Description of document:	**Minutes and agendas for meetings of USDA Biobased Stakeholders Workgroup during CY2007 (Council of Federal Stakeholders for BioPreferred™)**
Requested date:	16-December-2007
Released date:	25-January-2008
Posted date:	21-February-2008
Title of Document	(various) Council of Federal Stakeholders for BioPreferred™
Date/date range of document:	22-February – 11-September-2007
Source of document:	USDA FOIA Officer Room 209-A, Jamie Whitten Bldg. 1400 Independence Avenue, S.W. Washington, D.C. 20250-1300 E-mail: USDA FOIA

USDA

United States Department of Agriculture

Office of the Assistant Secretary for Administration

1400 Independence
Avenue SW

Washington, DC
20250-0103

January 25, 2008

This letter responds to your Freedom of Information Act (FOIA) request dated December 16, 2007, and received by the USDA FOIA Service Center on December 28, 2007. You requested "the meeting minutes and agendas for meeting of the Biobased Stakeholders Workgroup during calendar year 2007." Your request has been assigned number OSEC-08-014.

A search of the files of Office of the Chief Economist yielded 48 pages responsive to your request. Those pages are enclosed in entirety.

There are no fees associated with this request because the search required less than two hours and the number of responsive pages is less than 100.

We believe this fully satisfies your request.

Sincerely,

Rita Morgan

Rita Morgan
USDA Freedom of Information Act Officer
Administration

COUNCIL OF FEDERAL STAKEHOLDERS
for BioPreferred™

Fourth Quarterly Meeting

Thursday, February 22, 2007
9:30 a.m. – 11:30 a.m.

ROOM 108A WHITTEN BUILDING

AGENDA

Opening Comments: Roger Conway, USDA-OEPNU/OCE

Progress Report: Duncan Marvin, USDA-OEPNU/OCE

Model Procurement Program Updates: Shana Love, USDA-DA

I

Overview of Life Cycle Analysis, Minimum Biobased Content and Biodegradability:

Ramani Narayan, Michigan State University

Discussion and Feedback

II

Website changes: Steven Devlin, Iowa State University (ISU)-CIRAS

Short Overview of Items in the Next Rounds of Designation: Steven Devlin, ISU-CIRAS

Discussion and Feedback

III

Additional Issues and Questions, Feedback on Topics of Interest for Next Meeting

Next Meeting Scheduling and Adjournment

COUNCIL OF FEDERAL STAKEHOLDERS
for BioPreferred™

Fourth Quarterly Meeting

Thursday, February 22, 2007
9:30 a.m. - 11:30 a.m.

ROOM 108A WHITTEN BUILDING

SUMMARY

Opening Comments: Roger Conway, USDA-OEPNU/OCE

Progress Report: Duncan Marvin, USDA-OEPNU/OCE

The final rules for rounds 2, 3, and 4 are being drafted, and after they pass clearance 30 more items will be designated. This will populate the catalogue with over 2000 products. The proposed rule for Round 5 is being drafted and even though currently it is deemed a significant rule, OEPNU expects that with the extra attention given to it, it should be classified insignificant since it is not in essence different than the past rounds which were classified insignificant. Thus OEPNU expects the proposed rule for round 5 to be out soon. The rule for labeling is being drafted and is expected to be sent out for EPA and DLA review next month.

The BioPreferred websites hosted by DA and OEPNU have been merged into one website accessible through usual search engines and USDA.gov. The website has been improved so that the electronic catalogue on the website can now be populated directly by the manufacturers.

Request for council members to review on the website the list of future items and provide feedback on item suggestions and priorities.

Discussion and Feedback

Discussion of information availability on price differences between biobased and non-biobased products. The GSA schedule that will include biobased products can provide an immediate resource for comparison.

Discussion of the information provided by manufacturers on the BioPreferred website. The information provided by the manufacturers is voluntary but USDA requests specific information. It asks for information on performance testing performed and minimum biobased content of the products. To retain the confidence of the consumer USDA is planning to set up an audit system by 2008.

Discussion of market maturity. A product under the program is deemed mature if it had a national market presence in 1972.

Discussion on the organic label. Market information can be posted on the BioPreferred website and thus if a biobased product carries the organic label, this information can be included in the catalogue. Additionally the LCA results of the ASTM or BEES will indirectly include information on organic content. However it was noted that the definition of biobased products excludes food and feed.

USDA's Model Procurement Program Updates: Shana Love, USDA-DA

Proposed rule to incorporate BioPreferred into the Federal Acquisition Regulation (FAR) published December 26, with 60 day comment period.

March 16, 2007 marks the one year anniversary of the first six designated items. Each agency is required to establish a procurement program that assures that designated biobased products will be purchased to the maximum extent practical (excluding "Water Tank Coatings" and "Bedding, Bed Linens and Towels," which will not require procurement preference until further notice).

USDA scheduled to brief Federal Chief Acquisition Officers on BioPreferred program updates and requirements at the April 5, 2007 council meeting.

USDA is working actively with the General Services Administration (GSA) to include biobased products in GSA contracts, schedules and on GSA Advantage.

USDA is pursuing implementing biobased and compostable products in its Washington Area cafeterias.

Discussion and Feedback

Request for feedback on agencies' internal meetings (including environmental meetings) at which USDA may present the model procurement program.

Discussion of outreach workshops. Currently conducted in house at USDA. Outside of USDA conducted only by invitation.

Remark on the importance of indirect purchases through contracts and the usefulness of getting distributors on board. Suggestion for preparing a training program that distributors can have access to.

Website Changes and the Next Rounds of Designation: Steven Devlin, Iowa State University (ISU)-CIRAS

Website Activities: First introduced to stakeholders at the October 2006 meeting. Since then CIRAS:

- -Incorporated stakeholder suggestions for improving the system and catalog.
- -Worked through merger of Model Procurement website with FB4P website

- -Made changes to site for "branding" of BioPreferred
- -Made changes in URL to www.usda.gov/BioPreferred
- -Worked through fixes to functional system bugs with developing contractor
- -Completed phases I & II C&A for Cyber Security

Upcoming Website Activities

- Incorporating stake holder suggestions from October – February
- Adding additional material to website:
    - How to sell to the Federal Government
    - Listing of proposed items by designation rule
    - Bio-Procurement Training (Ag-Learn)

Question – Are there additional suggestions or problems stake holders have experienced?

Additional Materials

- Draft Versions from Linda Mesaros
- Vehicle and Equipment Maintenance Products
    - **Question** – What comments or suggestions would stake holders have?
- Currently working with Linda to develop proposal for next fact sheet
    - **Question** – What should the next area of focus be?

Pilot Exchange

We have not seen much activity over the last four months, not sure if this is because of continuing resolutions or holiday issues.

Designations

- Continuing to collect information from manufacturers
    - 11,230 Products
    - 2,210 Companies
- We have added some additional back ground searches to the process
    - Currently working to update Rounds 2 – 6
- Basic information for Round 6 is in hand
    - We had some problems transferring BEES from one contractor to another
        - Due to Manufacturer Drop Out
- Refocusing our designation efforts on Government Purchases
    - List of biobased purchases reported on Agency score cards survey
    - Shana Love working on purchasing data
        - And all govt – DoD
    - Potential Agency / Item List – Please send any comments or question

Case Study Effort

- Working to include a case study or early adopter story each proposed item
    - We have additional resources ready to work on these but need leads

Discussion and Feedback

Suggestion of making available on the BioPreferred website information provided by OEMs on OEM acknowledgements about warranty issues for biobased products.

Request to the Council for providing feedback on which items should have priority on designation for rounds 7 and on.

Request to the Council for providing feedback on what biobased products may be used by different federal agencies. Refer to attached document: "Copy of Government Deparments and potential biobased products".

Request to provide input to CIRAS about case study efforts, and success stories with biobased products. A suggestion mentioned was developing templates of possible quantitative and qualitative information that should be accumulated during the pilot and communicated to stakeholders. Request to send to CIRAS ideas about templates or past templates that federal stakeholders may be aware of.

Overview of Life Cycle Analysis, Minimum Biobased Content and Biodegradability:

Ramani Narayan, Michigan State University

Refer to presentation, attached document "BIOBASED AND BIODEGRADABLE PLASTICS USDA February 2007", and to attached background documents: "Biobased and Biodegradable products Q & A format", and "ACS BK Chapter Biobased Biodegradable".

Discussion and Feedback

Discussion of product biodegradability. The biodegradability requirement in the Program is determined on an item by item basis, if biodegradability is an important element for the product and a test method exists. Up to know there have been items under final or proposed designation that are required to be biodegradable. A council member noted the environmental advantages that are tied to biodegradability (for example with oil). Possible rules of thumb for requiring biodegradability mentioned were the life expectancy of the product and the risk that the product poses on the environment.

Discussion of composting: contaminant issues and infrastructure.

Next Meeting Scheduling and Adjournment

Suggestion: presenting the country of origin criteria of the Biopreferred Program.

BIOBASED & BIODEGRADABLE PLASTICS - - PRINCIPLES, CONCEPTS, & STANDARDS

Ramani Narayan
narayan@msu.edu

CHEMICAL
ENGINEERING
&
MATERIALS SCIENCE

www.msu.edu/user/narayan

Presented at 1st European BioPlastics Conference Brussels, Belgium Nov. 6 2006

Presented at SPE National Plastics Exposition (NPE 2006), Bioplastics 101 workshop

Rationale, Drivers, Standards, and Technology for Biobased Materials; Ch 1 In Renewable Resources and Renewable Energy, Ed Mauro Graziani & Paolo Fornasiero; CRC Press, 2006

ACS (American Chemical Society publication) Symposium Ser. 939, Ch 18, pg 282, 2006

If you use any of the slides/materials, please reference authorship and affiliation (Ramani Narayan, Michigan State University) – thank you

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THIS PRESENTATION TEACHES:

- **WHY BIO? And how the use of bio based plastics promotes sustainable development and is it environmentally responsible?**
- **How does one identify and measure bio content?**
  - theoretical and experimental bio content
- **Biodegradability — the relationship between biobased (feedstock use) and biodegradability (what happens to product after use when disposed into the waste stream?**
- **What is the metrics for measuring biodegradability (under defined disposal conditions)?**
- **Degradable vs biodegradable?**
  - Degradability is not an option!
- **LCA Principles**

BIOBASED PRODUCTS – WHY?
WHAT VALUE IN THE SUSTAINABILITY – LIFE CYCLE EQUATION

CARBON

is the major element that is the building block of biobased products, petroleum based products, biotech products, fuels, even life itself.

SO THE ISSUE IS:

MANAGING CARBON !!!!!

IN A SUSTAINABLE & ENVIRONMENTALLY RESPONSIBLE MANNER

NATURE MANAGES CARBON BY:

" BIOLOGICAL CARBON CYCLES "

SO NEED TO BECOME PART OF NATURAL CARBON CYCLES

ISSUE – MANAGING CARBON !!!!!

GLOBAL CARBON CYCLING
Inorganic to Organic carbon conversion

CO_2 (atmosphere) → **Biomass** Organic matter; Carbohydrates

$$CO_2 + H_2O \xrightarrow{\text{Sunlight energy}} \quad + O_2$$

photoautotrophs -- algae, plants, and some bacteria fix inorganic carbo
to (carbohydrates) using sunlight as the energy

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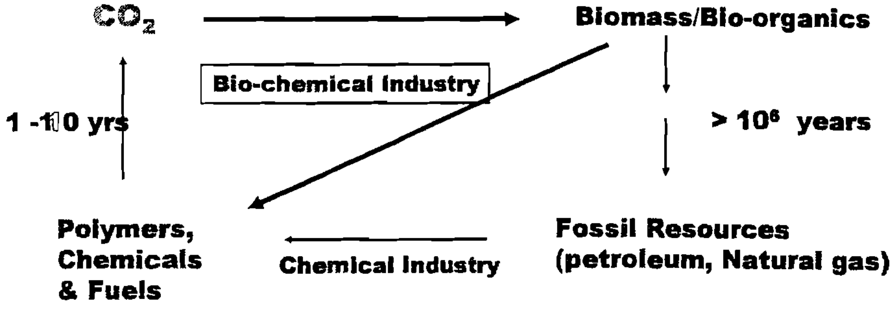
GLOBAL CARBON CYCLING
THE ECO DRIVER



CO_2 → **Biomass/Bio-organics**

Bio-chemical Industry

1 -10 yrs

> 10^6 years

Polymers, Chemicals & Fuels

Chemical Industry

Fossil Resources (petroleum, Natural gas)

Renewable Carbon CO_2, & Biomass → **New Biochemical Industry Small, entrepreneurial business** → **Green polymers & Chemicals**

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TERMINOLOGY

- **Biobased material(s)**

  Organic material(s) in which the carbon comes from contemporary (non-fossil) biological sources

$$CO_2 + H_2O \longrightarrow (CH_2O)_x + O_2$$

Organic material(s) – IUPAC terminology

Material(s) containing carbon based compound(s) in which the carbon is attached to other carbon atom(s), hydrogen, oxygen, or other elements in a chain, ring, or three dimensional structure

Thus, to be classified *bio or biobased*, the material must be *organic* and contain recently fixed (new) carbon present in biological sources

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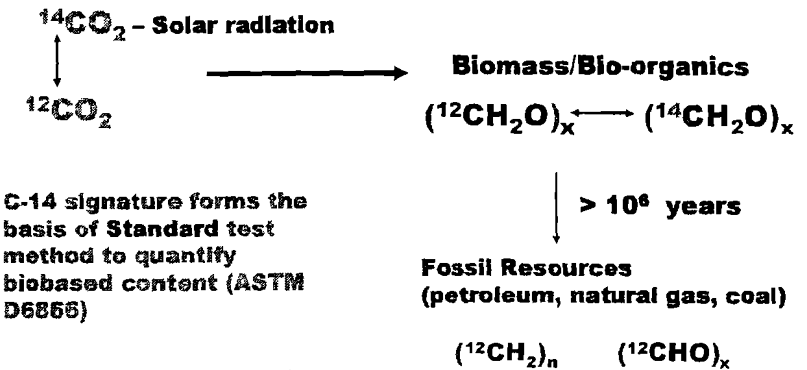
Standards – Identify & Quantify Biobased Content

- **How does one distinguish between new (contemporary) and old(fossil) carbon – identify biobased carbon?**
- **How does one quantify biobased carbon content?**



$^{14}CO_2$ - Solar radiation

$^{12}CO_2$

Biomass/Bio-organics

$(^{12}CH_2O)_x \longleftrightarrow (^{14}CH_2O)_x$

> 10^6 years

Fossil Resources (petroleum, natural gas, coal)

$(^{12}CH_2)_n$ $(^{12}CHO)_x$

C-14 signature forms the basis of Standard test method to quantify biobased content (ASTM D6866)

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BIOBASED CONTENT

Biobased materials may contain 100% bio-carbon (new carbon) or be mixed (physically, chemically, or biologically) with fossil carbon (old carbon). Therefore, one needs to define biobased content

biobased content, or gross biobased content

- **Amount of biobased *carbon* in the material or product as fraction weight (mass) or percent weight (mass) of the total organic carbon in the material or product.**

NOTE: Only on a carbon basis, not weight or mole or any other measure. This is because the rationale for using biobased products is that one can manage carbon emissions in a neutral fashion (the rate of carbon fixation by photosynthesis equals the rate of use and liberation to the atmosphere – carbon neutral

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BIOBASED CONTENT – EXAMPLES

Product 'O' is a fiber reinforced composite with the composition 30% biofiber (cellulose fiber) + 70% PLA (biobased material)

Product 'P' is a fiber reinforced composite with the composition 30% glass fiber + 70% PLA (biobased material

Product 'N' is a fiber reinforced composite with the composition 30% biofiber (cellulose) + 70% polypropylene (petroleum based organic)

1. **Product 'O' biobased content = 100%**
2. **Product 'P' biobased content = 100%; organic content only 70%**
3. **Therefore must define biobased content and organic content!**
4. **Product 'N' biobased content = 18.5% – not 30%!!!!**
    - **Because biobased content is on a carbon basis**
    - **0.3*45.5/0.3*45+0.7*85.7 = 18.5%**

MATERIALS DESIGN PRINCIPLES FOR THE ENVIRONMENT

BIOBASED & BIODEGRADABLE

- Single use, short-life, disposable, controlled-life time products
  - Packaging, disposable plastics, agricultural films, marine disposable

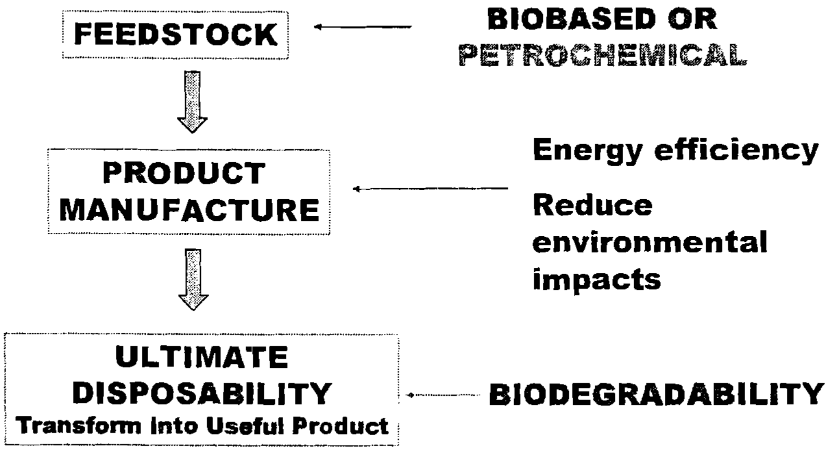
BIOBASED & DURABLE (where biodegradability is not a required element for reasons of performance and durability and alternate methods of disposal needs to be designed)

- Soy polyurethanes for automotive and farm vehicles
- Biofiber composites for industrial and automotive

Perform LIFE CYCLE ASSESSMENT (LCA) to document positive environmental attributes

- ASTM D7075 "Standard practice for evaluating and reporting environmental performance of biobased products". – LCA TOOLS
- To incorporate life cycle costing –carbon credits; emissions trading

MATERIALS DESIGN PRINCIPLES FOR THE ENVIRONMENT



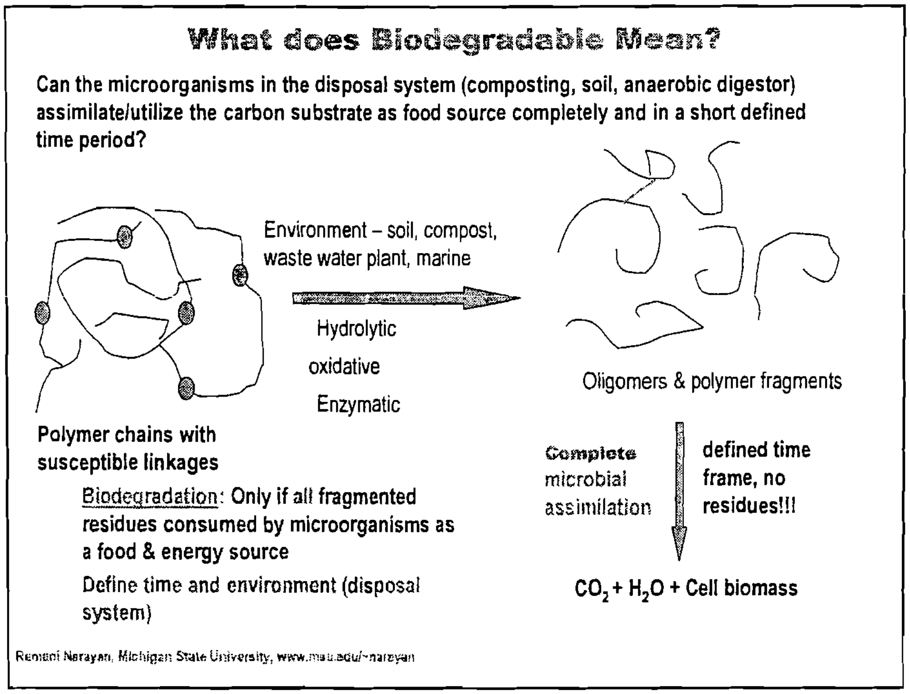
FEEDSTOCK ← BIOBASED OR PETROCHEMICAL

PRODUCT MANUFACTURE ← Energy efficiency; Reduce environmental impacts

ULTIMATE DISPOSABILITY ← BIODEGRADABILITY
Transform Into Useful Product

"LIFE CYCLE ASSESSMENT – LCA"

ASTM D7075



What does Biodegradable Mean?

Can the microorganisms in the disposal system (composting, soil, anaerobic digestor) assimilate/utilize the carbon substrate as food source completely and in a short defined time period?

Environment – soil, compost, waste water plant, marine

Hydrolytic

oxidative

Enzymatic

Polymer chains with susceptible linkages

Oligomers & polymer fragments

Complete microbial assimilation

defined time frame, no residues!!!

$CO_2 + H_2O$ + Cell biomass

<u>Biodegradation</u>: Only if all fragmented residues consumed by microorganisms as a food & energy source

Define time and environment (disposal system)

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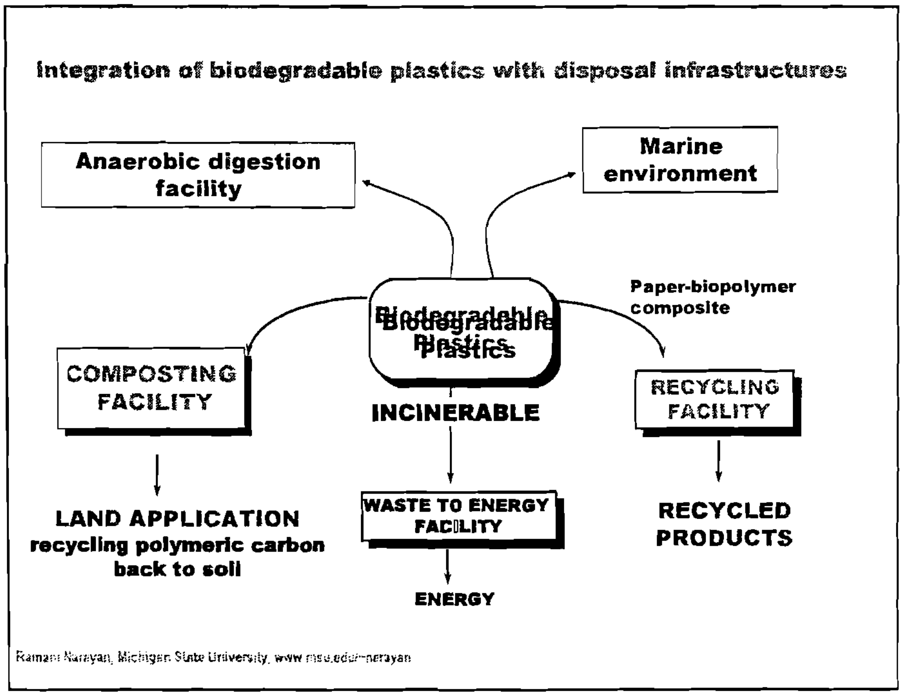

Integration of biodegradable plastics with disposal infrastructures

Anaerobic digestion facility

Marine environment

Biodegradable Plastics

Paper-biopolymer composite

COMPOSTING FACILITY

INCINERABLE

RECYCLING FACILITY

LAND APPLICATION
recycling polymeric carbon back to soil

WASTE TO ENERGY FACILITY

ENERGY

RECYCLED PRODUCTS

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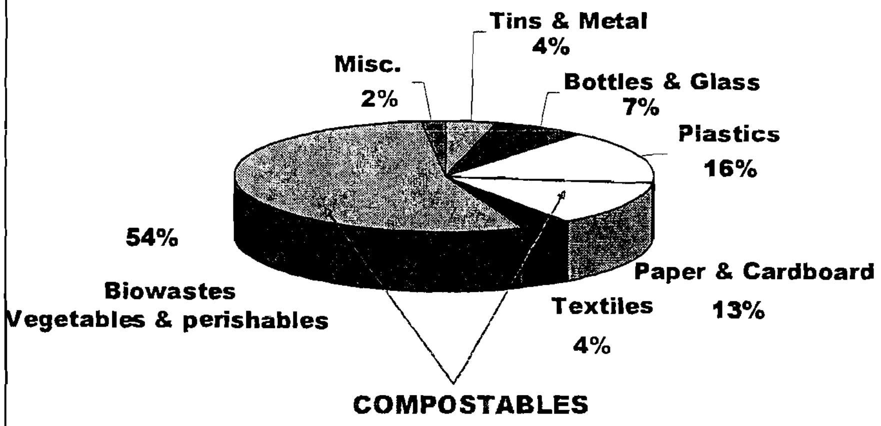
Country's typical MSW distribution by weight



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COMPOSTING & THE ENVIRONMENT

- COMPOSTING IS AN ECOLOGICALLY AND ENVIRONMENTALLY SOUND APPROACH TO TRANSFERRING BIODEGRADABLE WASTE (INCLUDES THE BIODEGRADABLE PLASTICS) TO USEFUL PRODUCT
- COMPOSTING IS BIOLOGICAL RECYCLING OF CARBON
- COMPOST USE REDUCES CHEMICAL INPUTS, SUPRESSES CROP DISEASES, REPLENISHES ORGANIC CARBON, INCREASES WATER & NUTRIENT RETENTION, IMPROVES SOIL PRODUCTIVITY

  "SUSTAINABLE AGRICULTURE"

SCIENCE & ENGINEERING OF COMPOSTING, HOITNIK & KEENER, EDS. 1993
Narayan -- Biodegradation of polymeric materials during composting, p. 339

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How does one quantify biodegradability or bioassimilation?

METRICS FOR BIODEGRADABILITY?

METRICS FOR BIODEGRADABILITY??

Microorganisms extract chemical energy for use in their life processes by the aerobic oxidation of glucose and other utilizable substrates – BIODEGRADBLE PLASTICS, food waste, paper, forest residues biological matter

AEROBIC

$$\text{Glucose} + 6\,O_2 \longrightarrow 6\,\text{CO2}\uparrow + 6\,\text{H2O};\quad \Delta G^{0\prime} = -686\ \text{kcal/mol}$$

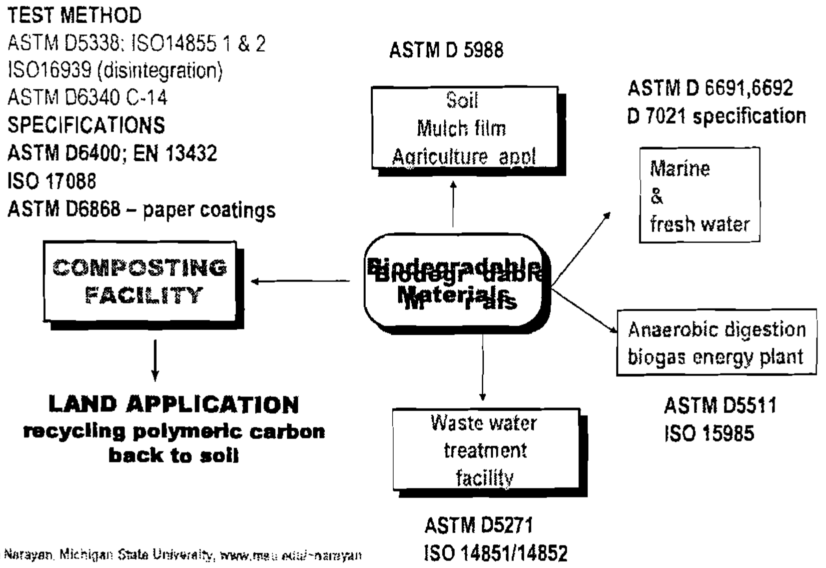
ANAEROBIC

$$\text{Glucose} \longrightarrow 2\ \text{lactate};\quad \Delta G^{0\prime} = -47\ \text{kcal/mol}$$

CO_2 is a quantitative measure of biodegradation/bioassimilation

Cradle to Cradle Concept for Material Design

(Integration of Biodegradable Materials with Disposal Infrasructures)



TEST METHOD
ASTM D5338; ISO14855 1 & 2
ISO16939 (disintegration)
ASTM D6340 C-14
SPECIFICATIONS
ASTM D6400; EN 13432
ISO 17088
ASTM D6868 – paper coatings

COMPOSTING FACILITY

LAND APPLICATION
recycling polymeric carbon back to soil

Biodegradable Materials

ASTM D 5988

Soil
Mulch film
Agriculture appl

ASTM D 6691,6692
D 7021 specification

Marine
&
fresh water

Anaerobic digestion
biogas energy plant

ASTM D5511
ISO 15985

Waste water
treatment
facility

ASTM D5271
ISO 14851/14852

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BIODEGRADABILITY

Define Time – complete and short (one growing season)

Define Disposal Environment like composting

Degradability is not an option!

Problems with Degradables – Toxic Chemicals Transport

- plastic pieces can attract and hold hydrophobic elements like PCB and DDT up to one million times background levels. As a result, floating plastic is like a poison pill – endocrine disruptors
  - **From Algalita Marine Research Foundation – www.algalita.org/pelagic_plastic.html**
- **PCBs, DDE, and nonylphenols (NP) were detected in high concentrations in degraded polypropylene (PP) resin pellets collected from four Japanese coasts.**
- **Plastic residues function as a transport medium for toxic chemicals in the marine environment.**
  - **Mato et al Environ. Sci. Technol. 2001, 35, 318-324**

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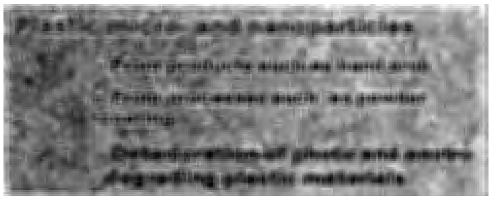
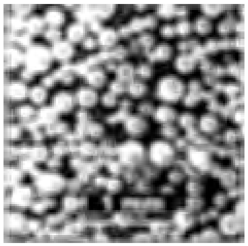
Microparticulate Plastics*





Concerns Relating to Microparticles

- Concentration and transfer of pollutants up the food chain
- Invasive species transport

Piece of plastic washed ashore on a remote Mozambican island, complete with colonists

SLIDE BY ANTHONY ANDRADY, RTI

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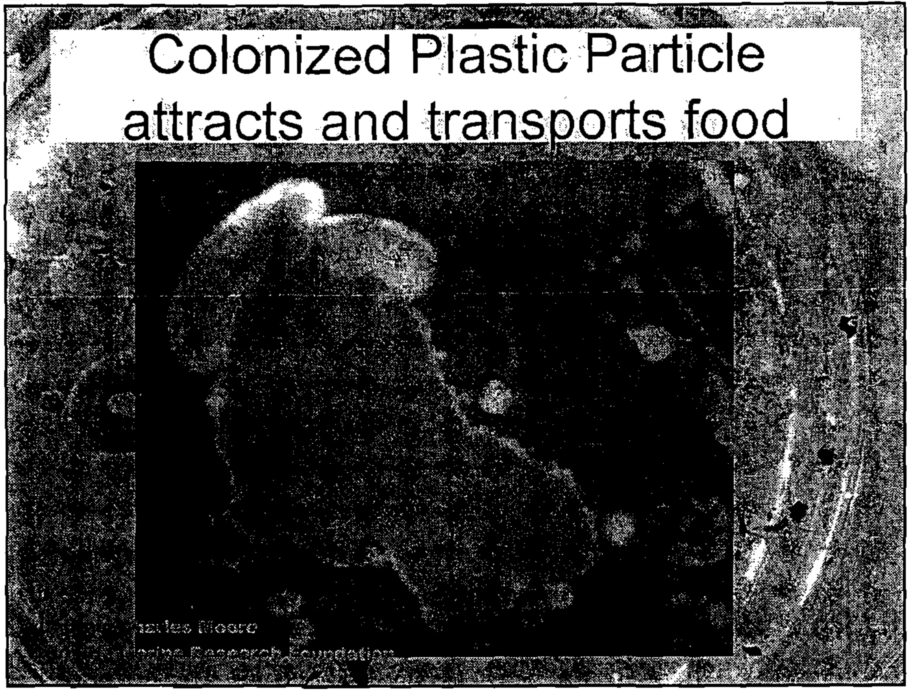
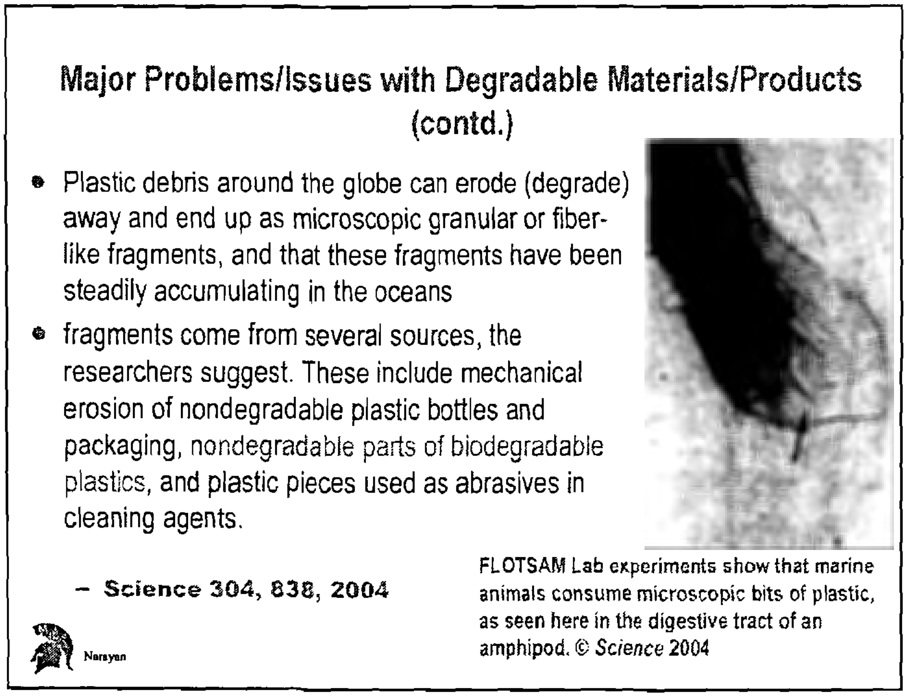


Colonized Plastic Particle attracts and transports food

harles Moore
arine Research Foundation



Major Problems/Issues with Degradable Materials/Products (contd.)

- Plastic debris around the globe can erode (degrade) away and end up as microscopic granular or fiber-like fragments, and that these fragments have been steadily accumulating in the oceans
- fragments come from several sources, the researchers suggest. These include mechanical erosion of nondegradable plastic bottles and packaging, nondegradable parts of biodegradable plastics, and plastic pieces used as abrasives in cleaning agents.

– **Science 304, 838, 2004**

FLOTSAM Lab experiments show that marine animals consume microscopic bits of plastic, as seen here in the digestive tract of an amphipod. © *Science* 2004

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Major Environmental Problems

Designing products to be degradable or partially biodegradable causes irreparable harm to the environment

Degraded products may be invisible to the naked eye. However, out of sight does not make the problem go away

- Degradable, biobased, single-use, disposable packaging and consumer plastics, and plastic-paper combination products (non-durable goods) have serious environmental consequences.
- Must ensure complete biodegradability in a short defined time frame (determined by the disposal infrastructure like composting)
  - **TIME** --- ONE GROWING SEASON
  - **DISPOSAL ENVIRONMENT** – Composting, anaerobic digestion plants, marine/oceans, soil

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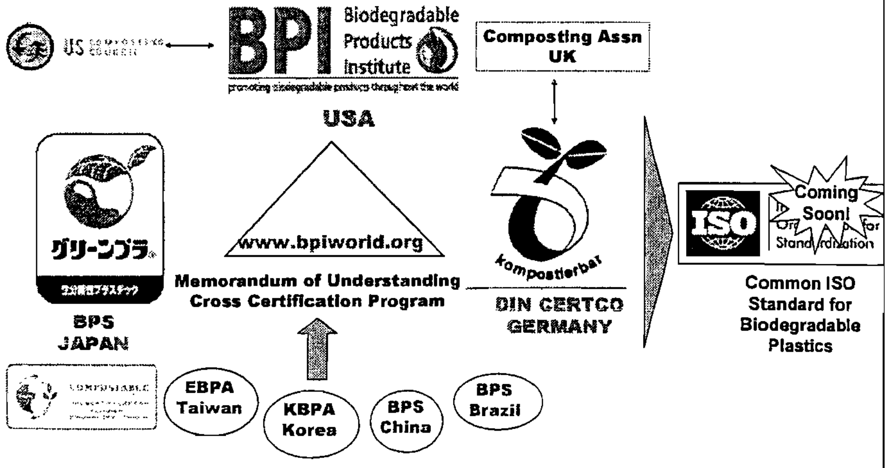
Global Standards for Biodegradability



Composting Assn UK

USA

www.bpiworld.org

Memorandum of Understanding Cross Certification Program

BPS JAPAN

DIN CERTCO GERMANY

Common ISO Standard for Biodegradable Plastics

EBPA Taiwan

KBPA Korea

BPS China

BPS Brazil

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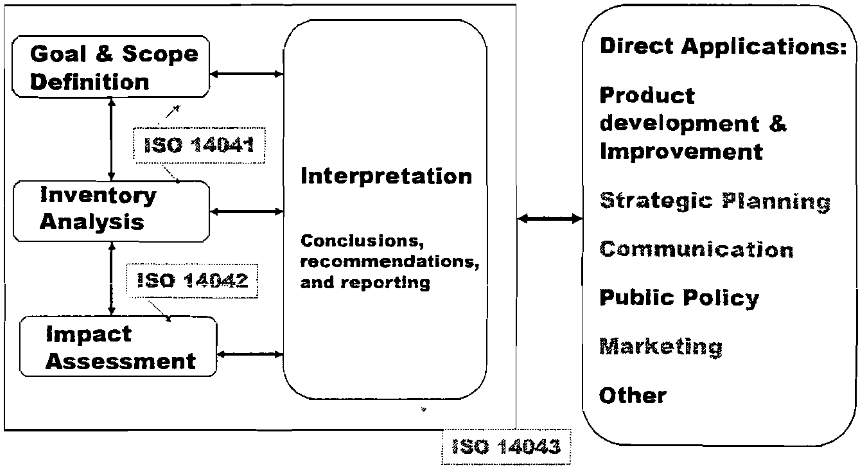
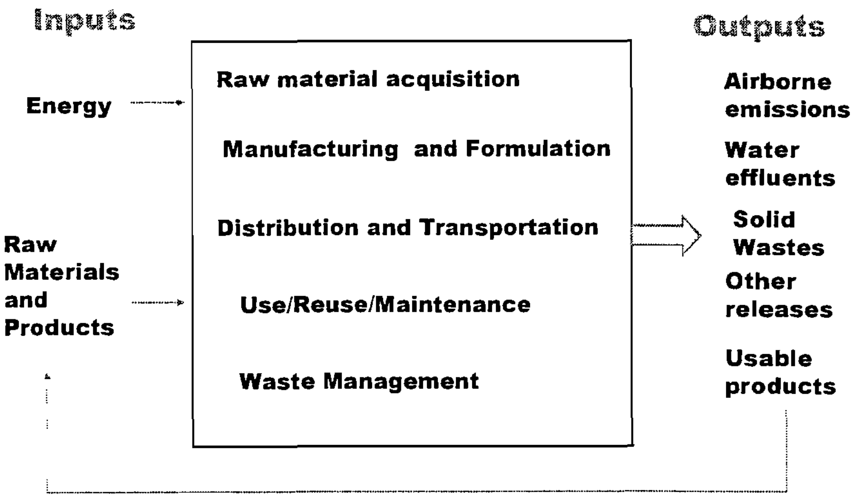
MATERIALS DESIGN PRINCIPLES FOR THE ENVIRONMENT

"LIFE CYCLE ASSESSMENT – LCA"
ASTM D7075

Life Cycle Assessment Framework



Components in a product life cycle



Inputs

Energy

Raw Materials and Products

Raw material acquisition

Manufacturing and Formulation

Distribution and Transportation

Use/Reuse/Maintenance

Waste Management

Outputs

Airborne emissions

Water effluents

Solid Wastes

Other releases

Usable products

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Life Cycle Impact Assessment

RELATED EMISSIONS	IMPACT CATEGORY
NO_x, VOCs, CH_2O (and others) **(+21)**	photochemical smog[1]
CCl_4, CCl_2F_2, CFC_{12}, CH_3Br **(+3)**	ozone depletion
PM_{10}, $PM_{2.5}$ (and others), SO_2, NO_2	human health criteria
As, Cr, Dioxins, Pb, Hg **(+20)**	human health (non)cancer
CO_2, CH_4, N_2O, CF_4 **(+8)**	global warming
NO_x, P, NO_3^-, PO_4^{3-}, NH_3, N_2O **(+6)**	eutrophication[1,2]
Mg, Zn, Ni, V, Cd **(+20)**	ecotoxicity
SO_2, NO_2, H_2S, HCN HCL, HF, NH3 **(+1)**	acidification[1]

Ramani Narayan, Michigan State University, www.msu.edu/~narayan

Scope:
Impact Categories and Methodology

Ramani Narayan, Michigan State University, www.msu.edu/~narayan

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Example
GLOBAL WARMING POTENTIAL CALCULATION

global warming index = $\Sigma_i\ m_i \times GWP_i$,

Where m_i = mass (in grams) of inventory flow i, and

GWP_i = grams of carbon dioxide with the same heat trapping potential over 100 years as one gram of inventory flow i, as listed in Table

Table 2.1 BEES Global Warming Potential Characterization Factors

Flow (i)	*GWPi(CO2-equivalents)*
Carbon Dioxide (CO_2, fossil)	**1**
Carbon Tetrafluoride (CF_4)	**5700**
CFC 12 (CCl_2F_2)	**10 600**
Chloroform ($CHCl_3$, HC-20)	**30**
Halon 1301 (CF_3Br)	**6900**
HCFC 22 (CHF_2Cl)	**1700**
Methane (CH_4)	**23**
Methyl Bromide (CH_3Br)	**5**
Methyl Chloride (CH_3Cl)	**16**
Methylene Chloride (CH_2Cl_2, HC-130)	**10**
Nitrous Oxide (N_2O)	**296**
Trichloroethane (1,1,1-CH_3CCl_3)	**140hg**

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Example –HUMAN HEALTH INDEX CALCULATION

Human health Index = $\Sigma_i\, m_i \times HP_i$,

Where m_i = mass (in grams) of inventory flow i, and

HPi = grams of toluene with the same potential human health effects as one gram of inventory flow i.

Table 2.7 Sampling of BEES Human Health Characterization Factors

Flow (i)	*HPI (tolueneequivalents)*
Cancer--(a) Dioxins (unspecified)	38 292 661 685 580
Noncancer--(a) Dioxins (unspecified)	2 286 396 218 965
Cancer--(a) Diethanol Amine (C4H11O2N)	2 532 000 000
Cancer--(a) Arsenic (As)	69 948 708
Cancer--(a) BenzoCancer--(a)pyrene (C20H12)	34 210 977
Noncancer--(a) Mercury (Hg)	19 255 160
Noncancer--(w) Mercury (Hg+, Hg++)	18 917 511
Cancer--(a) Carbon Tetrachloride (CCl4)	17 344 285
Cancer--(w) Carbon Tetrachloride (CCl4)	16 483 833
Cancer--(a) Trichloropropane (1,2,3-C2H5Cl3)	3 587 000
Cancer--(a) Chromium (Cr III, Cr VI)	3 530 974
Cancer--(a) Dimethyl Sulfate (C2H6O4S)	2 976 375
Noncancer--(a) Lead (Pb)	1 501 293
Cancer--(a) Lead (Pb)	748 316
Cancer--(a) Ethylene Oxide (C2H4O)	650 701

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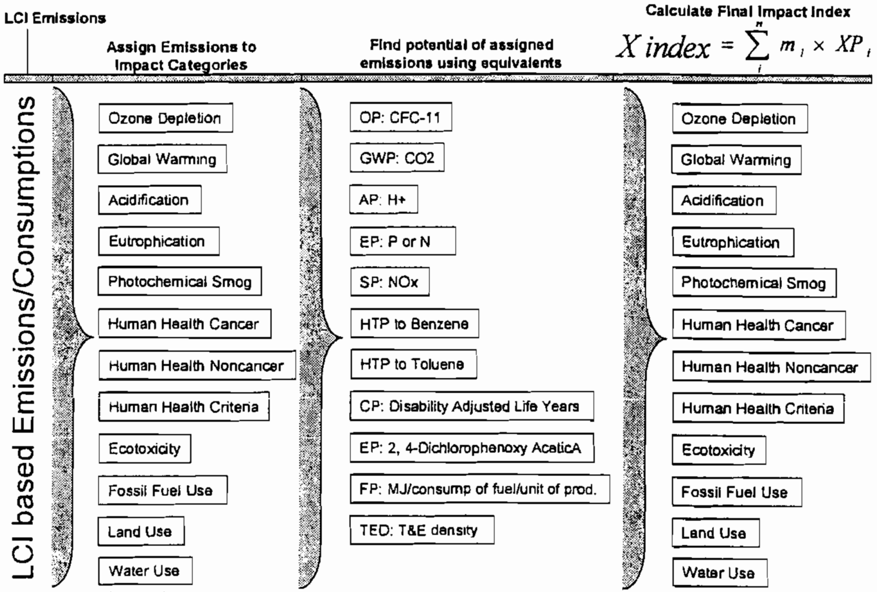
Life Cycle Impact Assessment



LCI Emissions

Calculate Final Impact Index

$$X\,index = \sum_i^n m_i \times XP_i$$

LCI based Emissions/Consumptions

Assign Emissions to Impact Categories	**Find potential of assigned emissions using equivalents**	
Ozone Depletion	OP: CFC-11	Ozone Depletion
Global Warming	GWP: CO2	Global Warming
Acidification	AP: H+	Acidification
Eutrophication	EP: P or N	Eutrophication
Photochemical Smog	SP: NOx	Photochemical Smog
Human Health Cancer	HTP to Benzene	Human Health Cancer
Human Health Noncancer	HTP to Toluene	Human Health Noncancer
Human Health Criteria	CP: Disability Adjusted Life Years	Human Health Criteria
Ecotoxicity	EP: 2, 4-Dichlorophenoxy AceticA	Ecotoxicity
Fossil Fuel Use	FP: MJ/consump of fuel/unit of prod.	Fossil Fuel Use
Land Use	TED: T&E density	Land Use
Water Use		Water Use

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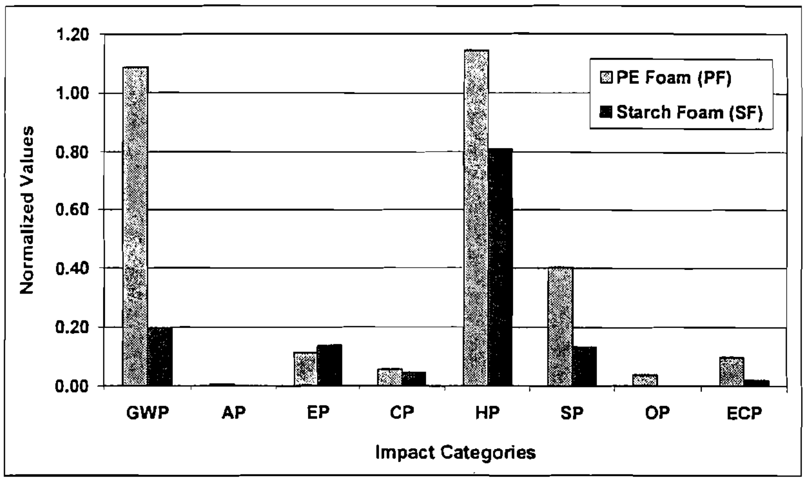
Life Cycle Impact Assessment: Normalized PE and Starch Foam LCIA



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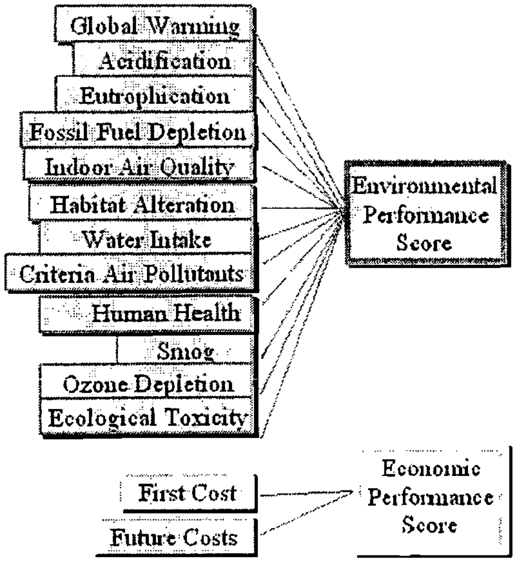
BEES SCORING GRAPHIC



Global Warming
Acidification
Eutrophication
Fossil Fuel Depletion
Indoor Air Quality
Habitat Alteration
Water Intake
Criteria Air Pollutants
Human Health
Smog
Ozone Depletion
Ecological Toxicity

Environmental Performance Score

First Cost
Future Costs

Economic Performance Score

TRACI

The Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts

Jane C. Bare EPA

- ASTM standard for Multiattribute Decision Analysis (E 1765).
- ASTM International standard life-cycle cost method (E 917),

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BIOBASED MATERIALS – 101 in Question –Answer Format

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CHEMICAL
ENGINEERING
&
MATERIALS SCIENCE

Q 1. Why biobased products (bioplastics) and how does using it help sustainable development?

Carbon is the major basic element that is the building block of polymeric materials -- biobased products, petroleum based products, biotechnology products, fuels, even life itself. Therefore, discussions on sustainability, sustainable development, environmental responsibility centers on the issue of managing carbon (carbon based materials) in a sustainable and environmentally responsible manner. Natural ecosystems manages carbon through its biological carbon cycle, and so it makes sense to review how carbon based polymeric materials fit into nature's carbon cycle and address any issues that may arise.

Global Carbon Cycle – Biobased Products Rationale

Carbon is present in the atmosphere as CO_2. Photoautotrophs like plants, algae, and some bacteria fix this inorganic carbon to organic carbon (carbohydrates) using sunlight for energy.

$$CO_2 + H_2O \xrightarrow{\text{Sunlight energy}} (CH_2O)_x + O_2 \qquad \text{Equation 1}$$

Over geological time frames (>10^6 years) this organic matter (plant materials) is fossilized to provide our petroleum, natural gas and coal. We consume these fossil resources to make our polymers, chemicals & fuel and release the carbon back into the atmosphere as CO_2 in a short time frame of 1-10 years (see Figure 1). However, the rate at which biomass is converted to fossil resources is in total imbalance with the rate at which they are consumed and liberated (>10^6 years vs. 1-10 years). Thus, we release more CO_2 than we sequester as fossil resources – a kinetics problem. Clearly, this is not sustainable, and we are not managing carbon in a sustainable and environmentally responsible manner.

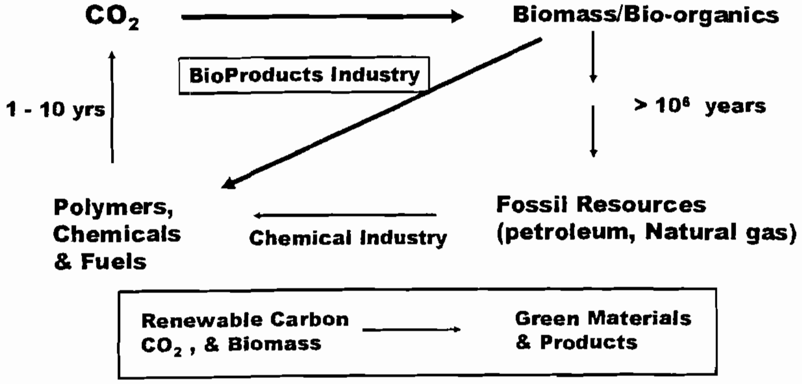

Figure 1. Global carbon cycle – sustainability driver

However, if we use annually renewable crops or biomass as the feedstocks for manufacturing our carbon based polymers, chemicals, and fuels, the rate at which CO_2 is fixed equals the rate at which it is consumed and liberated – this is sustainable and the use of annually renewable crops/biomass would allows us to manage carbon in a sustainable manner. Furthermore, if we manage our biomass resources effectively by making sure that we plant more biomass (trees, crops) than we utilize, we can begin to start reversing the CO_2 rate equation and move towards a net balance between CO_2 fixation/sequestration and release due to consumption. Thus, using annually renewable carbon feedstocks allows for:

- Sustainable development of carbon based polymer materials
- Control and even reduce CO_2 emissions and help meet global CO_2 emissions standards – Kyoto protocol
- Provide for an improved environmental profile

Q 2. How does one define a biobased material?

Based on the discussions above, and the global carbon cycle one defines biboased materials/products as:

Biobased material(s) (ASTM definition also in US Federal Government procurement definition)

Organic material(s) in which the carbon comes from contemporary (new carbon vs old fossil carbon) biological sources

$$CO_2 + H_2O \longrightarrow (CH_2O)_x + O_2$$

One must define organic materials since the term is used, and for this we adopt the accepted IUPAC (International Union of Pure and Applied Chemistry) nomenclautre

Organic material(s) – IUPAC terminology

Material(s) containing carbon based compound(s) in which the carbon is attached to other carbon atom(s), hydrogen, oxygen, or other elements in a chain, ring, or three dimensional structures.

Thus, to be classified *biobased*, the material must be *organic* and contain recently fixed (new) carbon present in biological sources

Q 3. How does one distinguish between new (contemporary) and old (fossil) carbon – identify biobased carbon?

Q 4. How does one quantify biobased carbon content?

Biobased materials may contain 100% bio-carbon (new carbon) or be mixed (physically, chemically, or biologically) with fossil carbon (old carbon). Therefore, one needs to define biobased content)

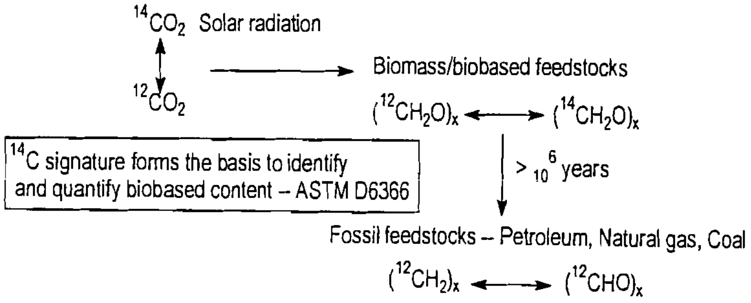

Figure 2. Carbon-14 method to identify and quantify biobased content

As shown in Figure 2, ^{14}C signature forms the basis for identifying and quantifying biboased content. The CO_2 in the atmosphere is in equilibrium with radioactive $^{14}CO_2$. Radioactive carbon is formed in the upper atmosphere through the effect of cosmic ray neutrons on ^{14}N. It is rapidly oxidized to radioactive $^{14}CO_2$, and enters the Earth's plant and animal lifeways through photosynthesis and the food chain. Plants and animals which utilise carbon in biological foodchains take up ^{14}C during their lifetimes. They exist in equilibrium with the ^{14}C concentration of the atmosphere, that is, the numbers of C-14 atoms and non-radioactive carbon atoms stays approximately the same over time. As soon as a plant or animal dies, they cease the metabolic function of carbon uptake; there is no replenishment of radioactive carbon, only decay. Since the half life of carbon is around 5730 years, the fossil feedstocks formed over millions of years will have no ^{14}C signature. Thus, by using this methodology one can identify and quantify biobased content. ASTM subcommittee D20.96 developed a test method (D 6866) to quantify biobased content using this approach.

D6866 test method involves combusting the test material in the presence of oxygen to produce carbon dioxide (CO_2) gas. The gas is analyzed to provide a measure of the products $^{14}C/^{12}C$ content and relative to the modern carbon-based oxalic acid radiocarbon Standard Reference Material (SRM) 4990c, (referred to as HOxII).

biobased content, or gross biobased content

> Amount of biobased *carbon* in the material or product as fraction weight (mass) or percent weight (mass) of the total organic carbon in the material or product.

Q 5. Why is biobased content on a carbon basis?

This is because the rationale for using biobased products is that one can manage carbon emissions in a sustainable manner (the rate of carbon fixation by photosynthesis equals the rate of use and liberation to the atmosphere – carbon neutral). Therefore, it makes sense to use carbon as the basis for the measure of bioasead content and not oxygen or hydrogen or weight or mole. It is sustainable carbon management that is the driver for biobased products utilization.

Q 6. Given a products elemental composition, how can one compute biobased content theoretically?

Examples of biobased content determination

The following examples illustrate biobased content determinations.

1. Product 'O' is a fiber reinforced composite with the composition 30% biofiber (cellulose fiber) + 70% PLA (biobased material). The biobased content of Product 'O' is 100% -- all the carbon in the product comes from biofeedstocks..
2. Product 'P' is a fiber reinforced composite with the composition 30% glass fiber + 70% PLA (biobased material. The biobased content of Product 'P' is 100%, not 70%. This is because the biobased content is on the basis of carbon, and glass fiber has no carbon associated with it. However, in all cases, one must define biobased content and organic content. Thus, the biobased content of Product 'P' is 100% but organic content is 70%, implying that the balance 30% is inorganic material. In the earlier example of Product 'O' the biobased content is 100% and organic content is 100%. Thus this allows the end-user/customer to clearly differentiate between two 100% biobased products and make their choice on additional criteria – looking at the LCA profile of the two products (using ASTM D 7075).
3. Product 'N' is a fiber reinforced composite with the composition 30% biofiber (cellulose) + 70% polypropylene (petroleum based organic). Product 'N' biobased content = 18.17% and not 30%. Again, biobased content is not based on weight (mass), but on a carbon basis i.e. amount of biobased *carbon* as fraction weight (mass) or percent weight (mass) of the total organic carbon.

Therefore, biobased content = 0.3*44.4 (percent biocarbon; cellulose)/0.7*85.7 (percent carbon in polypropylene)+ 0.3*44.4 (percent biocarbon) * 100 which computes to 18.17%.

The justification and rationale for using carbon and not the weight or moles or other elements like oxygen, or hydrogen as the basis for establishing biobased content of products should now be very self evident. As discussed in earlier sections, the rationale for using biobased products is to manage carbon in a sustainable and efficient manner as part of the natural carbon cycle, therefore it makes sense to use carbon as the basis for determining biobased content. It is also fortituous that an absoloute method using ^{14}C is available to measure the biobased carbon present in a material.

Q 7. Have the theoretical calculations been validated by the ASTM test methods?

The theoretical calculations presented earlier have been validated in experimental observations using ASTM D6866 and are in agreement within +/- 2%.

Q 8. So where does biodegradability fit into this biobased equation?

BIOBASED & BIODEGRADABLE -- Single use, short-life, disposable, controlled-life time products like packaging, disposable plastics, agricultural films, marine disposable must be engineered to be biodegradable/compostable, particularly if the disposal infrastructure is composting, anaerobic digestion, waste water treatment, soil, and similar biological infrastructures. In such a case, the product must meet ASTM D6400 Specification standard.

BIOBASED & DURABLE – products like soy polyurethanes for automotive and farm vehicles or Biofiber thermoplastic (like polypropylene) composites for industrial and automotive applications where biodegradability is not a required element for reasons of performance and durability and alternate methods of disposal needs to be designed.

However, one needs to perform LIFE CYCLE ASSESSMENT (LCA) to document positive environmental attributes

- ASTM D7075 "Standard practice for evaluating and reporting environmental performance of biobased products". -- LCA TOOLS
- To incorporate life cycle costing analysis

References (the above Q & A is excerpted from the following publications)

1. *Biobased & Biodegradable Polymer Materials: Rationale, Drivers, and Technology Exemplars; ACS (an American Chemical Societypublication) Symposium Ser. 939, Bk Chapter 2006.*
2. *Presented at the National American Chemical Society, Division of Polymer Chemistry meeting, San Diego (2005);*
3. *R Narayan, Proceedings "Plastics From Renewable Resources" GPEC 2005 Global Plastics Environmental Conference - Creating Sustainability for the Environment, February 23-25, 2005*
4. *"Plastics from Renewable Resources an E-live presentation to Society of Plastics Engineers (SPE) 2006*

Presented at the National American Chemical Society, Division of Polymer Chemistry meeting, San Diego (2005); ACS Symposium Ser (An American Chemical Society Publication) 939 June 2006
BIODEGRADABILITY VS DEGRADABILITY ISSUES SECTION
EXCERPTED FROM THE BOOOK CHAPTER

BIOBASED & BIODEGRADABLE POLYMER MATERIALS: RATIONALE, DRIVERS, AND TECHNOLOGY EXEMPLARS

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Biobased and biodegradable plastics can form the basis for an environmentally preferable, sustainable alternative to current materials based exclusively on petroleum feedstocks. These biobased materials offer value in the sustainability/life-cycle equation by being part of the biological carbon cycle, especially as it relates to carbon-based polymeric materials such as plastics, water soluble polymers and other carbon-based products like lubricants, biodiesel, and detergents. This global carbon cycle vis-à-vis managing carbon efficiently and in an environmentally responsible manner is discussed. Identification and quantification of biobased content uses radioactive C-14 signature. **Biopolymers are generally capable of being utilized by living matter (biodegraded), and so can be disposed in safe and ecologically sound ways through disposal processes (waste management) like composting, soil application, and biological wastewater treatment. Single use, short-life, disposable products can be engineered to be biboased and biodegradable. The need for such products to be fully biodegradable in a defined time frame in the selected disposal infrastructure as opposed to degradable or partially biodegradable is reviewed. Emerging ASTM and International consensus standards on biobased content, and biodegradability is presented.** The manufacture of starch foam and starch bioplastics is discussed as technology exemplars for biobased and biodegradable products.

Biodegradable Materials

Currently, most products are designed with limited consideration to its ecological footprint especially as it relates to its ultimate disposability. Of particular concern are plastics used in single-use, disposable packaging and consumer goods. Designing these materials to be biodegradable and ensuring that they end up in an appropriate disposal system is environmentally and ecologically sound. For example, by composting our biodegradable plastic and paper waste along with other "organic" compostable materials like yard, food, and agricultural wastes, we can generate much-needed carbon-rich compost (humic material). Compost amended soil has beneficial effects by increasing soil organic carbon, increasing water and nutrient retention, reducing chemical inputs, and suppressing plant disease. Composting is increasingly a critical element for maintaining the sustainability of our agriculture system. The food wastes along with other biowastes are separately collected and composted to generate a good, valuable soil amendment that goes back on the farmland to re-initiate the carbon cycle (*4, 5*).

Polymer materials have been designed in the past to resist degradation. The challenge is to design polymers that have the necessary functionality during use, but destruct under the stimulus of an environmental trigger after use. The trigger could be microbial, hydrolytically or oxidatively susceptible linkage built into the backbone of the polymer, or additives that catalyze breakdown of the polymer chains in specific environments. More importantly, the breakdown products should not be toxic or persist in the environment, and should be completely assimilated (as food) by soil microorganisms in a defined time frame. In order to ensure market acceptance of biodegradable products, the ultimate biodegradability of these materials in the appropriate waste management infrastructures (more correctly the assimilation/utilization of these materials by the microbial populations present in the disposal infrastructures) in short time frames (one or two growing seasons) needs to be demonstrated beyond doubt.

Polyethylene (PE) or PE-wax coated paper products are problematic in composting because the paper will fully biodegrade under composting conditions, but the PE or wax coating does not biodegrade and builds up in the compost. Paper products coated with fully biodegradable film can provide comparable water resistance, tear strength like the PE coating. However, it is completely biodegradable and non-interfering in recycling operations (unlike current polytheylene or PE-wax coated paper). These new packaging products along with other biowastes, including food wastes can be collected and composted to generate a good, valuable soil amendment that goes back on the farmland to re-initiate the carbon cycle.

Integration with Disposal Infrastructure

Making or calling a product biodegradable or recyclable has no meaning whatsoever if the product after use by the customer does not end up in a disposal infrastructure that utilizes the biodegradability or recyclability features. Recycling makes sense if the recyclable product can be easily collected and sent to a recycling facility to be transformed into the same or new product. Biodegradable products would make sense if the product after use ends up in a disposal infrastructure that utilizes biodegradation. Composting, waste water/sewage treatment facilities, and managed, biologically active landfills (methane/landfill gas for energy) are established biodegradation infrastructures Therefore, producing biodegradable plastics using annually renewable biomass feedstocks that generally end up in biodegradation infrastructures like composting is ecologically sound and promotes sustainability. Materials that cannot be recycled or biodegraded can be incinerated with recovery of energy (waste to energy). Landfills are a poor choice as a repository of plastic and organic waste. Today's sanitary landfills are plastic-lined tombs that retard biodegradation because of little or no moisture and negligible microbial activity. Organic waste such as lawn and yard waste, paper, food, biodegradable plastics, and other inert materials should not be entombed in such landfills. Figure 4 illustrates the integration of biodegradable plastics with disposal infrastructures that utilize the biodegradable function of the plastic product..

Amongst disposal options, composting is an environmentally sound approach to transfer biodegradable waste, including the new biodegradable plastics, into useful soil amendment products. Composting is the accelerated degradation of heterogeneous organic matter by a mixed microbial population in a moist, warm, aerobic environment under controlled conditions. Biodegradation of such natural materials will produce valuable compost as the major product, along with water and carbon dioxide. The CO_2 produced does not contribute to an increase in greenhouse gases because it is already part of the biological carbon cycle. Composting our biowastes not only provides ecologically sound waste disposal but also provides much needed compost to maintain the productivity of our soil and sustainable agriculture. Figure 4 shows disposal infrastructures that can receive biodegradable plastics.

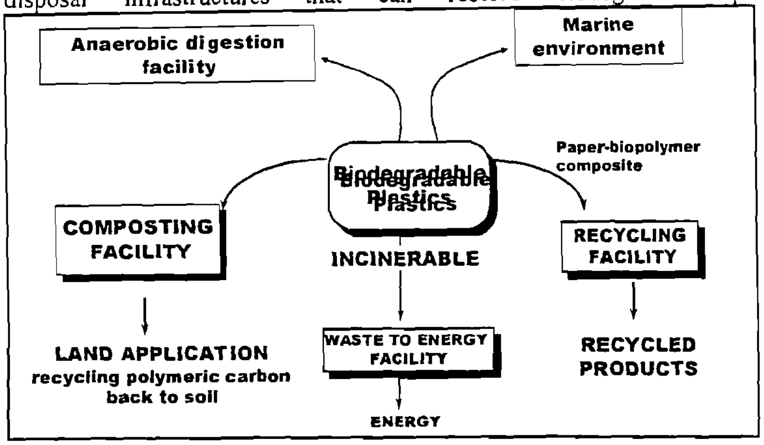

Figure 4. Integration of biodegradable plastics with disposal infrastructures.

As discussed earlier, composting is an important disposal infrastructure because greater than 50% of the municipal soild waste (MSW) stream is biowastes like yard trimmings, food, non-recyclable paper products (see Figure 5)

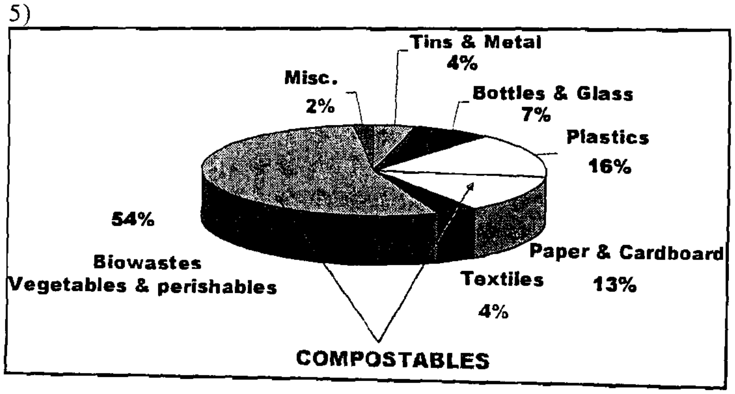

Figure 5. Typical MSW distribution by weight

Degradable vs Biodegradable – An Issue

Designing products to be degradable or partially biodegradable causes irreparable harm to the environment. Degraded products may be invisible to the naked eye. However, out of sight does not make the problem go away. One must ensure complete biodegradability in a short defined time frame (determined by the disposal infrastructure). Typical time frames would be up to one growing season or one year. As discussed earlier the disposal environments are composting, anaerobic digestion, marine/ocean, and soil.

Unfortunately, there are products in the market place that are designed to be degradable, i.e they fragment into smaller pieces and may even degrade to residues invisible to the naked eye. However, there is no data presented to document complete biodegradability within the one growing season/one year time period. It is assumed that the breakdown products will eventually biodegrade. In the meanwhile, these degraded, hydrophobic, high surface area plastic residues migrate into the water table and other compartments of the ecosystem causing irreparable harm to the environment. In a recent Science article (*6*) researchers report that plastic debris around the globe can erode (degrade) away and end up as microscopic granular or fiber-like fragments, and that these fragments have been steadily accumulating in the oceans. Their experiments show that marine animals consume microscopic bits of plastic, as seen in the digestive tract of an amphipod. The Algalita Marine Research Foundation (*7*) report that degraded plastic residues can attract and hold hydrophobic elements like PCB and DDT up to one million times background levels. The PCB's and DDT's are at background levels in soil, and diluted out so as to not pose significant risk. However, degradable plastic residues with these high surface area concentrate these highly toxic chemicals, resulting in a toxic time bomb, a poison pill floating in the environment posing serious risks.

Recently, Japanese researchers (*8*) confirmed these findings. They reported that PCBs, DDE, and nonylphenols (NP) were detected in high concentrations in degraded polypropylene (PP) resin pellets collected from four Japanese coasts. The paper documents that plastic residues function as a transport medium for toxic chemicals in the marine environment.

Therefore, designing hydrophobic polyolefin plastics, like polyethylene (PE) to be degradable, without ensuing that the degraded fragments are completely assimilated by the microbial populations in the disposal infrastructure in a very short time period poses more harm to the environment than if it was not made degradable. These concepts are illustrated in Figure 6. The Figure shows that heat, moisture, sunlight and/or enzymes shorten & weaken polymer chains, resulting in fragmentation of the plastic and some cross-linking creating more intractable persistent residues. It is possible to accelerate the breakdown of the plastics in a controlled fashion to generate these fragments, some of which could be microscopic and invisible to the naked eye, and some elegant chemistry has been done to make this happen as reported in some papers in this book.

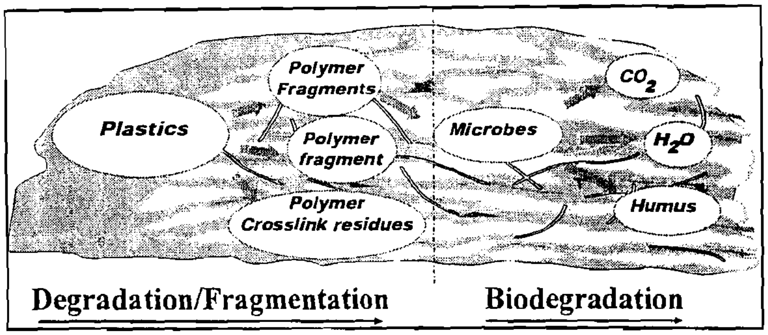

Figure 6. Degradation vs biodegradation

However, this constitutes only degradation/fragmentation, and not biodegradation. As discussed earlier hydrophobic polymer fragments pose risk to the environment, unless the degraded fragments are completely assimilated as food and energy source by the microbial populations present in the disposal system in a very short period (one year). Microorganisms use the carbon substrates to extract chemical energy for driving their life processes by aerobic oxidation of glucose and other readily utilizable C-substrates as shown by the Equation 2.

AEROBIC

$$\text{C-substrate} + 6\,O_2 \longrightarrow 6\,CO_2\uparrow + 6\,H_2O;\ \Delta G^{0\prime} = -686\ \text{kcal/mol} \qquad \text{Equation 2}$$

$(CH_2O)_X$; $x = 6$

Thus, a measure of the rate and amount of CO_2 evolved in the process is a direct measure of the amount and rate of microbial utilization (biodegradation) of the C-polymer. This forms the basis for ASTM and International Standards for measuring biodegradability or microbial utilization of the test polymer/plastics. Thus, one can measure the rate and extent of biodegradation or microbial utilization of the test plastic material by using it as the sole carbon source in a test system containing a microbially rich matrix like compost in the presence of air and under optimal temperature conditions (preferably at 58^0 C – representing the thermophilic phase). Figure 7 shows a typical graphical output that would be obtained if one were to plot the percent carbon converted to CO_2 as a function of time in days.First, a lag phase during which the microbial population adapts to the available test C-substrate. Then, the biodegradation phase during which the adapted microbial population begins to utilize the carbon substrate for its cellular life processes, as measured by the conversion of the carbon in the test material to CO_2. Finally, the output reaches a plateau when all of the substrate is completely utilized.

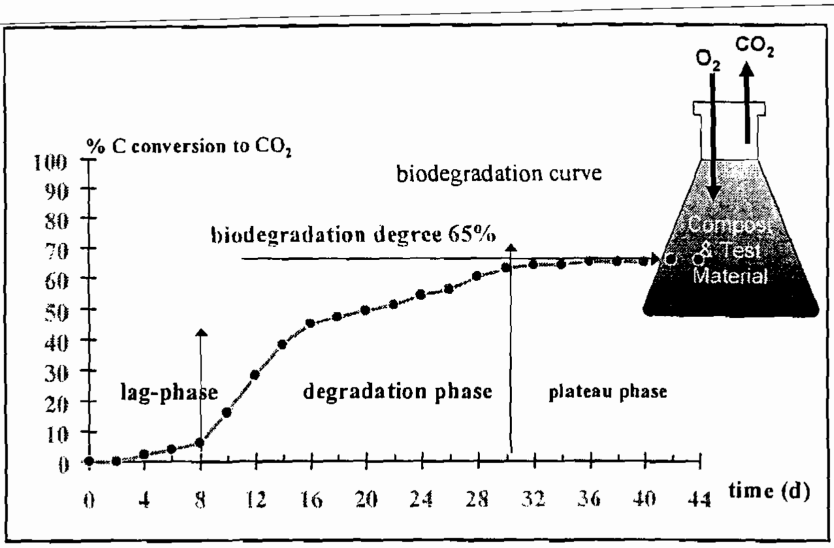

Figure 7. Test method to measure the rate and extent of microbial utilization (biodegradation) of biodegradable plastics

Based on the above concepts, ASTM committee D20.96 (9) has developed a Specification Standard for products claiming to be biodegradable under composting conditions or compostable plastic. The specification standard ASTM D6400 identifies 3 criteria

- **Complete biodegradation (using ASTM D5338 test method)**:
    - Conversion to CO_2, water & biomass via microbial assimilation of the test polymer material in powder, film, or granule form.
    - 60% carbon conversion of the test polymer to CO_2 for homopolymer & 90% carbon conversion to CO_2 for copolymers, polymer blends, and addition of low MW additives or plasticizers.
    - Same rate of biodegradation as natural materials -- leaves, paper, grass & food scraps
    - Time -- 180 days or less; if radiolabeled polymer is used 365 days or less.

Disintegration

- <10% of test material on 2mm sieve using the test polymer material in the shape and thickness identical to the product's final intended use – see ISO 16929 *(10)* and ISO 20200 *(11)*.

Safety

- The resultant compost should have no impacts on plants, using OECD Guide 208, Terrestrial Plants, Growth Test
- Regulated (heavy) metals content in the polymer material should be less than 50% of EPA (USA, Canada) prescribed threshold.

The above specification standard is in harmony with standards in Europe, Japan, Korea, China, and Taiwan, for example EN13432 titled "Requirements for Packaging Recoverable through Composting and Biodegradation—Test Scheme and Evaluation Criteria for the Final Acceptance of Packaging" is the European standard (norm) and similar to D6400. At the International level, the International Standards Organization (ISO) is developing ISO 17088, "Specification for Compostable Plastics" which is in harmony with ASTM D 6400, and the European norms.

Figure 8 summarizes the current standards for the different disposal systems.

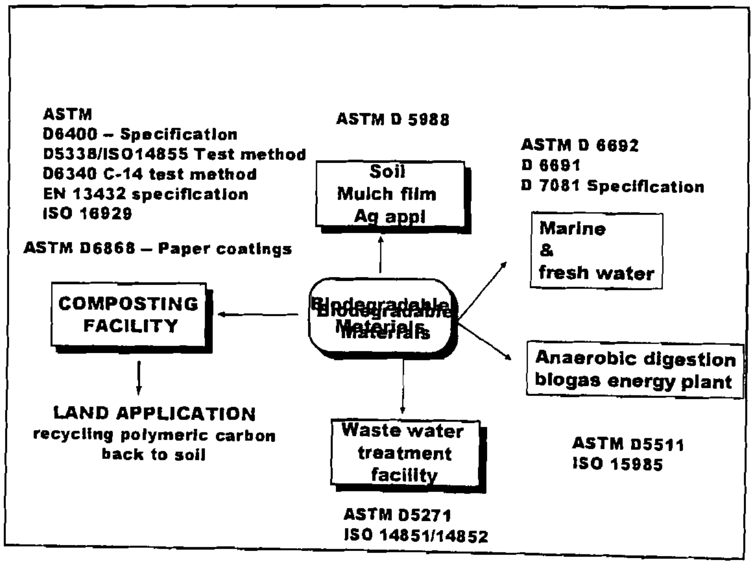

Figure 8 ASTM and European (EN) Standards for biodegradable plastics in different disposal systems.

Presented at the National American Chemical Society, Division of Polymer Chemistry meeting, San Diego (2005); ACS Symposium Ser (An American Chemical Society Publication) 939 June 2006

BIODEGRADABILITY VS DEGRADABILITY ISSUES SECTION
EXCERPTED FROM THE BOOOK CHAPTER

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11. International Standards Organization (ISO) Plastics ISO 202004 – Determination of the degree of disintegration of plastic materials under simulated composting conditions in a laboratory-scale test

COUNCIL OF FEDERAL STAKEHOLDERS
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Fifth Quarterly Meeting

Tuesday, September 11, 2007
9:00a.m. – 11:30 a.m.

ROOM 108A WHITTEN BUILDING

AGENDA

Opening Comments: Roger Conway, USDA-OEPNU/OCE

Designation Progress Report: Duncan Marvin, USDA-OEPNU/OCE

Model Procurement Program Updates: Shana Love, USDA-DA

I

Buying BioPreferred -Linda Mesaros, Mesaros Associates Inc.

*Discussion and Feedback

II

"BEES Global Warming Changes." Bobbie Lippiatt, DOC-NIST

Short Overview of Items in the Next Rounds of Designation: Steven Devlin, ISU-CIRAS

*Discussion and Feedback

III

Additional Issues and Questions, Feedback on Topics of Interest for Next Meeting

Next Meeting Scheduling and Adjournment

COUNCIL OF FEDERAL STAKEHOLDERS
for BioPreferred™

Fifth Quarterly Meeting

Tuesday, September 11, 2007
9:00a.m. - 11:30 a.m.

ROOM 108A WHITTEN BUILDING

AGENDA

Opening Comments: Roger Conway, USDA-OEPNU/OCE

The importance of the council's input for selecting items for upcoming designation rounds was underlined.

Designation Progress Report: Duncan Marvin, USDA-OEPNU/OCE

Since the last stakeholder meeting, the Office of Management and Budget (OMB) has determined the Rounds, 2, 3, and 4 final rules, and all subsequent proposed and final rules to be significant. This has resulted in Office of Energy Policy and New Uses (OEPNU) pulling back the three final rules from OMB to do the necessary additional analyses needed to support a significant rule. OEPNU expects to have the three final rules revised and back to USDA's Office of the General Counsel (OGC) for final review for clearance prior to the end of September. Once Rounds 2, 3, and 4 are published in the Federal Register, a total of 36 items (generic groupings of products) will be eligible for preferred procurement by Federal agencies. We expect that will include up to 2,400 separate products.

In the context of OMB's declaration that all BioPreferred rules will be significant, USDA has revised and refined the clearance process by which rules go to OMB. First, draft rules are sent to the Defense Logistics Agency, the EPA, and USDA's Departmental Administration (DA) for review and comment. Comments are due back in thirty days from receipt of the rule. These comments are incorporated into the rule after concurrence and sign-off by the rule drafting team which includes both OEPNU and DA. That draft rule is then sent to OGC for review for clearance. OGC comments related to legal issues are incorporated into the draft rule and sign-off by OGC is received. At that point, the draft rule goes to USDA's Office of Budget and Program Analysis (OBPA) for review for clearance. After clearance, and revisions if required, OBPA sends the rule to OMB for review and clearance. Once cleared by OMB, the rule can be published in the Federal Register.

OEPNU, in conjunction with DA, is currently revising the Round 5 proposed rule to reflect comments from DLA, EPA, and DA. Comments on the Round 6 proposed rule from these outside reviewers are due back to OEPNU by September 14, at which time revisions to that rule will be made. Both Rounds 5 and 6 proposed rules are expected to be sent to OGC for review for clearance by the end of September.

Testing for environmental and health effects (BEES) for the Round 7 proposed rule are currently under way. Each proposed and final rule to designate is scheduled to include 10 items. OEPNU is open to the Council's suggestions for item designations beyond round 7

Work is proceeding on review and revision of the proposed labeling rule. It has gone through EPA, DLA, DA review and is being returned from OGC within days. The next step is submitting a Proposed Rule to OMB for clearance. A public hearing will be arranged after the proposed rule has been published in the Federal Register; the hearing outcome, as well as public comments can be expected to change the final rule substantially.

Discussion and Feedback

Discussion of how the upcoming definition change for biobased products in the Farm Bill will change the Labeling Rule

Model Procurement Program Updates: Shana Love, USDA-DA

1. As this fiscal year concludes, we will be moving from a developmental phase to a marketing and implementation phase. By September 30, 2007, we will have completed the online awareness training, updated/created 4 of 6 contract templates, a host of targeted fact sheets, and a "How to Do BioPreferred Business Guide" for biobased manufacturers/vendors - all of which will be available on the BioPreferred website.
2. Update to FAR expected to be published final by September 30, 2007
3. This fiscal year, has participated in over 22 outreach events and is looking for your support in additional opportunities in the upcoming year.
4. USDA will continue to interact with the Federal agencies to identify opportunities to ease the implementation of the BioPreferred program.

Note: Strategy for moving forward: make it easy to implement.

Discussion and Feedback

OFEE and OFPP indicated some of the material (described in Buying BioPreferred below) should have been out already. Request for getting the packages out without delay for marketing purposes.

Buying BioPreferred -Linda Mesaros, Mesaros Associates Inc.

Refer to Buying BioPreferred presentation, attached document "Buying BioPreferred.ppt".

Discussion and Feedback

Buying BioPreferred fact sheet suggestions: Building Cleaning, Construction, Healthcare, Cafeterias[1], Packaging, Plastics, and Office Materials.

[1] It was suggested that USDA conduct a DC wide pilot for cafeterias to transform the cafeteria contracts in the same way as the janitorial contracts.

Contract language: OFEE and OFPP underlined the urgency for DA to include contact language in USDA contracts and to make it available to the Council, so that it may be publicized to procurement sooner rather than latter.

Cost comparison list: Provide info that in some cases biobased products could be cheaper. In addition to price comparisons also include BEES[1] (environmental and health) life cycle comparisons. Specific interest in fertilizer comparisons.

[1]One page product on what BEES and ASTM is and how it can be used by the procuring community.

Combining the BioPreferred with other requirements: guidance from the new Farm Legislation ?

Reaching facilities/ technical personnel: At technical Officer training[1], updating the training material

[1]OFEE indicated that this did not help with the recycling program

Environmental Council (procurement representation), Procurement Council, representatives to the Acquisition Council, website, national conference calls. These venues where associated with USDA, VA and Treasury examples.

Procurement Conferences, with group follow up

The contract personnel can guide to the technical personnel related to the contract

In many cases (example Commerce) the technical people get their input from the vendors. Technical personnel when asked usually did not know about biobased products but seemed interested and open when informed.

The environmental management system can be a venue to technical personnel in facilities management

II

"BEES Global Warming Changes." Bobbie Lippiatt, DOC-NIST

Refer to the BEES presentation, attached document "BioPreferred Stakeholders #5_Round7 Changes"

Short Overview of Items in the Next Rounds of Designation: Steven Devlin, ISU-CIRAS

We continue to work on information collection on rounds 8, 9, and 10, if agencies have companies working with them on product evaluation that they would like to see moved up in the designation process we still have flexibility if there is a motivated manufacturer willing to work with us on a BEES.

Discussion and Feedback

OFEE and OFPP urged a slow down in the designation process and argued that designations are coming out more rapidly than the procuring community can adjust to. They also indicated that having designations come out in chucks can also be a problem for the procuring community (example 30 items this year in route of designation), and suggested that a designation slow down may be key to implementation success.

OFPP also suggested working within USDA with the forest service for insight on implementation needs.

OFEE suggested an e-mail follow up for getting feedback about the implementation process in the federal agencies followed possibly by a phone conference.

OEPNU and DA indicated the pressure from Congress and vendors to designate items rapidly. DA also indicated the ongoing coordination efforts with GSA and DLA.

Last it was indicated that 1 year is a standard implementation framework and that implementation can often exceed the indicated time (example of cutlery, 8 years)

III

Additional Issues and Questions, Feedback on Topics of Interest for Next Meeting Next Meeting Scheduling and Adjournment

Topics of Interest for next meeting: Implementation models in different agencies
Environmental Policies or Standards where Biobased Products are or can be included as an element
Comparison of Life Cycle Costs for Biobased and Non-biobased products

BioPreferred Federal Stakeholders Council

Buying BioPreferred:
Implementation Tools

Linda Mesaros

IMPLEMENTATION IS KEY

- **The Laws, Presidential Executive Orders, and Procurement Policy are in place for buying BioPreferred.**
- **Still how do you get Government Personnel to buy Biobased Products?**
- **Lets discuss, discuss, discuss.**

TARGET STAKEHOLDERS

- **Facilities/Technical Personnel**
- **Procurement/Contracting Personnel**
- **Purchase Card Holders**

FACILITIES/TECHNICAL PERSONNEL

- **Technical Guide Sheets**
  - **Vehicle and Equipment Maintenance**
  - **Maintenance and Repair**
  - **More to come...**
- **Fact Sheets - tailored to facilities/technical personnel**
- **Sample biobased language for Section C – Performance Work Statement**

FACILITIES/TECHNICAL PERSONNEL

- Directives and Regulations – Revise materials that they use
- Case Studies
- Example cost information on products

FACILITIES/TECHNICAL PERSONNEL

- How do we reach them?
- What do they read?
- What conferences do they attend?
- What training do they take?

PROCUREMENT/CONTRACTING PERSONNEL

- Implement Comprehensive Green Purchasing Affirmative Procurement Program
- Sample Contract Language (Section C, I, K, L, and M)
  - Maintenance and Repair of Buildings
  - Vehicle Maintenance
  - Minor Construction
  - Grounds Maintenance
  - More to come...

PROCUREMENT/CONTRACTING PERSONNEL

- Develop model Source Selection Green Evaluation Factors.
- Make Presentations at Conferences.

PURCHASE CARD HOLDERS

- General Awareness Training
- Facts Sheets - simple and short that are informative
- Revise Card Holder Guidance.
- Send Reminders via Invoices.
- How do we reach them?

INFORMATION

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BEES Scoring Changes for BioPreferred™

Barbara C. Lippiatt
U.S. Department of Commerce
National Institute of Standards and Technology

Scoring Changes

Prompted by BEES 4.0 updates

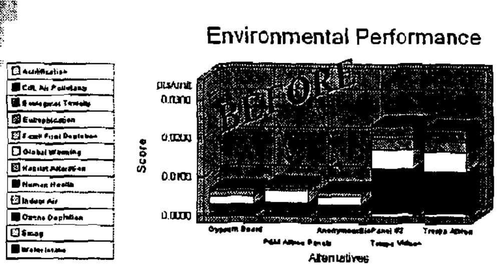
- Global Warming Scoring
- Environmental Impact Weighting

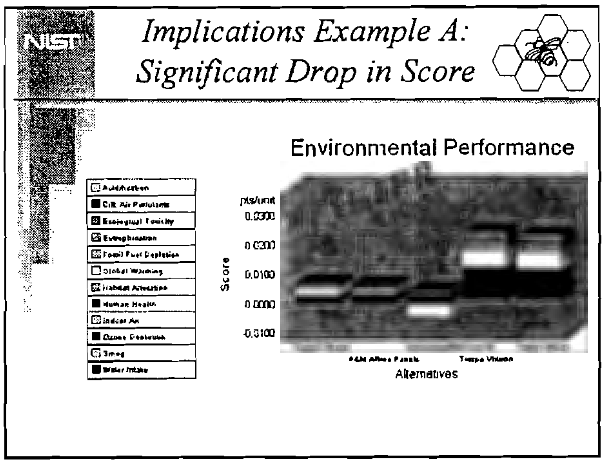
Global Warming Scoring

Carbon cycle change

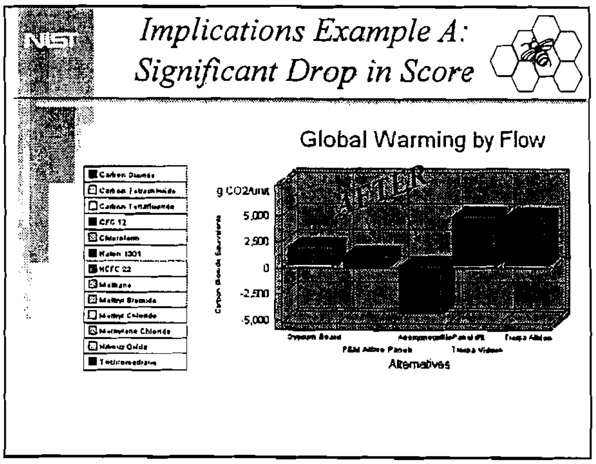
- Accounts for recently sequestered carbon
- Adopted by
  - Intergovernmental Panel on Climate Change (IPCC)
- Approved by
  - EPA Office of Research and Development

Implications Example A: Significant Drop in Score

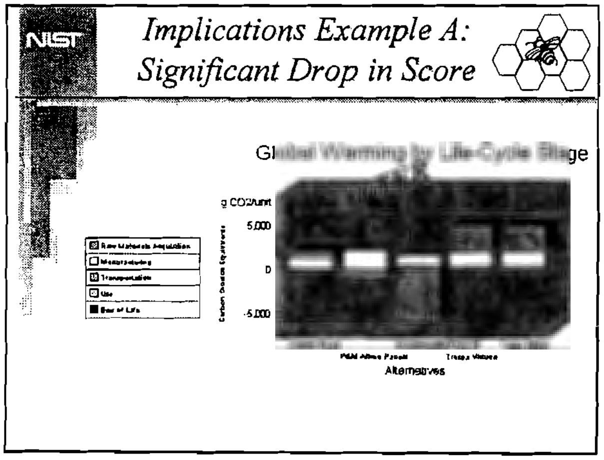




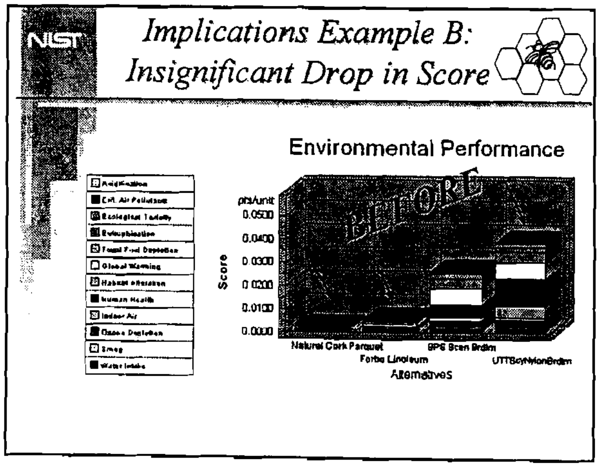
Implications Example A: Significant Drop in Score



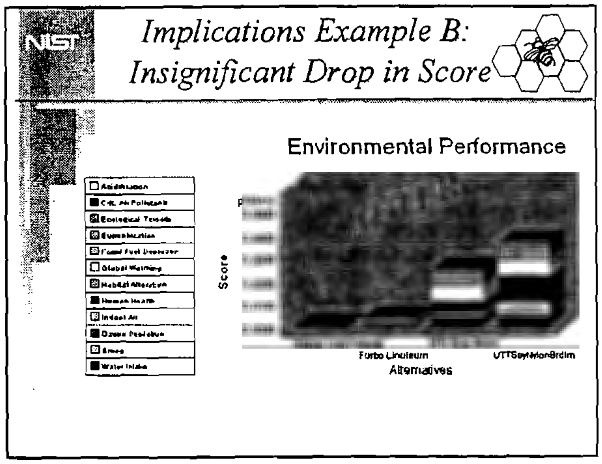
Implications Example A: Significant Drop in Score



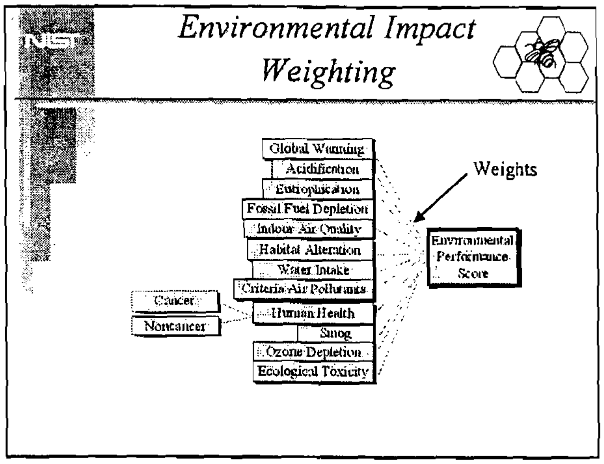
Implications Example A: Significant Drop in Score



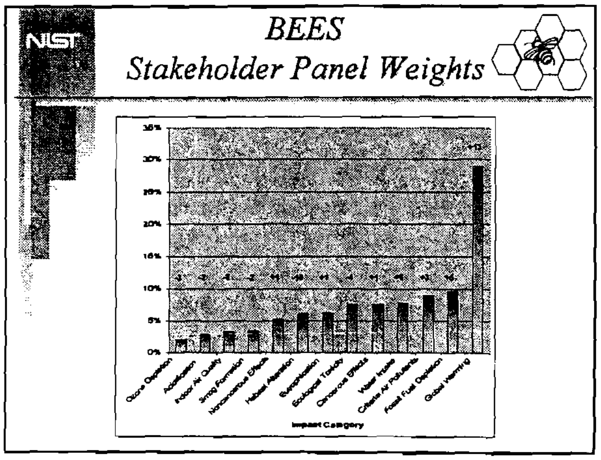
Implications Example B: Insignificant Drop in Score



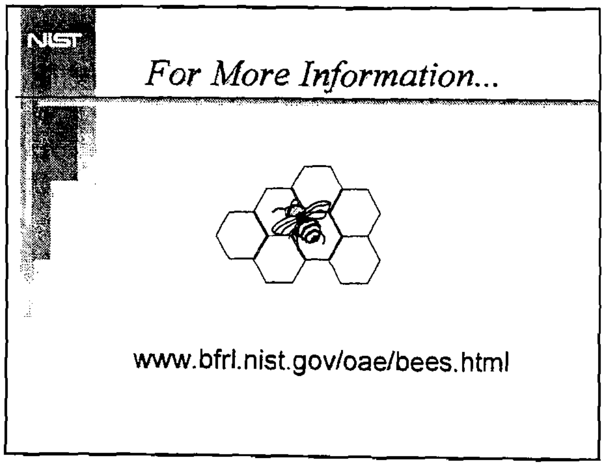
Implications Example B: Insignificant Drop in Score



Environmental Impact Weighting



BEES Stakeholder Panel Weights



For More Information...

www.bfrl.nist.gov/oae/bees.html