Total Economic Value of Compost : Results of a Life-Cycle Analysis on Composting and the Use of Compost

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2010 snapshot

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- **The world's leading chemical company**
- **Serves all major industries**
- **Production facilities on six continents**
- **World-class, innovative, high-value products**
- **2009 Sales: $70.5 billion**
- **Employees: 105,000+**

BASF – Four Strategic Initiatives

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Ensure Sustainable Development

Help our customers to be more successful

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Form the best team in industry

Earn a premium on our cost of capital

Integration of the Three Pillars

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What Sustainability Means to BASF

- It means combining economic success with environmental protection and social responsibility.

Analysis & Measurement

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Simple

Complex

Being able to measure sustainability is critical to its successful integration into business strategy

Eco-Efficiency is a Life-Cycle Approach

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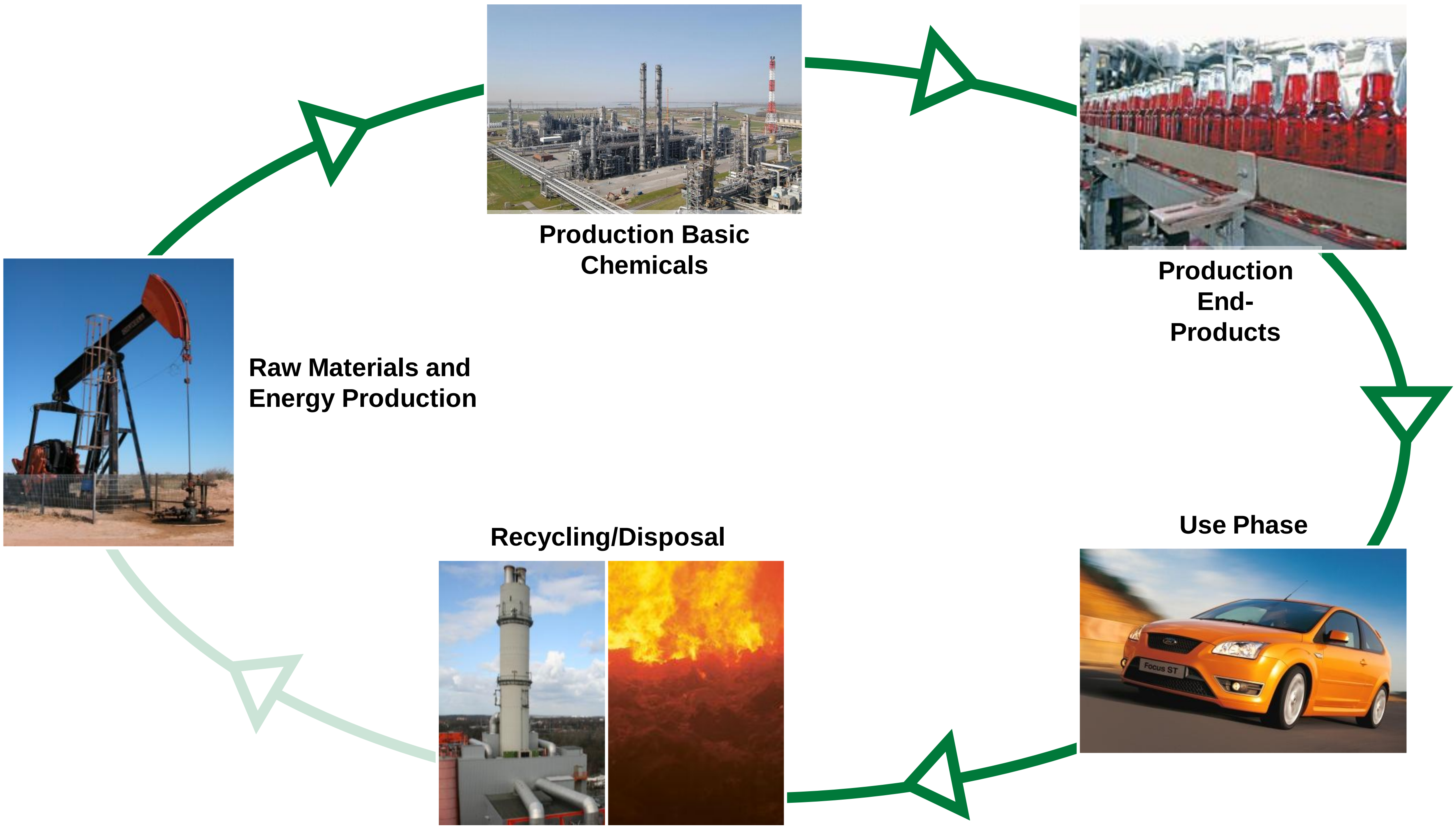

Environmental Impact Categories

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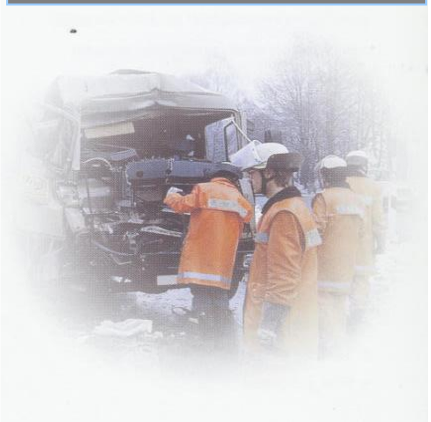
Energy

Raw Materials

Land Use

Risk



Toxicity Potential

Emissions

Emissions Impact Categories

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Emissions

Solid Waste

Residential, Hazardous, Mining, Construction

Air

Green House Gases

CO_2, N_2O, halogenated hydrocarbons, CH_4

Ozone Depletion

halogenated hydrocarbons

Summer Smog

Hydrocarbons, CH_4

Acid Rain

SO_x, NO_x, NH_3, HCl

Water

BOD, COD, Heavy Metals, Total N, PO_4, Hydrocarbons

Weighting Factors for the Ecological Impacts

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“societal factor”
(qualitative)

What value does society attach to the reduction of the individual potentials?

method:
public opinion poll

“relevance factor”
(quantitative)

What does the emission (or energy consumption) contribute to the total emissions (or energy consumption) in North America?

method:
comparison of the data calculated for the alternatives with statistical values for North America

$$\text{Calculation Factor} = \sqrt{\text{Relevance Factor} * \text{Societal Factor}}$$

EEA Impact Categories
Economic

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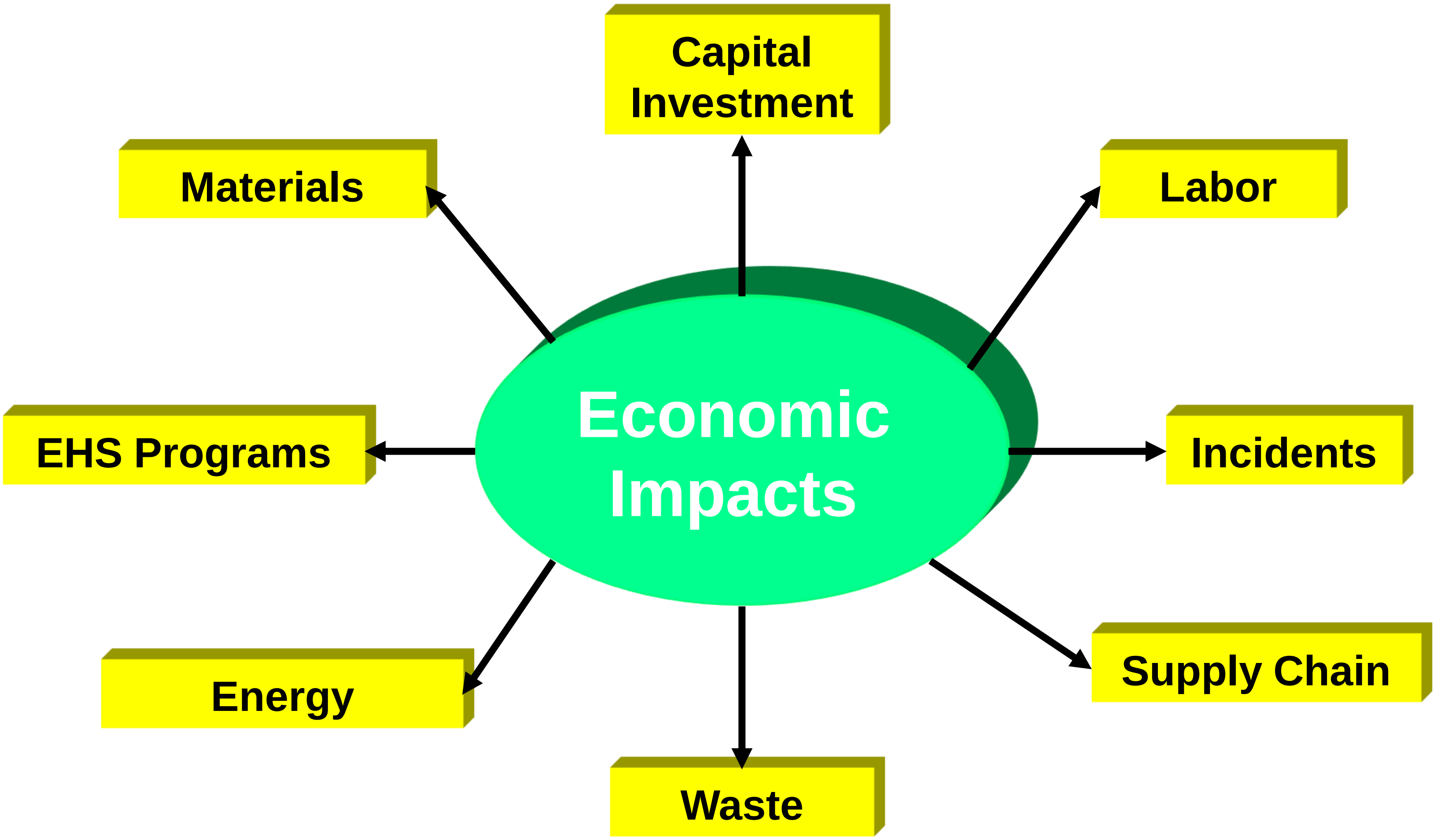

Base Case

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Customer Benefit

- End of Life Impact/Use from the collection and disposal of 800,000 tons/year of municipal waste over 20 years.

Alternatives:

- Landfill – with Landfill Gas Recovery
- Composting I – current diversion rates (2%, 64%, 9% & 54%; Food, Yard, Wood & Paper)
- Composting II (51%, 82%, 55% & 77%; Food, Yard, Wood & Paper)
- Composting III (100%; Food, Yard, Wood & Paper)

General Study Assumptions
Base Case

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- One Landfill and one Compost site are already built and established.
- 28.3% Landfills in U.S. have Landfill Gas recovery systems
- Feedstock to finish compost ratio is 50%.
- Use of compost is:
  - 50% agricultural
  - 30% LEED landscaping
  - 20% bio-remediation projects.

Compost Benefits Evaluated
Base Case

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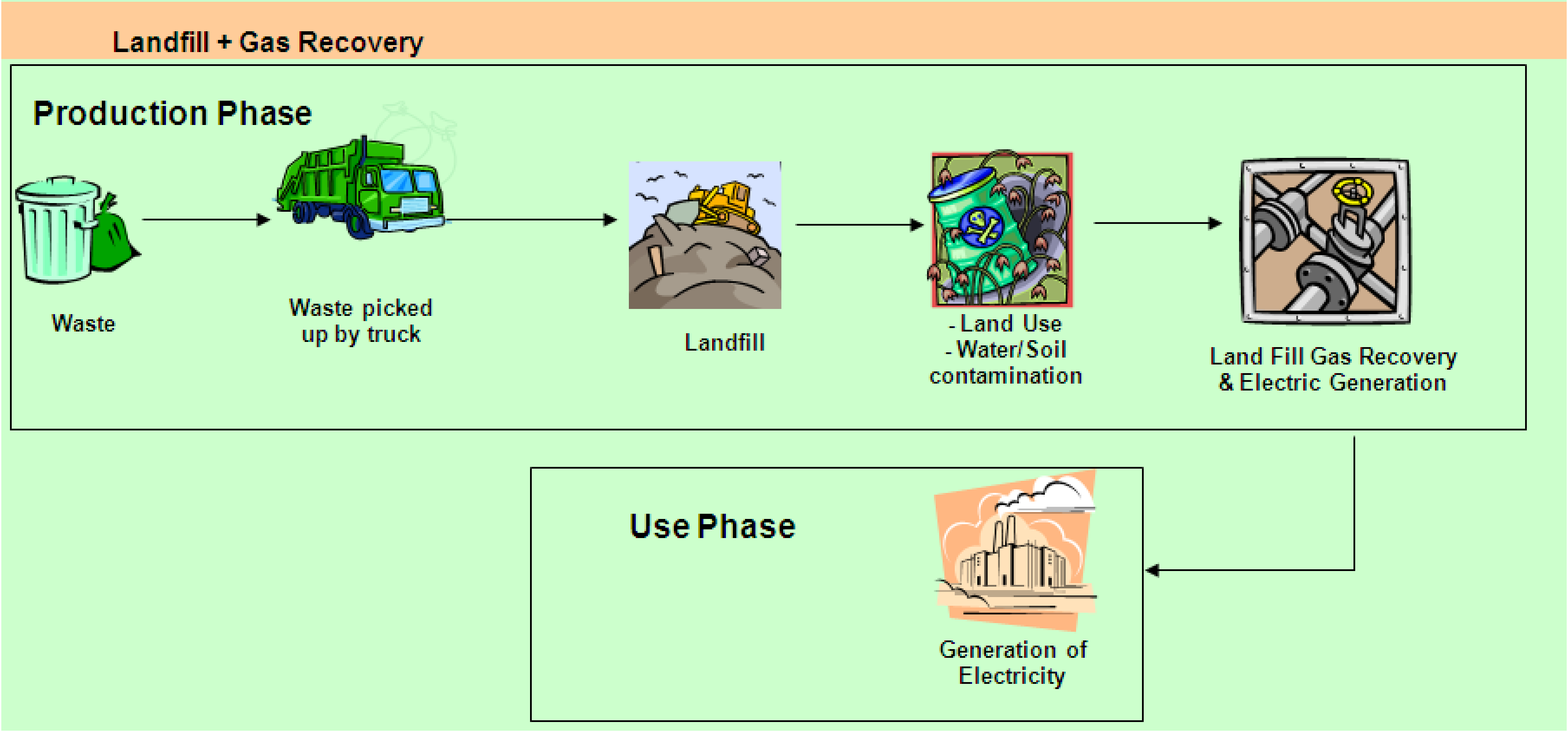
Extend life of landfill
Carbon sequestration
Reduced agriculture impacts:
- Reduced Water Use
- Reduced Fertilizers Use
- Reduced Herbicide Use
- Reduced Biocide Use
- Reduced Topsoil Erosion/Use

Increase Yield Response
- Sodicity
- Soil Structure

LEED Green Building and Construction
- Reduced Water Use
- Reduced Fertilizers Use
- Reduced Herbicide Use
- Reduced Biocide Use
- Reduced Topsoil Erosion during construction

Bio-remediation Projects
- Compost helps cleanup (remediate) contaminated soil

System Boundaries – Organic MSW to Landfill Gas to Electricity



System Boundaries – Organic MSW to Compost

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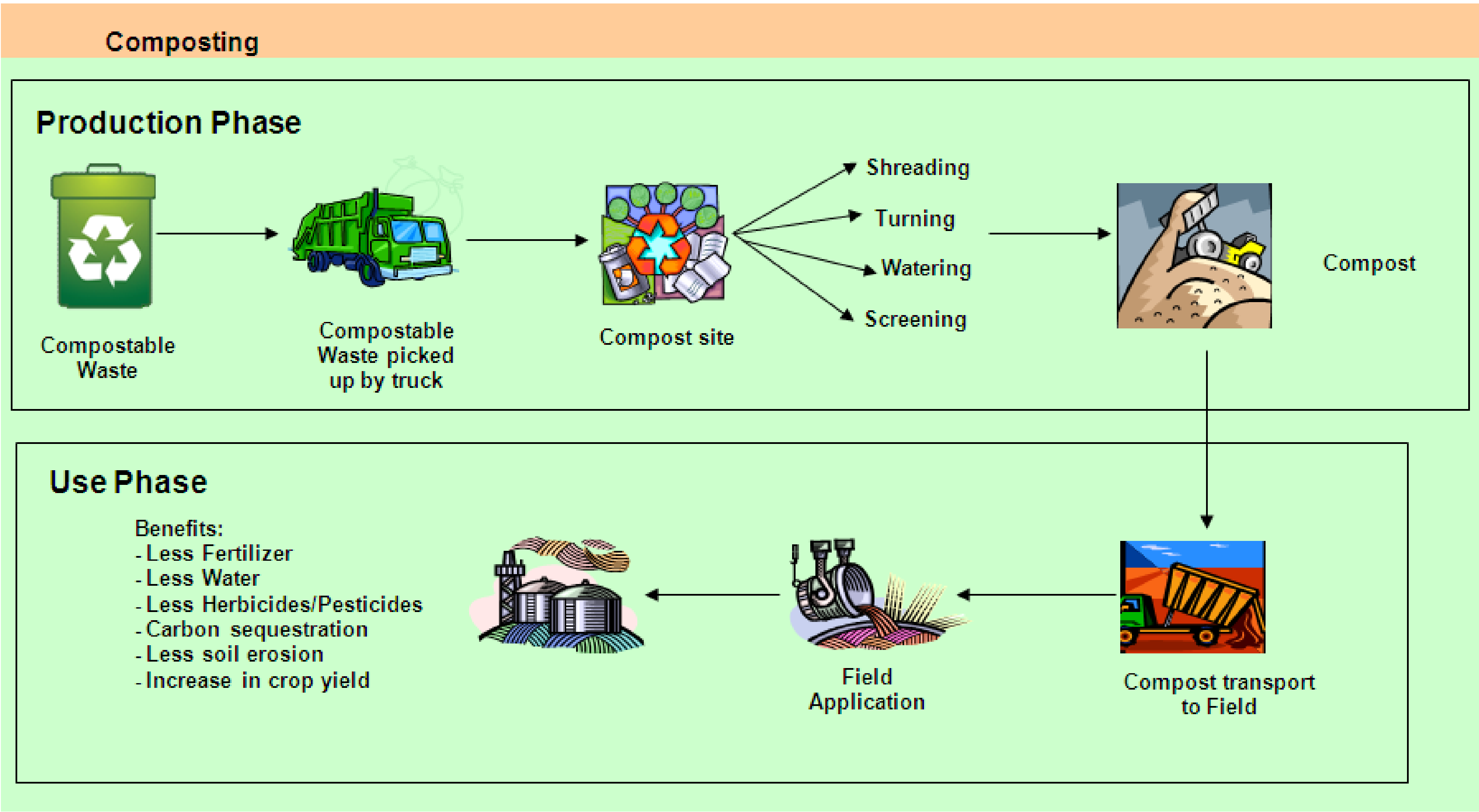
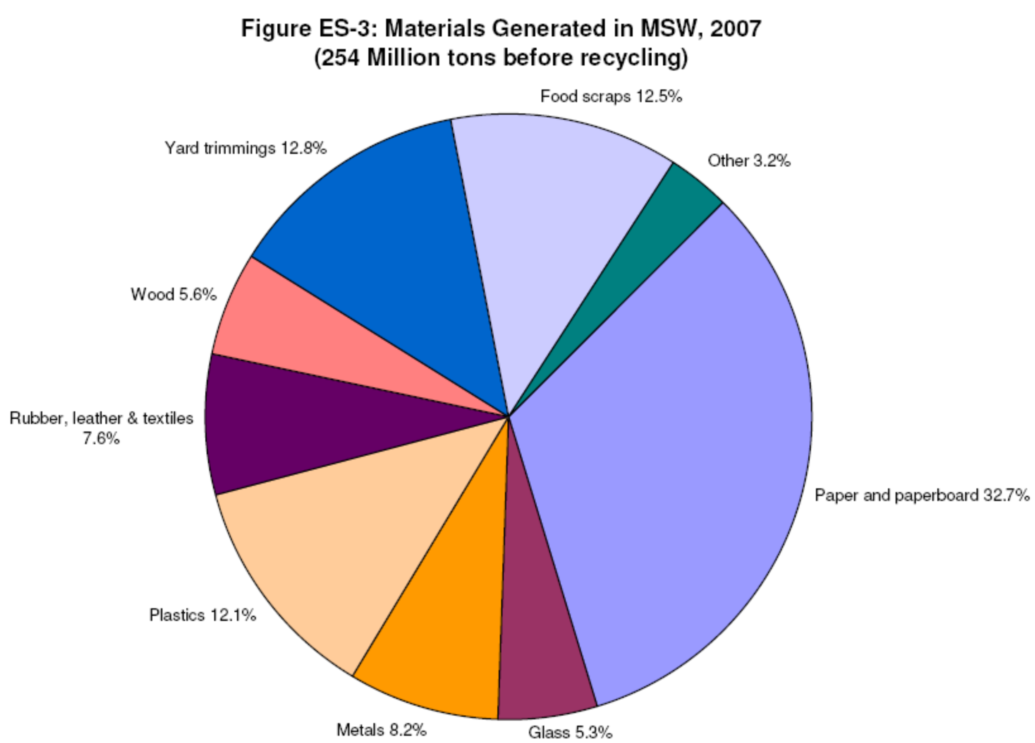


Parameters Summary: Waste % breakdown

Scope:

- Based on municipal waste generation and disposal in US.



Potential for Zero Landfill (M tons)

- **83.0 Paper and paperboard**
- **32.5 Yard trimmings**
- **31.8 Food scraps**
- **14.2 Wood**

Source:
MSW Generation, Recycling and Disposal in the US
US EPA Nov. 2008 (EPA-530-F-08-018)

Parameters Summary: Waste % breakdown

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PRODUCTION	Landfill - No Compost	Current Organic Diversion - Compost I	50% Extra Organic Diversion - Compost II	100% Organic Diversion - Compost III
Material to Landfill				
Food Scraps (tons/CB)	12.5	12.2	6.1	0.0
Yard Trimmings (tons/CB)	12.8	4.6	2.3	0.0
Wood (tons/CB)	4.8	4.8	2.4	0.0
Paper (tons/CB)	9.4	9.4	4.7	0.0
Plastic (tons/CB)	9.4	9.4	9.4	9.4
Metal (tons/CB)	5.3	5.3	5.3	5.3
Glass (tons/CB)	4.1	4.1	4.1	4.1
Rubber, leather, textiles (tons/CB)	4.3	4.3	4.3	4.3
Other (tons/CB)	0.0	0.0	0.0	0.0
Total Sum (tons/CB):	62.6	54.1	38.6	23.1
Material to Composting				
Food Scraps (tons/CB)	-	0.3	6.4	12.5
Yard Trimmings (tons/CB)	-	8.2	10.5	12.8
Wood (tons/CB)	-	-	2.4	4.8
Paper (tons/CB)	-	-	4.7	9.4
Plastic (tons/CB)	-	-	-	-
Rubber, leather, textiles (tons/CB)	-	-	-	-
Total Sum (tons/CB):	0.0	8.5	24.0	39.5

Parameters Summary:
Waste % diversion constants

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PRODUCTION	Landfill - No Compost	Current Organic Diversion - Compost I	50% Extra Organic Diversion - Compost II	100% Organic Diversion - Compost III
Material to Recycling				
Food Scraps (tons/CB)	-	-	-	-
Wood (tons/CB)	0.5	0.5	0.5	0.5
Paper (tons/CB)	17.8	17.8	17.8	17.8
Plastic (tons/CB)	0.8	0.8	0.8	0.8
Metal (tons/CB)	2.8	2.8	2.8	2.8
Glass (tons/CB)	1.3	1.3	1.3	1.3
Rubber, leather, textiles (tons/CB)	1.2	1.2	1.2	1.2
Other (tons/CB)	0.5	0.5	0.5	0.5
Total Sum (tons/CB):	24.9	24.9	24.9	24.9
Material to Combustion				
Wood (tons/CB)	0.2	0.2	0.2	0.2
Paper (tons/CB)	5.5	5.5	5.5	5.5
Plastic (tons/CB)	1.9	1.9	1.9	1.9
Rubber, leather, textiles (tons/CB)	2.2	2.2	2.2	2.2
Other (tons/CB)	2.8	2.8	2.8	2.8
Total Sum (tons/CB):	12.5	12.5	12.5	12.5
Total Sum (tons/CB):	100.0	100.0	100.0	100.0

Results

Ecological Fingerprint

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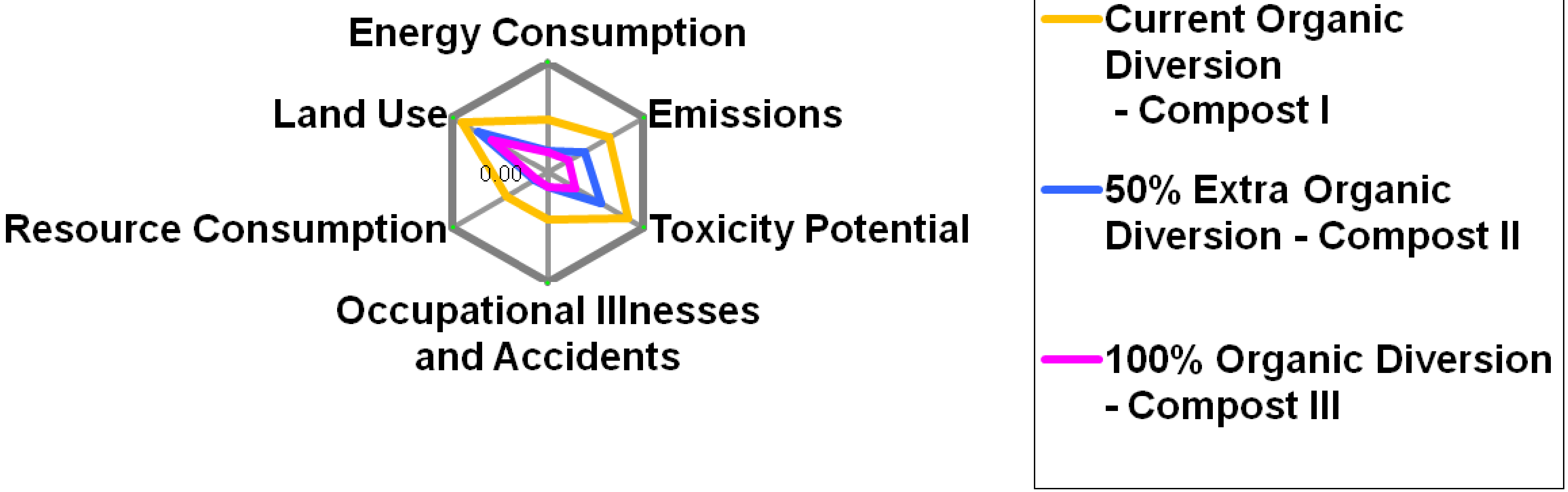

Ecological Fingerprint: Comments

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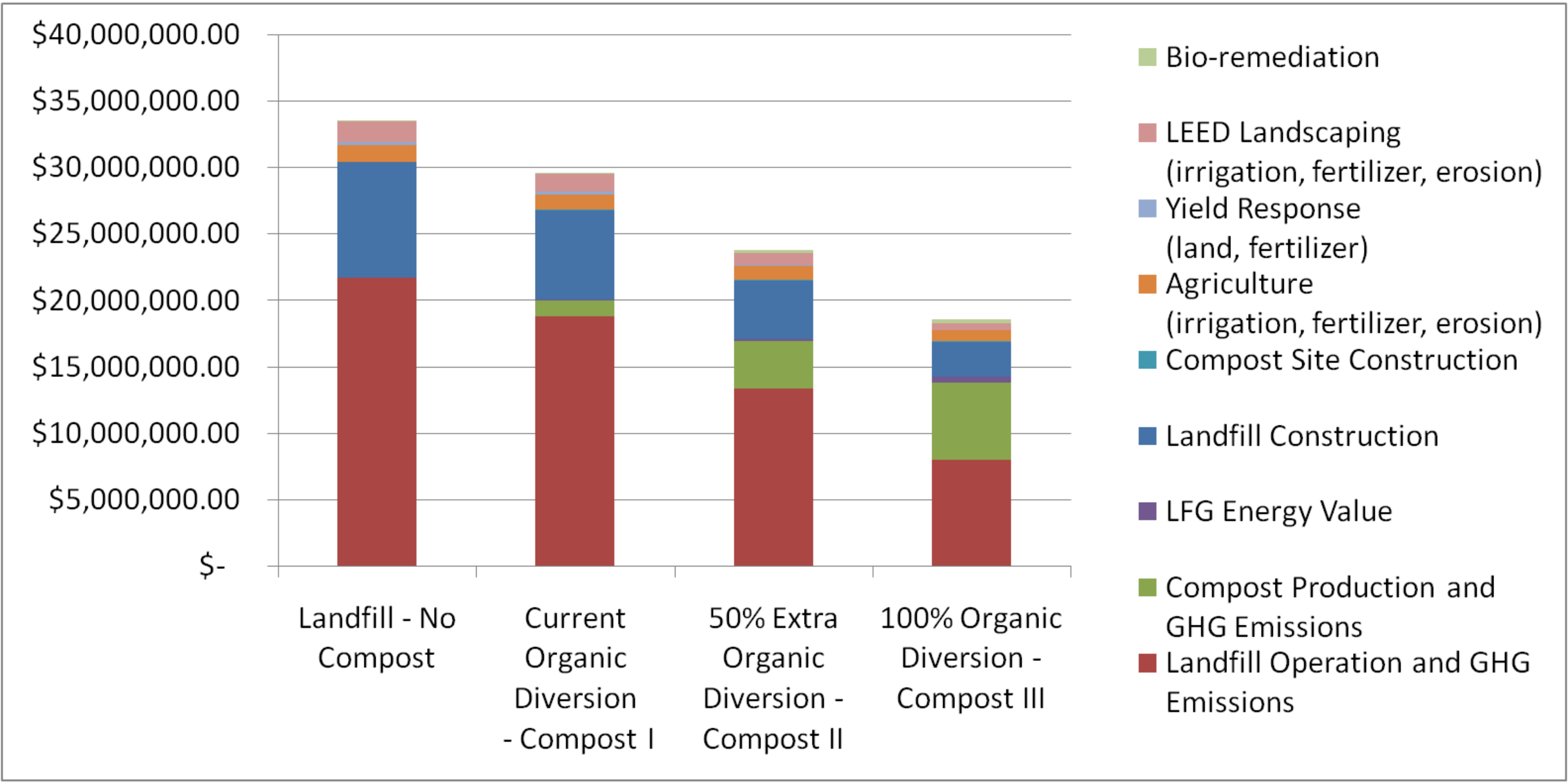
- The ecological fingerprint shows the different environmental impact categories in a normalized style.
- A value of 1 represents the alternative with the highest impact in the concerning category, all other alternatives are rated in relation to 1.
- The advantage to composting can be noticed in all the environmental categories.
- The greatest enviromental benefits for composting are:
  - Resource consumption
  - Emissions
  - Energy use
  - Occupationals illnesses and working accidents

Costs Summary:



Costs Summary: Comments

- Production costs for each of the alternatives is the major driver. This includes the landfill operations or the compost operations.
- The cost to operate a compost site is much less than operation of a landfill site, thus more compost production cost less as seen in alternative 4.
- The GHG emissions from both of the operations are also considered as part of the costs in each alternatives.
- Cost for construction of an additional landfill can also add significately to total costs.

Eco-Efficiency Portfolio (Base Case)

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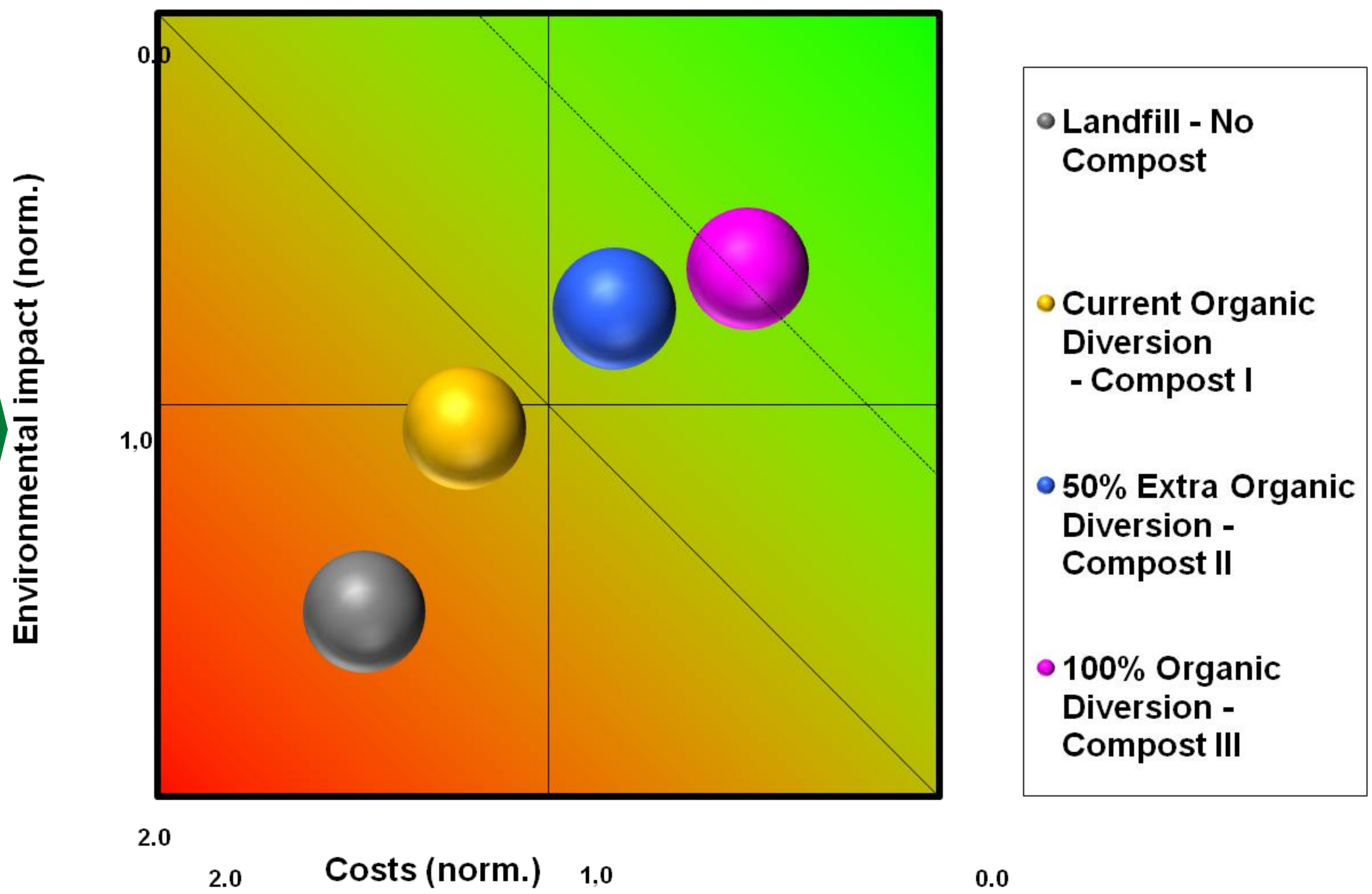
Base Case:

Diversion of 800,000 tons of MSW per year.



Conclusions

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- In this study, the critical point is extending the life of the landfill or having to build a new landfill.
- In the Base Case of this study, a new landfill needed to be built because the waste generation was higher than the landfill could support for 20 years. The critical point of the CB is around 640,000 tons of MSW generated every year. Any amount over this would cause an additional landfill to be built.
- Clearly the benefits of the organic waste being used as compost is greater than using the Landfill Gas (LFG) that is generated from the organic waste in a landfill. The value of the compost outweighs the value the electricity generation brings from the LFG. Even if all the landfills had LFG collection, the compost brings greater value.
- This study helps to prove that there is value in compost and the benefits of the compost are better than disposal of organic waste in a landfill.

Contact Information

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Additional Results

Eco-Efficiency Portfolio (Scenario 1)

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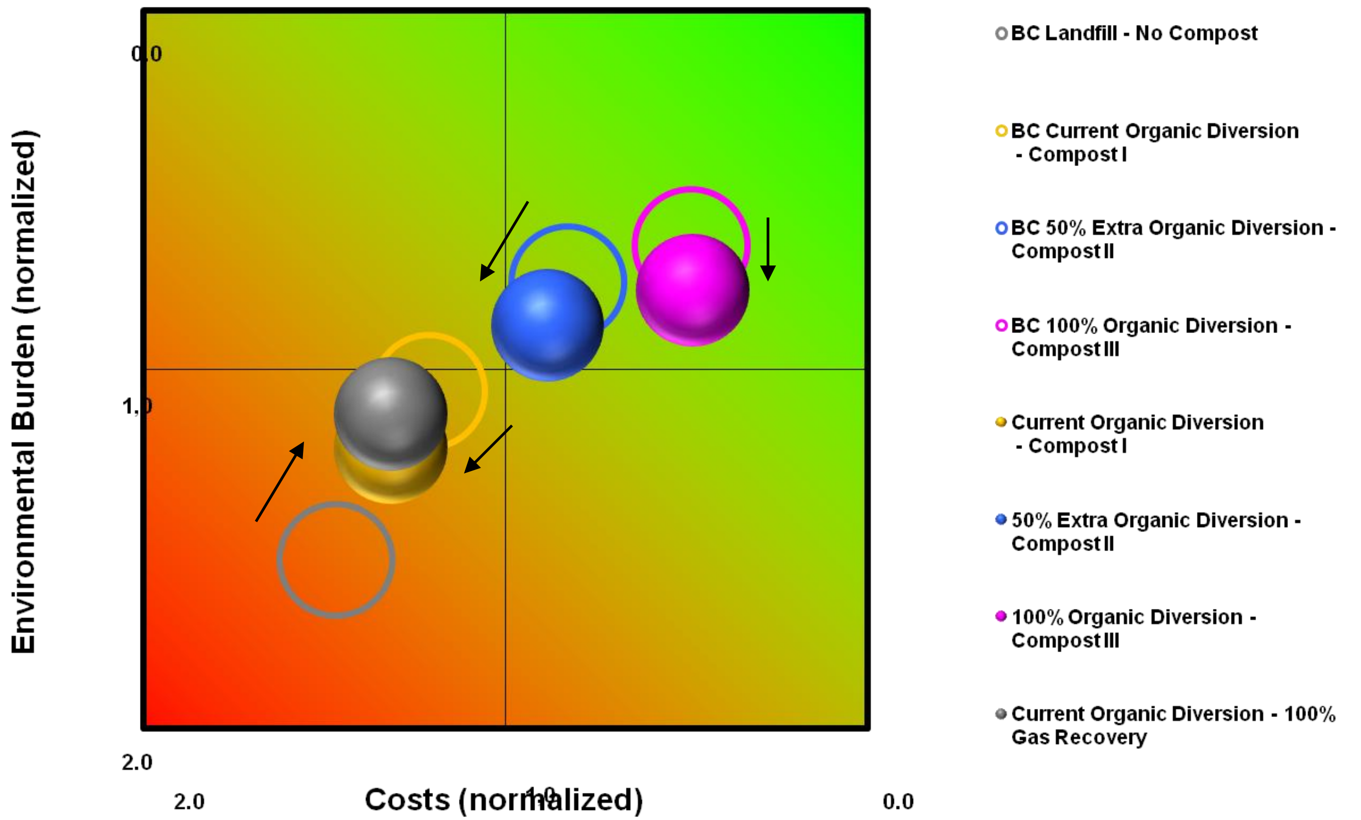
Scenario 1:
If all the Landfills in the U.S. had Gas Recovery systems and this was established as the Base Case.



Ecological Fingerprint (Scenario 1)

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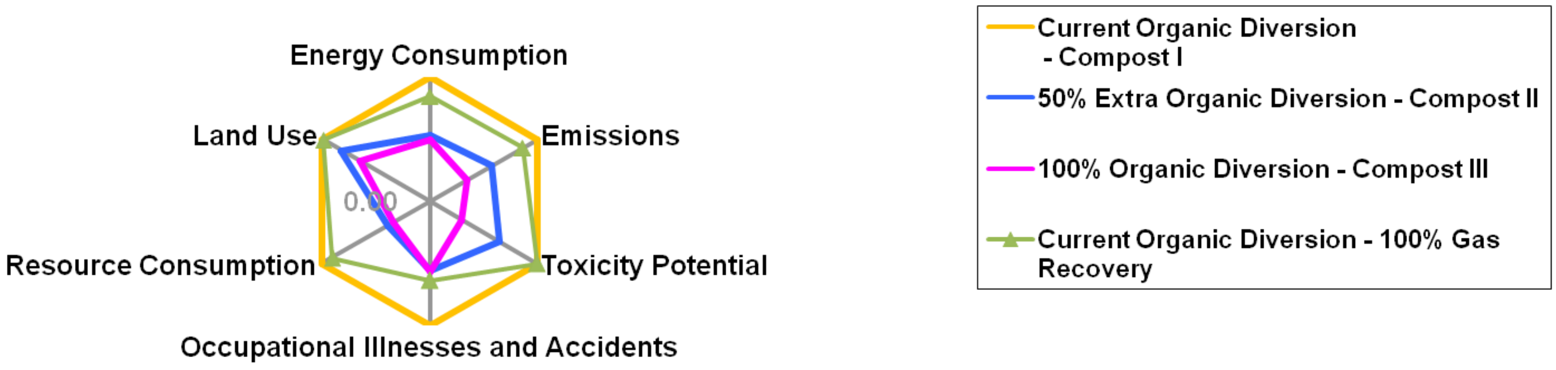

Eco-Efficiency Portfolio (Scenario 2)

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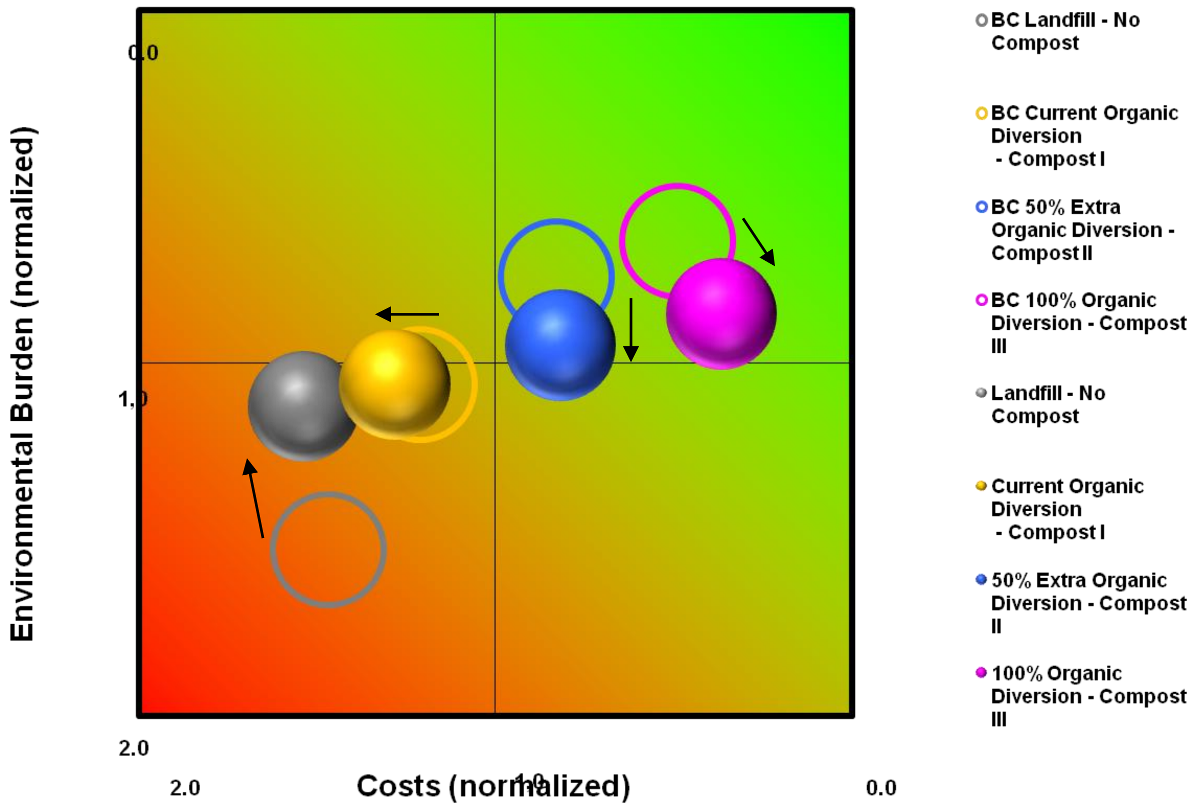
Scenario 2:
Decrease MSW generation by 25% form the Base Case. There would be no additional landfill that would need to be built within the 20 year time frame. The Customer Benefits (CB) would decrease to 600,000 tons of MSW per year.



Ecological Fingerprint (Scenario 2)

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