

## *“The Four Toos”*

- *Too Much Information*
- *Too Many Criteria*
- *Too Many Choices*
- *Too Little Time*

# *Building for Environmental and Economic Sustainability (BEES)*

---

*Barbara Lippiatt*

*National Institute of Standards and Technology*

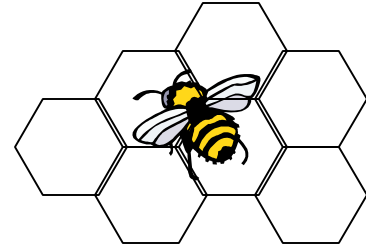
*Mike Levy*

*Environmental Strategies & Solutions, Inc.*

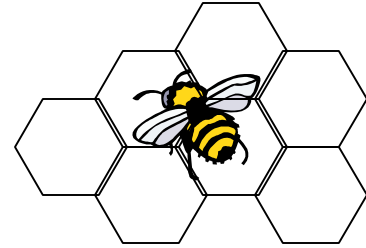
*Vince Camobreco*

*Ecobalance, Inc.*

# *How Does BEES Work?*



- *Model*
- *Data*
- *Software*



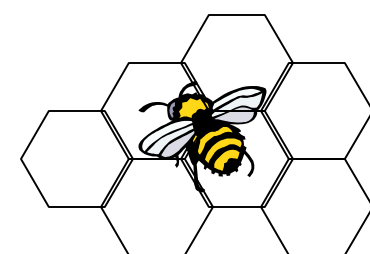
# *BEES Model*

- ***Takes Life-Cycle Approach***
  
- ***Based on Consensus Standards***
  - *Life-Cycle Costing (ASTM E917)*
  - *Building Element Classification (ASTM E1557)*
  - *Environmental Life-Cycle Assessment (ISO 14040)*
  - *Multi-Attribute Decision Analysis (ASTM E1765)*

# Analysis Parameters



No Weighting



## Environmental vs. Economic Performance Weights

Environmental Performance (%):

50

vs.

Economic Performance (%):

50

## Environmental Impact Category Weights

- User-Defined
- EPA Scientific Advisory Board
- Harvard University
- Equal Weights

View Weights

Discount Rate (%): (Excluding Inflation)

4.2

Ok

Cancel

Help



Weight Set

Global Warming

Acidification

Eutrophication

Natural Resource Depletion

Indoor Air Quality

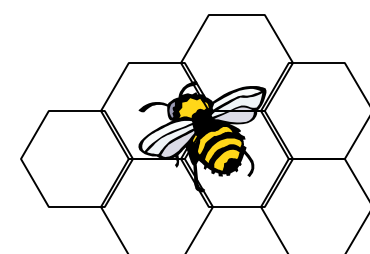
Solid Waste

**SUM**

# Analysis Parameters



No Weighting



## Environmental vs. Economic Performance Weights

Environmental Performance (%):

50

vs.

Economic Performance (%):

50

## Environmental Impact Category Weights

- User-Defined
- EPA Scientific Advisory Board
- Harvard University
- Equal Weights

View Weights

Discount Rate (%): (Excluding Inflation)

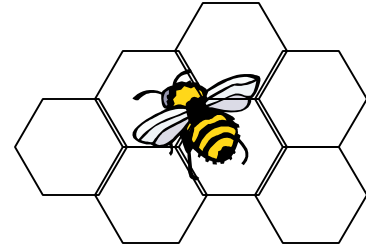
4.2

Ok

Cancel

Help

# *BEES Model: Parameters*



## Transportation

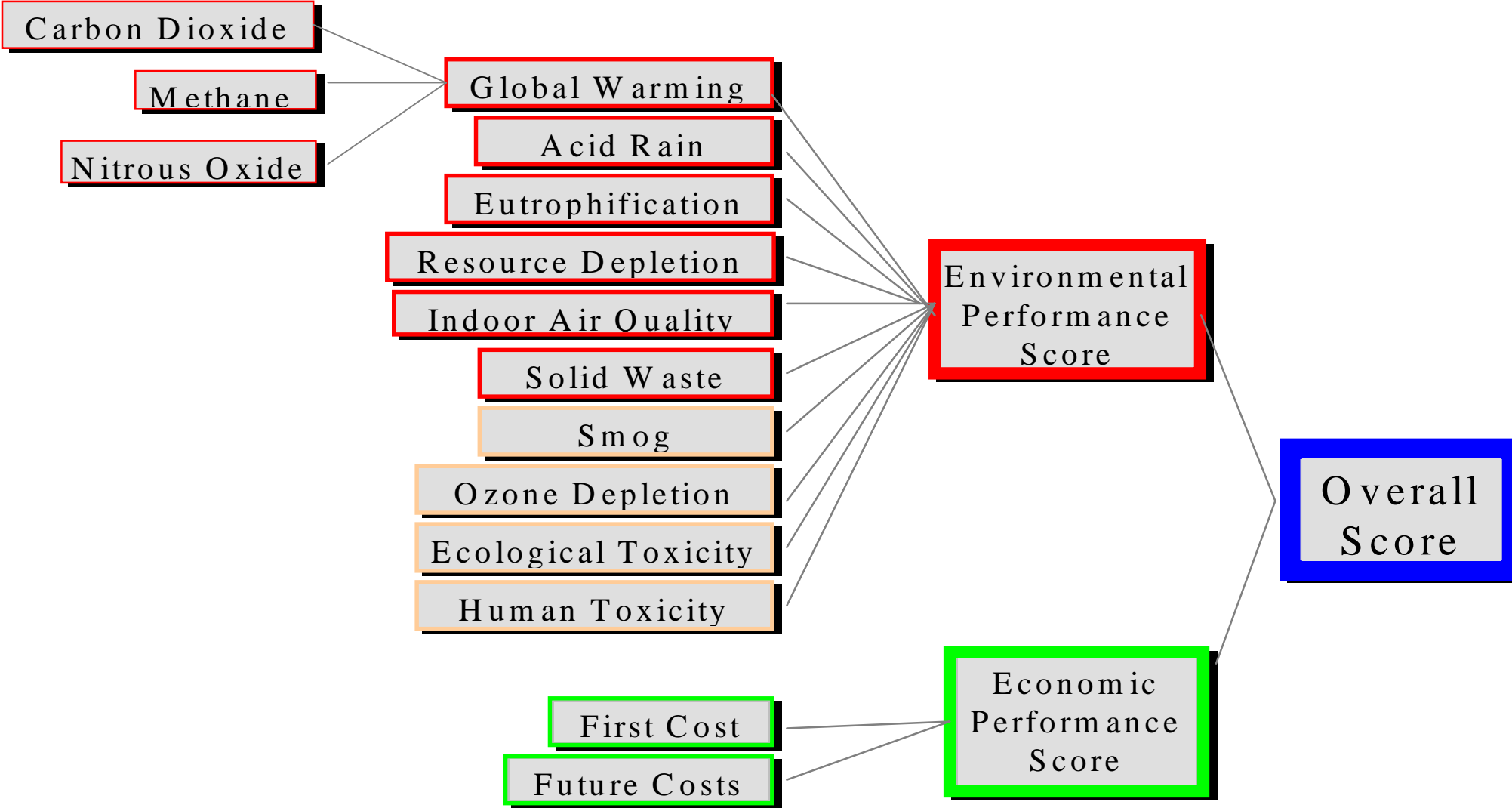
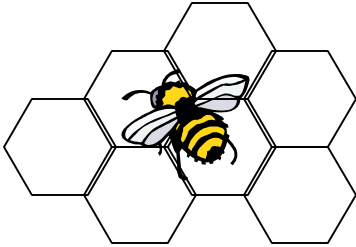
RecycledPETCarpetBrdlm/SynGlue

Transportation Distance from Manufacture to Use

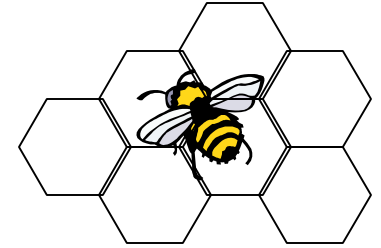
- 161 km (100 mi)
- 805 km (500 mi)
- 1609 km (1000 mi)

Ok

# BEES 2.0 Model



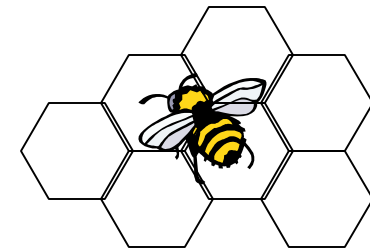
# BEES Data



## ■ U.S. Industry Average

## ■ Sixteen Building Elements

- *Framing*
- *Exterior Wall Finishes*
- *Wall Sheathing*
- *Wall Insulation*
- *Roof Coverings*
- *Roof Sheathing*
- *Ceiling Insulation*
- *Interior Partitions*
- *Interior Wall Finishes*
- *Floor Coverings*
- *Slab on Grade*
- *Basement Walls*
- *Beams*
- *Columns*
- *Parking Lot Paving*
- *Driveways/Sidewalks*

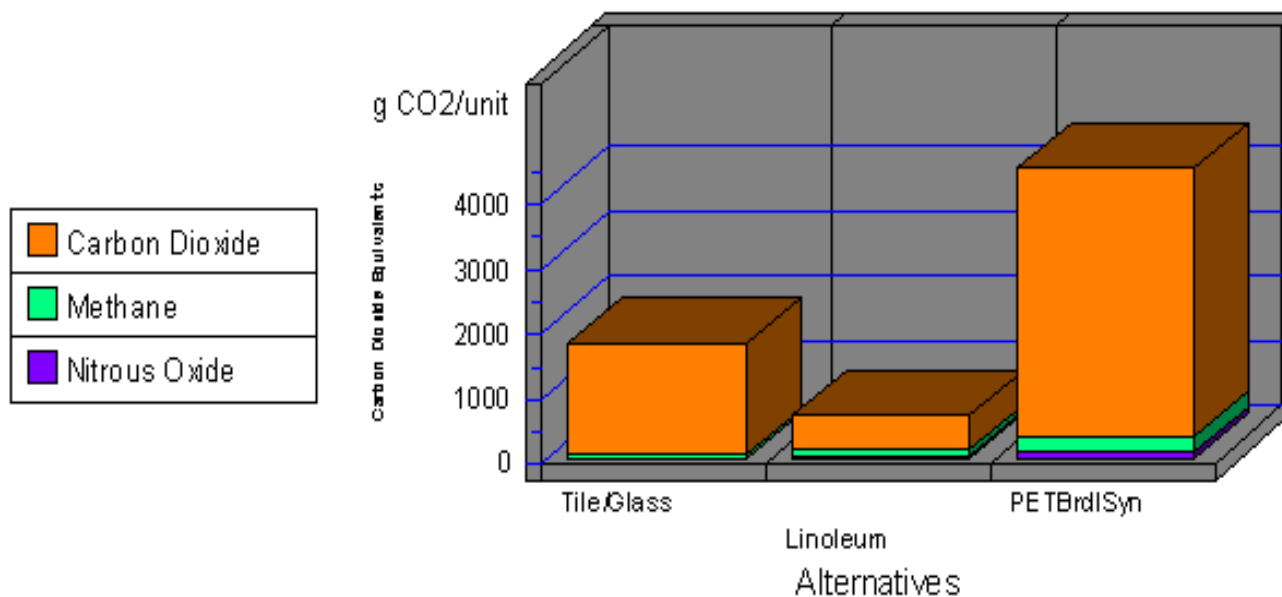


Potential Environmental Impact	Raw Results			
	Units	Tile/Glass	Linoleum	PET BrdISyn
Acidification	H+	0.4590	0.3884	0.7962
Eutrophication	PO4	0.7777	20.6679	2.1535
Global Warming	CO2	1783	696	4478
Indoor Air Quality	pts	0	38	100
Resource Depl.	index	0.0420	0.0450	0.1329
Solid Waste	CFt	0.08	0.03	0.33

Potential Economic Impact	Units	Tile/Glass	Linoleum	PET BrdISyn
	First Cost	\$	8.53	3.18
Future Cost	PV\$	0.00	2.15	4.13
<b>Life-Cycle Cost</b>		8.53	5.33	7.07
<i>Discount Rate (%)</i>		4.2		



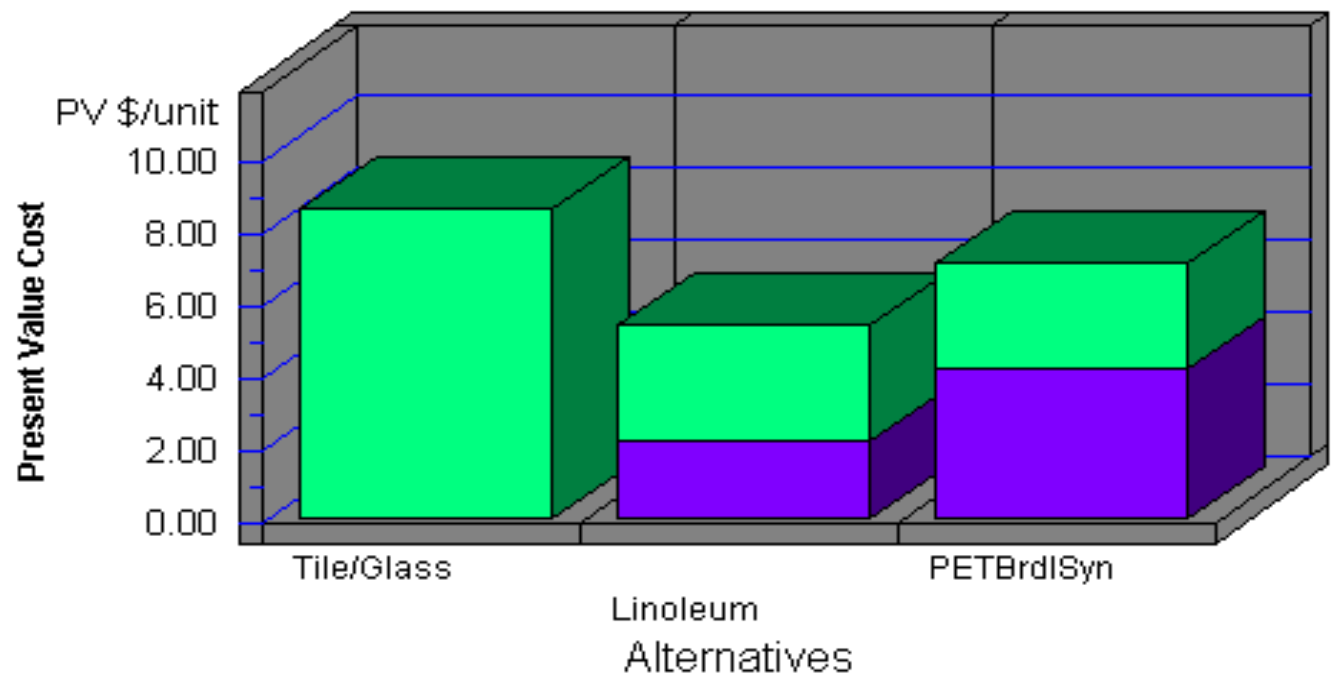
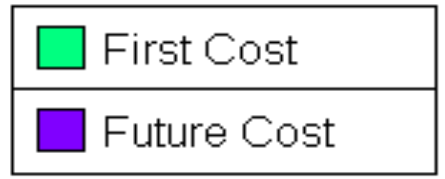
# Global Warming by Flow



Category	Tile/Glass	Linoleum	PETBrdISyn
Carbon Dioxide	1692	533	4095
Methane	62	119	275
Nitrous Oxide	28	43	107
<b>Sum</b>	1783	696	4478



# Economic Performance

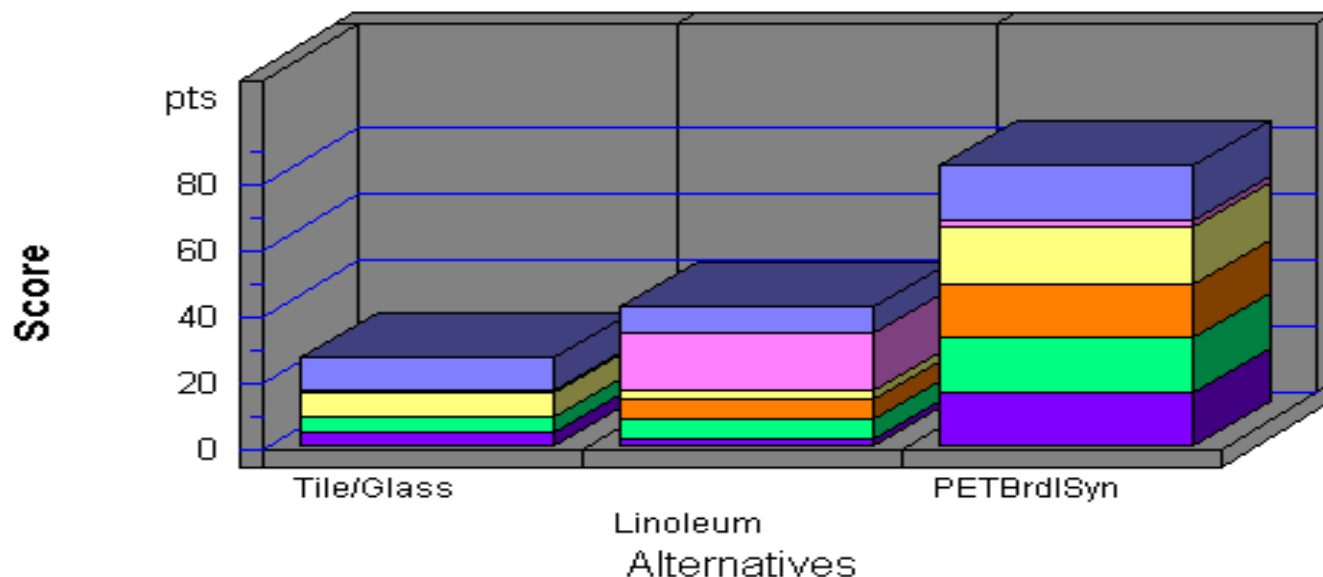


Category	Tile/Glass	Linoleum	PETBrdISyn
First Cost	8.53	3.18	2.94
Future Cost--4.2%	0.00	2.15	4.13
<b>Sum</b>	8.53	5.33	7.07



# Environmental Performance

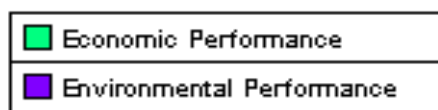
Acidification
Eutrophication
Global Warming
Indoor Air
Natural Resources
Solid Waste



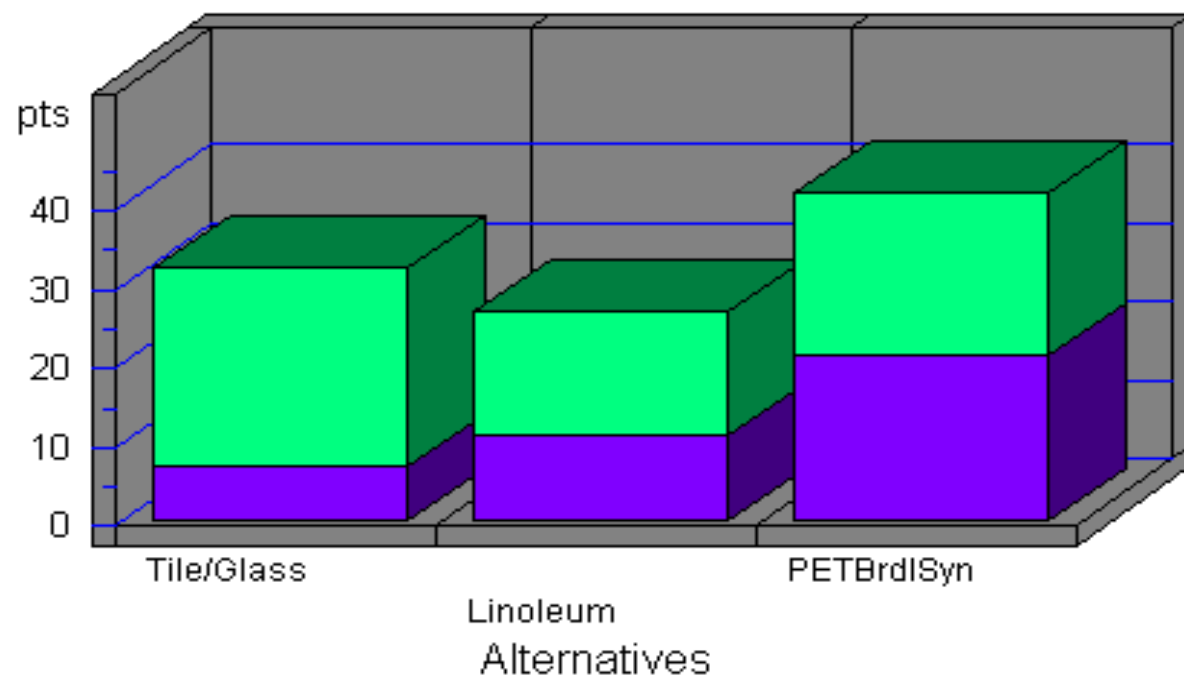
Category	Tile/Glass	Linoleum	PETBrdISyn
Acidification--17%	10	8	17
Eutrophication--17%	1	17	2
Global Warming--17%	7	3	17
Indoor Air--16%	0	6	16
Natural Resources--17%	5	6	17
Solid Waste--16%	4	2	16
<b>Sum</b>	<b>27</b>	<b>42</b>	<b>85</b>



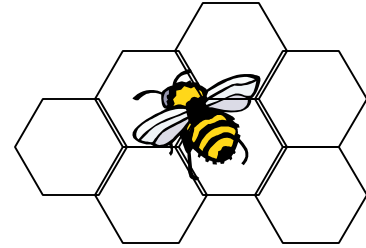
# Overall Performance



Score



Category	Tile/Glass	Linoleum	PETBrdISyn
Economic Perform.--50%	25	15	20
Environ. Perform.--50%	7	11	21
<b>Sum</b>	32	26	41

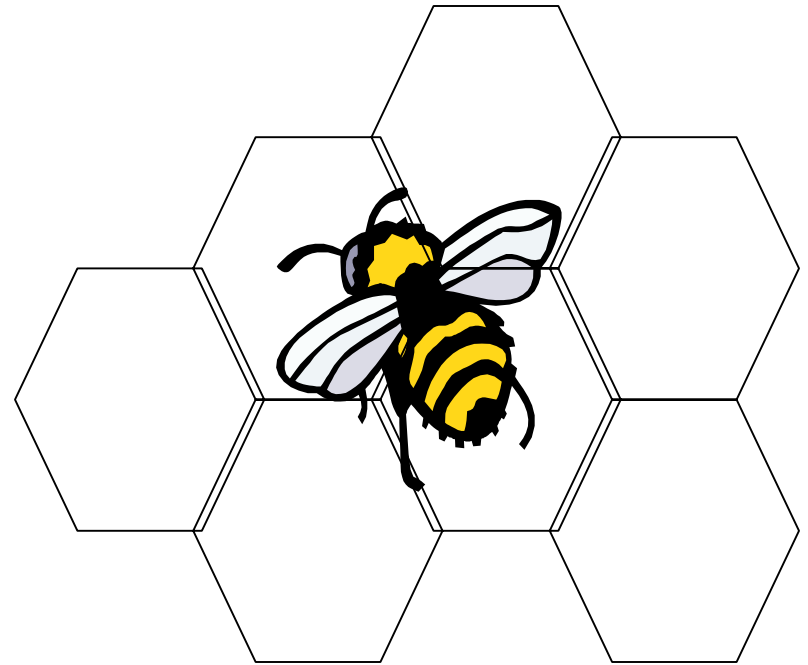


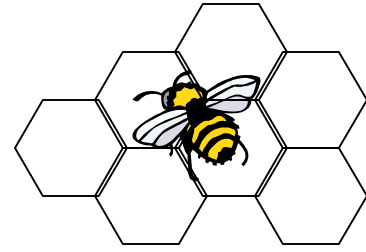
## *What's Next?*

- *Release BEES 2.0*
- *Publish data format*
- *“BEES Please:” Collect brand-specific data*
- *Conduct BEES training*

# *BEES Tool*

- *Practical*
- *Consistent*
- *Transparent*
- *Flexible*





## *For a Free Copy of BEES...*

### ***BEES 1.0: Order from U.S.EPA***

- *(202) 260-1023, or*
- *ppic@epamail.epa.gov*

### ***BEES 2.0: Download from NIST***

- *www.bfrl.nist.gov/oea/bees.html*