are stacked bar graphs, meaning the height of each bar represents a summary performance score consisting of contributing scores represented as its stacked bars.

1. The Economic Performance summary graph displays the first cost, discounted future costs and their sum, the life-cycle cost.
2. The Environmental Performance summary graph, shown in Figure 1.7, displays the weighted environmental impact category scores and their sum, the environmental performance score. Because this graph displays scores for unit quantities of individual building products that have been normalized (i.e., placed on a common scale) by reference to total U.S. impacts, they appear as very small numbers. For a primer on interpreting environmental performance scores, refer to BEES Score Interpretation available from BEES Online Help. If you chose not to weight, this graph is not available.
3. The Overall Performance summary graph, shown in Figure 1.8, displays the weighted environmental and economic performance scores and their sum, the overall performance score. If you chose not to weight, this graph is not available.

BEES Online results are derived by using the BEES model to combine environmental and economic performance data using your study parameters.

From the page for selecting BEES Online reports, you may choose to display detailed graphs depicting results by life-cycle stage or by contributing flow for each environmental impact category, and graphs depicting embodied energy performance. Figures 1.9 through 1.11 illustrate each of these options. Print any BEES Online report by using your browser's print feature.

Embodied Energy

While the environmental impacts from energy consumption and combustion are already accounted for throughout the BEES Online results by environmental impact category, BEES Online reports embodied energy results due to widespread interest in this measure. BEES Online classifies and reports total embodied energy in two ways: (1) by fuel and feedstock energy and (2) by fuel renewability.

The first classification system uses the energy accounting categories of fuel energy and feedstock energy. Feedstock energy is the energy content of fuel resources extracted from the earth, while fuel energy is the amount of energy that is released when fuels are burned. When fuel resources such as petroleum and natural gas are used as material inputs (e.g., as feedstocks for the manufacture of polystyrene resin), the energy value remains in the feedstock category. When extracted fuel resources are transformed into fuels and burned for energy, however, most of the feedstock energy is transformed into industrial process or transportation energy. This moves the quantity of combustion energy from the feedstock category into the fuel category. Because less than 100 % of the inherent energy value of extracted resources remains after fuel converting processes and combustion, a small amount of energy remains in the feedstock category. In general, biobased products and plastics will generate higher BEES Online feedstock energy values because there is potential energy "embodied" in the system. A rubber tire, for example, will have feedstock energy in the tire itself and fuel energy from its production. If, after use, the tire is then sent to a cement kiln to recover its energy as a method of "disposing" of the used tire, then that feedstock (potential) energy in the tire is converted to that amount of fuel by the cement kiln. In this case, the feedstock energy in the tire has been converted to fuel energy.

Total embodied energy is also classified and reported using the energy accounting categories of renewable energy and non-renewable energy. Energy derived from fossil fuels such as petroleum, natural gas, and coal is classified as non-renewable while energy from all other sources (hydropower, wind, nuclear, geothermal, biomass) is classified as renewable.

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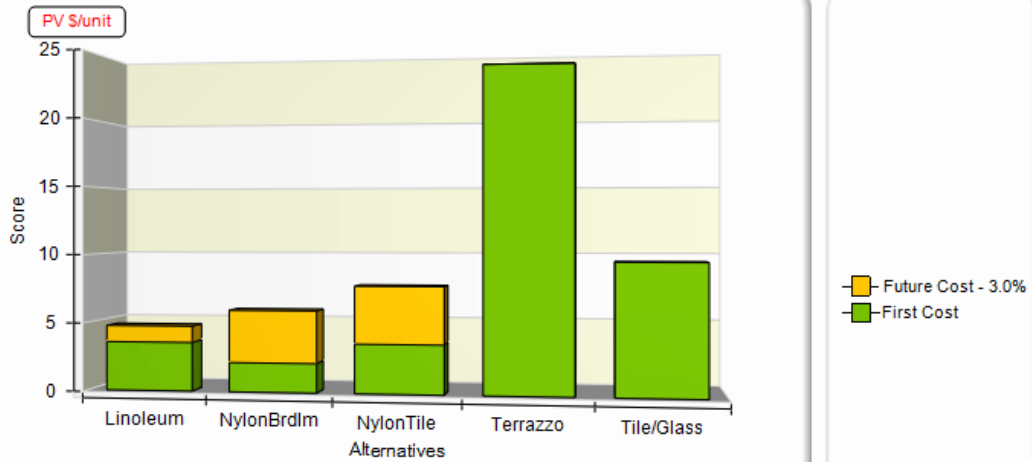
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- Summary Graphs
- Life-Cycle Stage Graphs
- Environmental Flow Graphs
- Embodied Energy

Economic Performance

Economic Performance



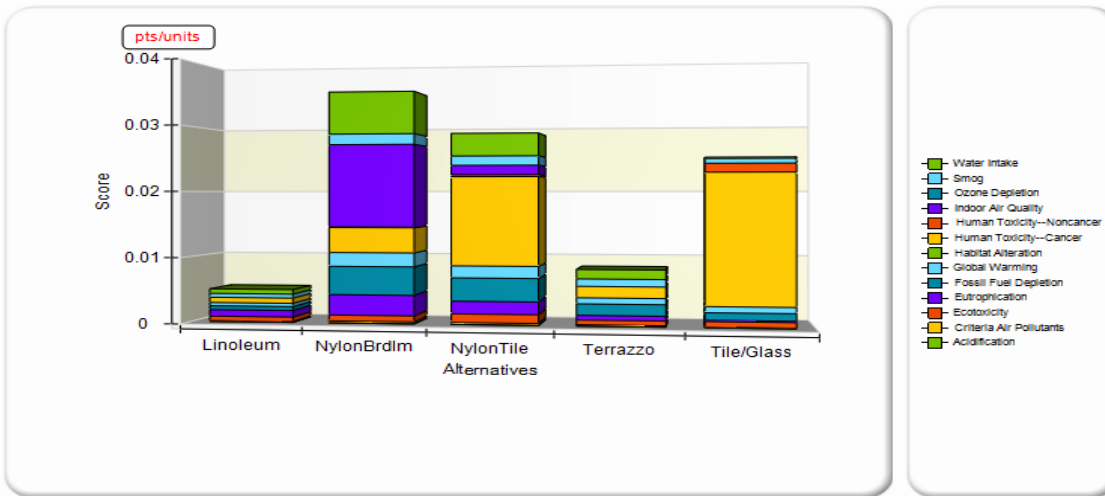
Category	Linoleum	NylonBrdlm	NylonTile	Terrazzo	Tile/Glass
First Cost	3.5600	2.1300	3.5800	23.5900	9.5500
Future Cost - 3.0%	1.1960	3.8128	4.1751	0.0000	0.0000
Sum	4.7560	5.9428	7.7551	23.5900	9.5500

Figure 1.6 Selecting BEES Online Reports

- Summary Graphs
- Life-Cycle Stage Graphs
- Environmental Flow Graphs
- Embodied Energy

Environmental Performance ▾

Environmental Performance



Note: Lower values are better

Category	Linoleum	NylonBrdlm	NylonTile	Terrazzo	Tile/Glass
Acidification	0.0000	0.0000	0.0000	0.0000	0.0000
Criteria Air Pollutants	0.0001	0.0003	0.0003	0.0002	0.0001
Ecotoxicity	0.0007	0.0009	0.0013	0.0007	0.0008
Eutrophication	0.0010	0.0031	0.0019	0.0007	0.0002
Fossil Fuel Depletion	0.0006	0.0043	0.0035	0.0017	0.0011
Global Warming	0.0005	0.0021	0.0018	0.0009	0.0009
Habitat Alteration	0.0000	0.0000	0.0000	0.0000	0.0000
Human Toxicity--Cancer	0.0008	0.0038	0.0134	0.0017	0.0197
Human Toxicity--Noncancer	0.0000	0.0001	0.0003	0.0000	0.0013
Indoor Air Quality	0.0000	0.0125	0.0014	0.0000	0.0000
Ozone Depletion	0.0000	0.0000	0.0000	0.0000	0.0000
Smog	0.0006	0.0016	0.0014	0.0011	0.0007
Water Intake	0.0007	0.0064	0.0034	0.0014	0.0002
Sum	0.0050	0.0351	0.0287	0.0084	0.0250

Figure 1.7 Viewing BEES Online Environmental Performance Results

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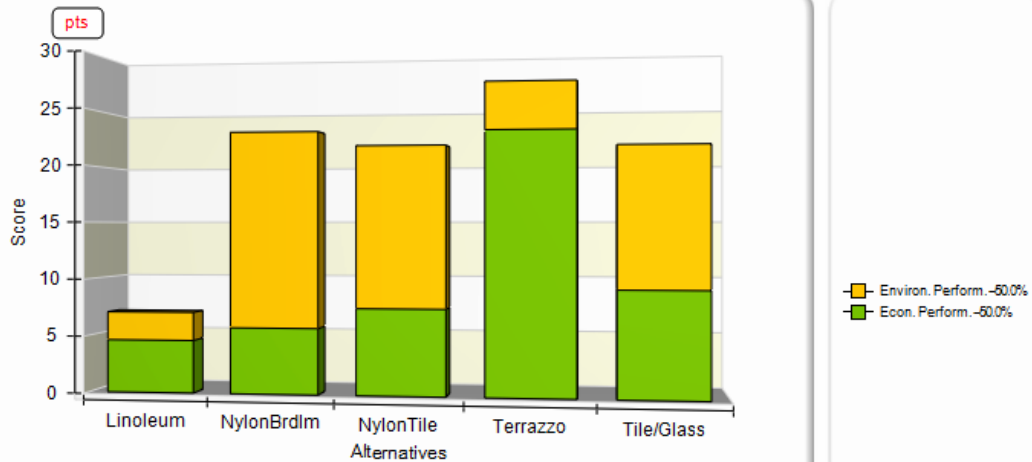
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Overall Performance ▼

Overall Performance



Note: Lower values are better

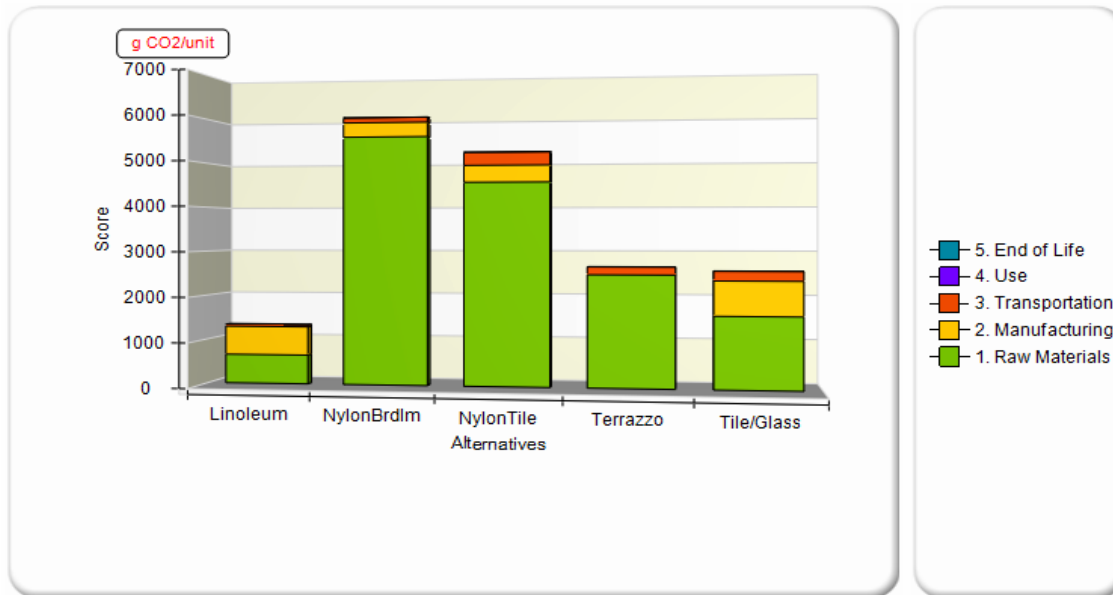
Category	Linoleum	NylonBrdlm	NylonTile	Terrazzo	Tile/Glass
Econ. Perform.--50.0%	4.6091	5.7592	7.5155	22.8613	9.2550
Environ. Perform.--50.0%	2.4655	17.0734	14.0703	4.1264	12.2644
Sum	7.0746	22.8326	21.5858	26.9877	21.5194

Figure 1.8 Viewing BEES Online Overall Performance Results

- Summary Graphs
- Life-Cycle Stage Graphs
- Environmental Flow Graphs
- Embodied Energy

Global Warming ▼

Global Warming



Note: Lower values are better

Category	Linoleum	NylonBrdlm	NylonTile	Terrazzo	Tile/Glass
1. Raw Materials	649.5848	5567.6270	4540.0944	2492.9625	1602.0258
2. Manufacturing	638.6637	321.4957	375.6831	0.0000	766.5896
3. Transportation	43.1574	113.5873	292.4296	172.4351	211.5102
4. Use	0.0000	0.0000	0.0000	0.4488	0.0000
5. End of Life	0.0000	0.0000	0.0000	0.0000	0.0000
Sum	1331.4059	6002.7100	5208.2071	2665.8464	2580.1256

Figure 1.9 Viewing BEES Online Environmental Impact Category Performance Results by Life-Cycle Stage

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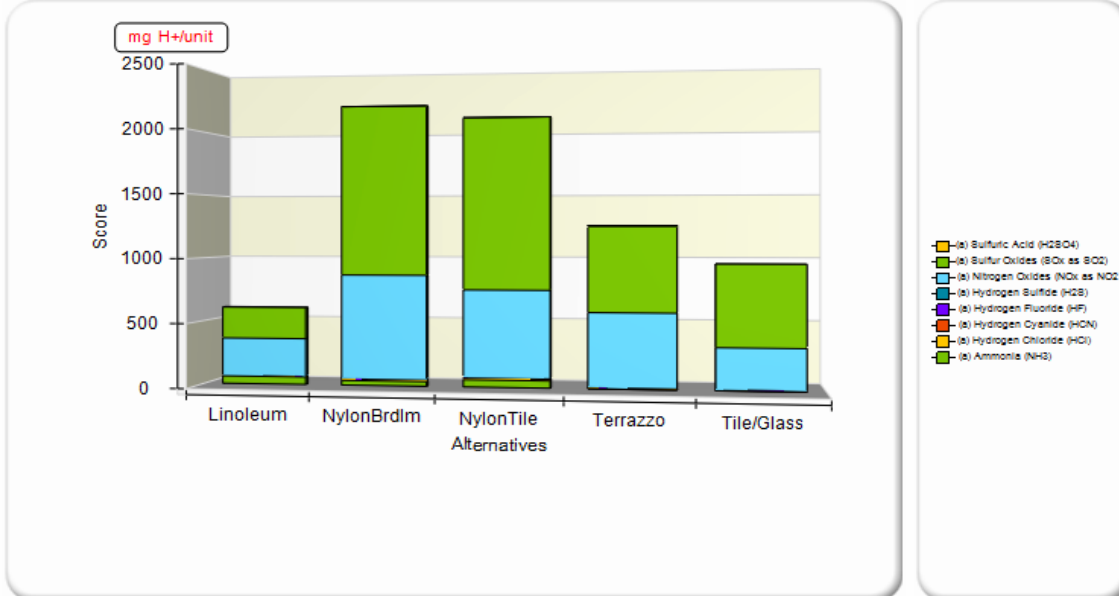
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- Summary Graphs
- Life-Cycle Stage Graphs
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Acidification ▼

Acidification



Note: Lower values are better

Category	Linoleum	NylonBrdlm	NylonTile	Terrazzo	Tile/Glass
(a) Ammonia (NH3)	58.8353	36.2785	55.8898	0.4411	0.6407
(a) Hydrogen Chloride (HCl)	3.7624	10.6856	12.7909	7.6429	2.9007
(a) Hydrogen Cyanide (HCN)	0.0439	0.0000	0.0033	0.0000	0.0000
(a) Hydrogen Fluoride (HF)	0.7338	1.3138	2.4172	0.8939	4.3070
(a) Hydrogen Sulfide (H2S)	0.2384	0.1170	0.1931	0.0834	0.0049
(a) Nitrogen Oxides (NOx as NO2)	297.2153	817.6328	683.1276	576.5760	319.1188
(a) Sulfur Oxides (SOx as SO2)	246.2731	1324.8252	1339.6828	665.3490	634.8750
(a) Sulfuric Acid (H2SO4)	0.0008	0.0015	0.0020	0.0673	0.0006
Sum	607.1030	2190.8544	2094.1067	1251.0536	961.8477

Figure 1.10 Viewing BEES Online Environmental Impact Category Performance Results by Flow

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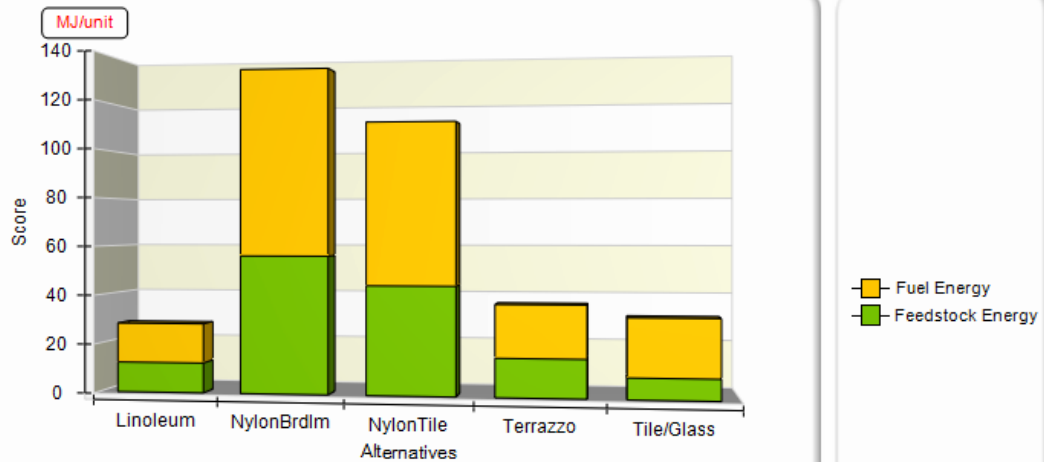
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- Summary Graphs
- Life-Cycle Stage Graphs
- Environmental Flow Graphs
- Embodied Energy

Embodied Energy by Fuel Usage ▼

Embodied Energy by Fuel Usage



Category	Linoleum	NylonBrdlm	NylonTile	Terrazzo	Tile/Glass
Feedstock Energy	12.2078	56.0938	44.2165	15.7000	8.6400
Fuel Energy	16.0756	75.9924	65.9379	21.4000	23.6000
Sum	28.2834	132.0862	110.1544	37.1000	32.2400

Figure 1.11 Viewing BEES Online Embodied Energy Results