



Will
Green Plastics
enable
Zero Waste?

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(AMRF)**

**For significant
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summary
presentation, and for
their stewardship.**

The Johari Window



Fossil Plastic is Polluting our Ecosphere at an Alarming Rate

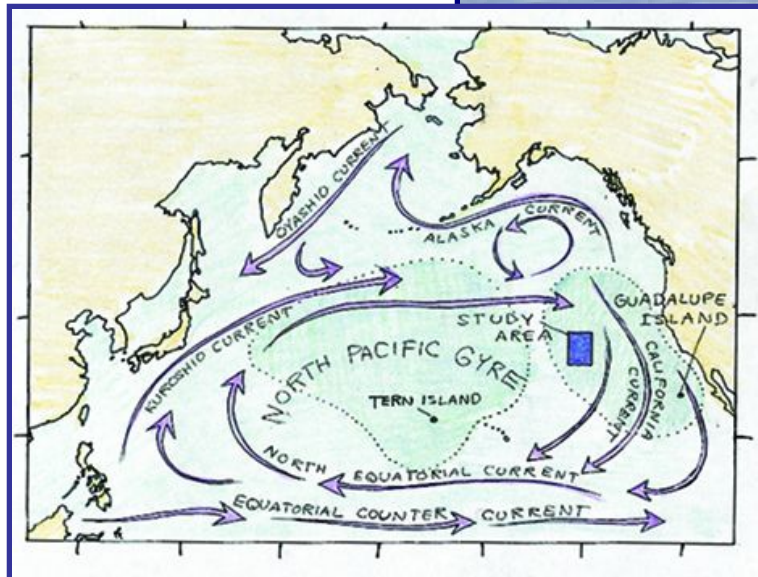
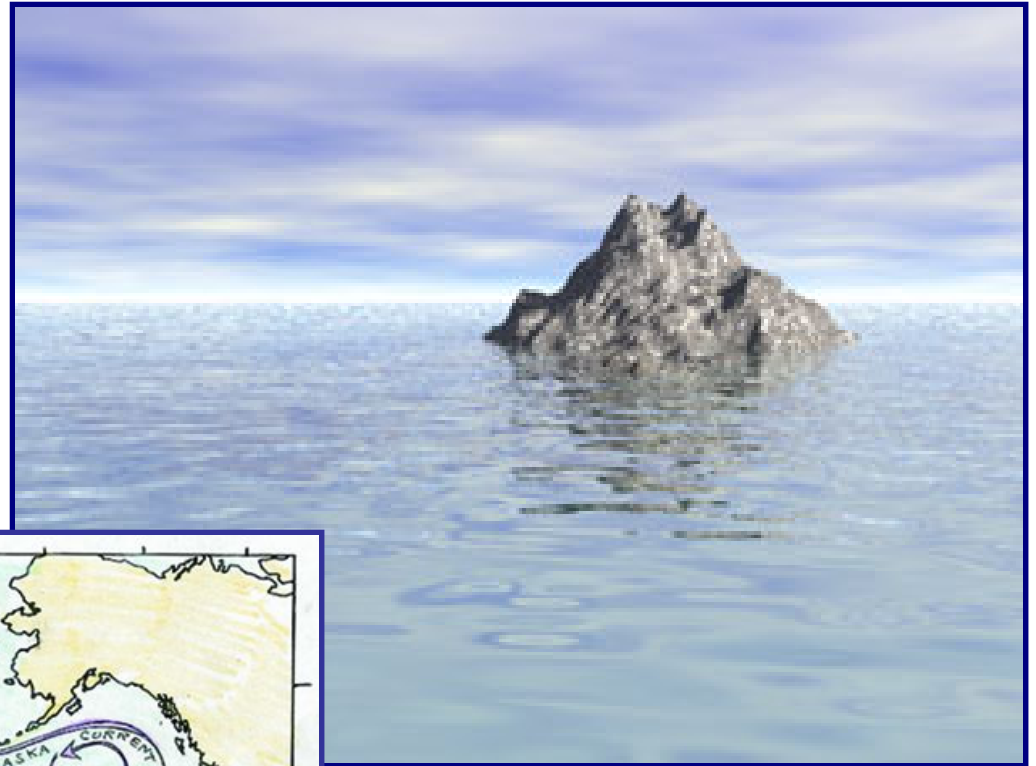


We can't close our eyes anymore and pretend it "goes away".

It doesn't go away-
"Every piece of fossil plastic ever manufactured still exists!"

Garbage Island in Pacific Ocean

An entire "island" composed of trash has been discovered in the Pacific Ocean between California and Hawaiian islands . It is as large as the Central Europe. Fossil plastic objects prevail among the trash.



Plastics are Forever

Fossil plastics, like Diamonds are forever.

-Captain Charles Moore (AMRF)

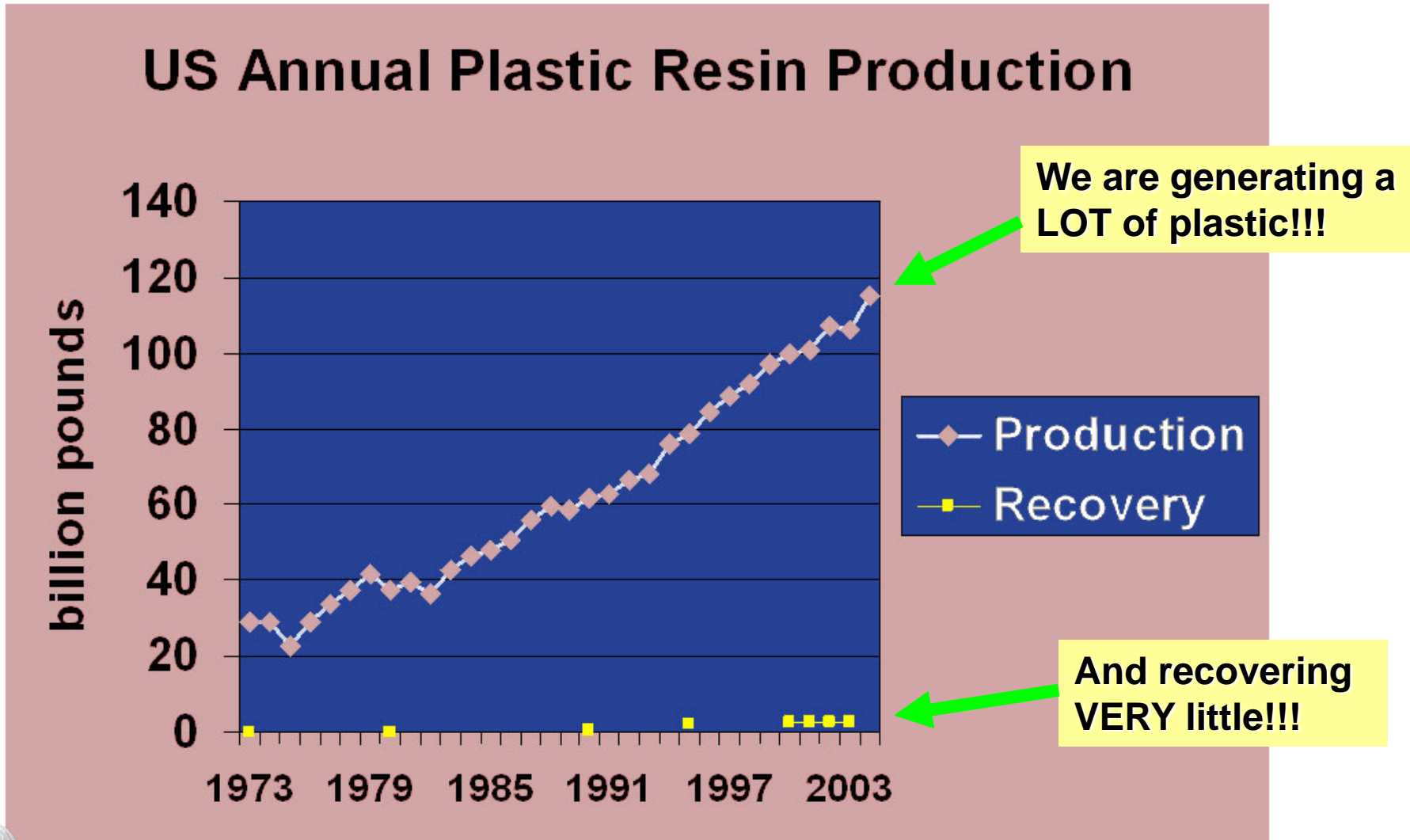
“An estimated 500 billion to 1 trillion bags are used annually worldwide.

100,000 whales, seals, turtles and other marine animals are killed by plastic bags each year worldwide.”

(source Planet Ark)



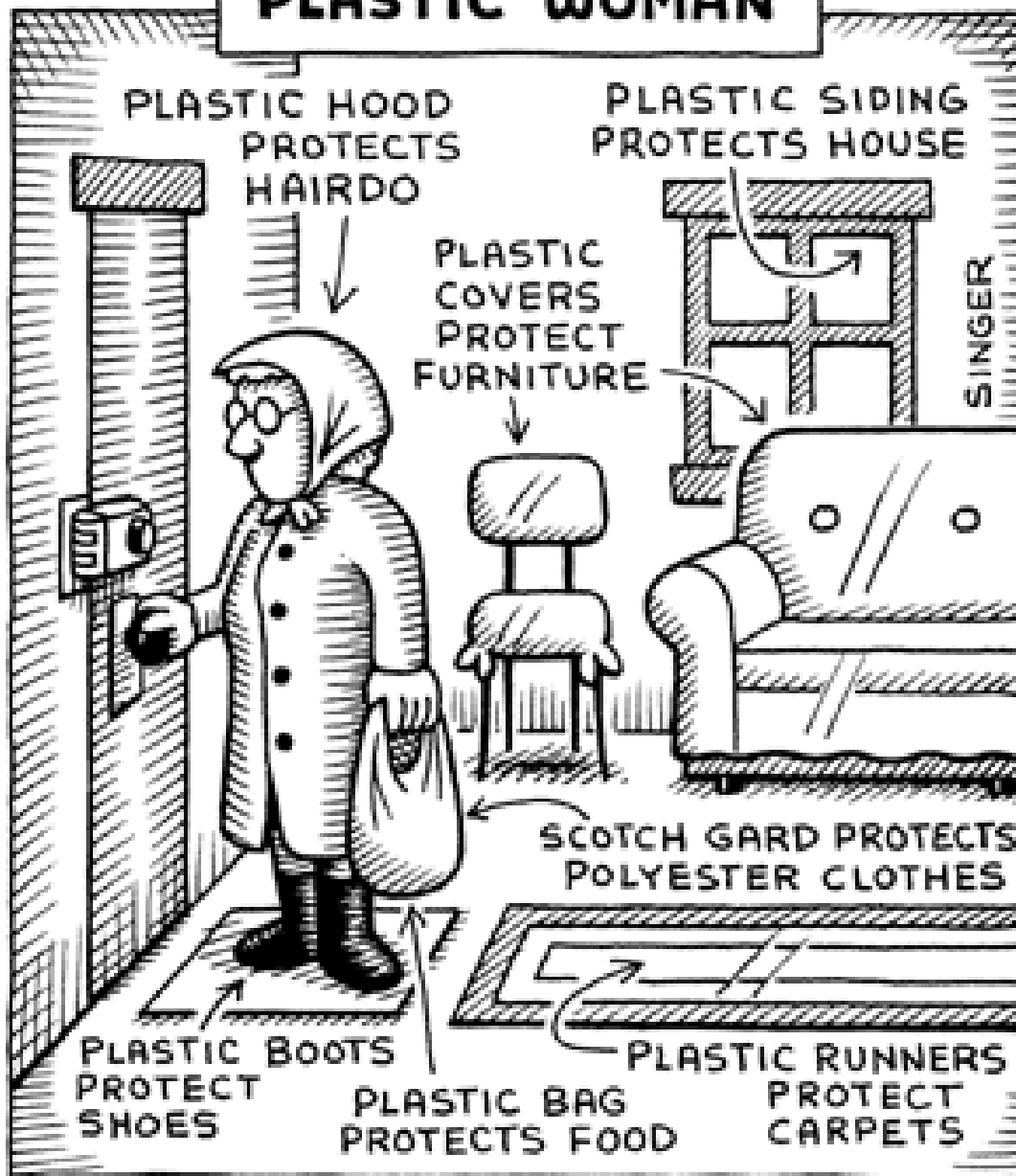
Virgin Plastic Production is Still on the Rise



(APC, 2004)



PLASTIC WOMAN

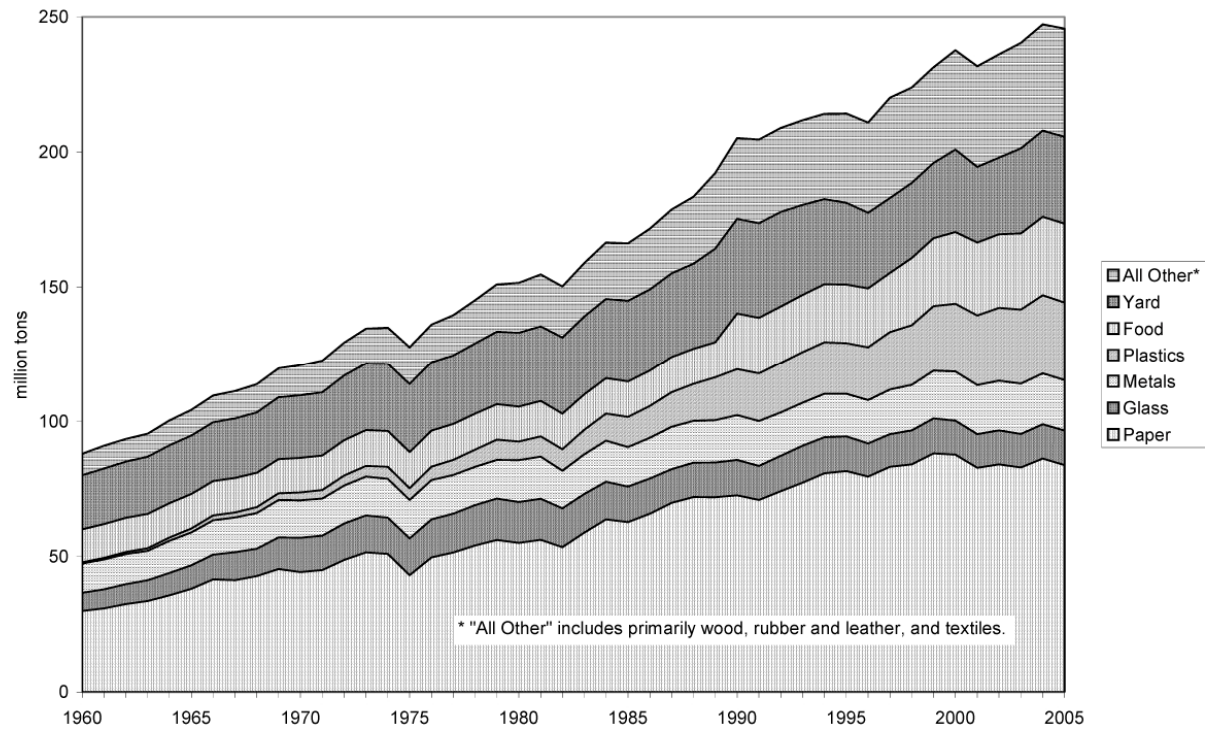


Hydrocarbon Plastics – (The Myth of) the Chasing Arrows



All trash generated

Figure 10. Generation of materials in MSW, 1960 to 2005



Do we really need Fossil Plastics?



Only if they **REALLY** recycle.

A ZeroWaste Alliance:

<http://container-recycling.org/zbcwaste/links.htm>



Green Plastics

An
Introduction
to the New
Science of
Biodegradable
Plastics

E.S. STEVENS

Remaking the Way We Make Things

A concept that goes hand in hand with the notion of a technical nutrient, the concept of a **product of service**. Inside "business," products continue to be made—cars, televisions, computers, and refrigerators. Products would be designed to last for a **defined user period**—say, ten thousand hours. At the end of that period, they could be repaired or simply upgraded to a newer version, the manufacturer would receive the services they need, and the user would retain ownership of the maintenance themselves. In order for such a scenario to be upcycled rather than recycled—to retain high quality in a closed-loop composed of by "consumers," products like a high-quality computer case, for example, will continually circulate as a sturdy plastic component. These products will be designed to last for a long time, but will also be designed to be repaired or replaced. A technical nutrient is a material that is designed to go to the end of its life cycle, but will also be designed to be repaired or replaced. In this scenario, the user would be paying for the service of maintaining the product, rather than for the product itself. When they finish using its complex materials and components, they need for its materials themselves.

cradle to cradle

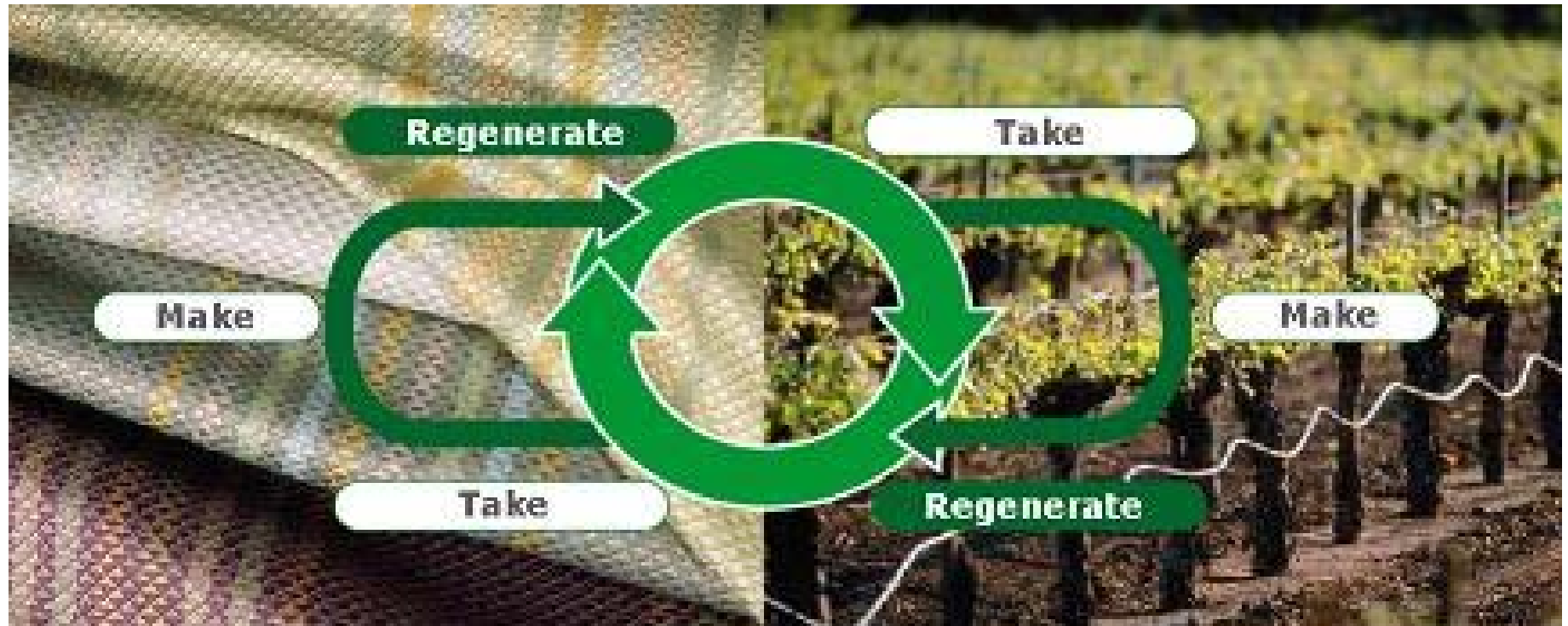
William McDonough & Michael Braungart



Bill McDonough

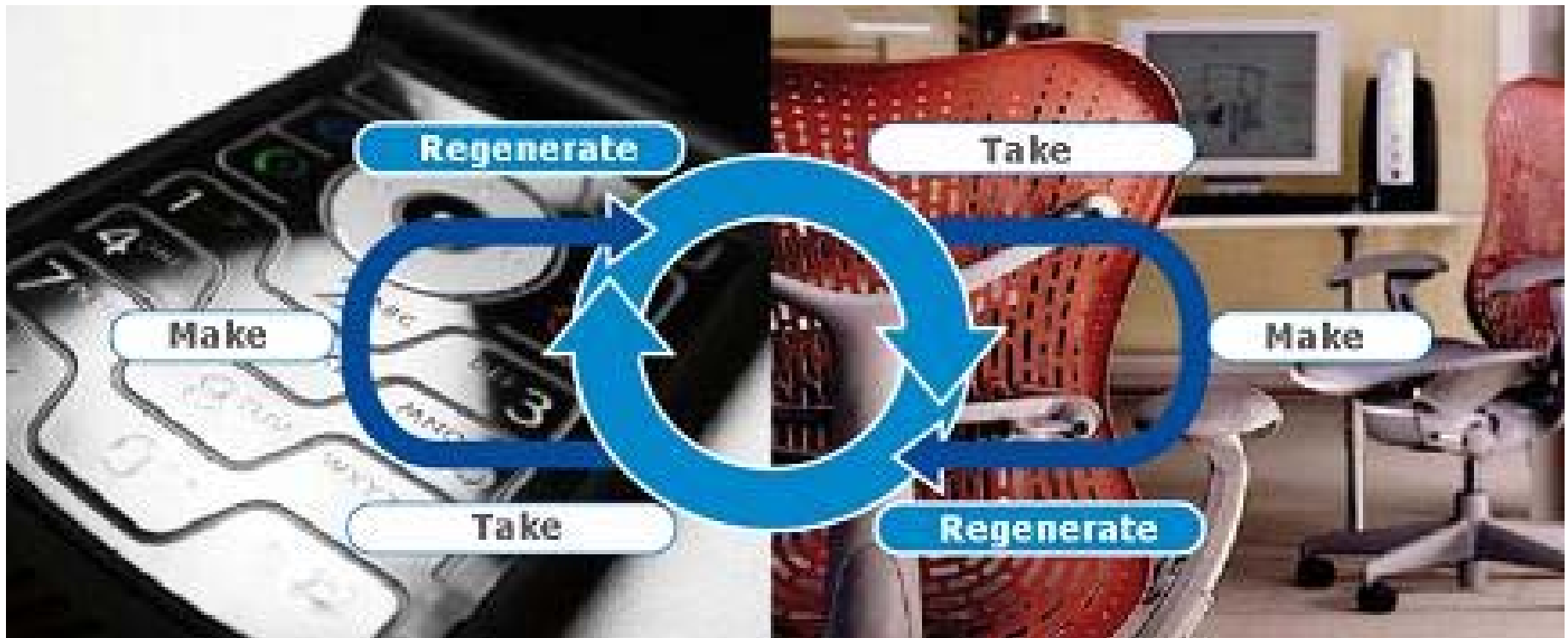
- “There are two fundamental frameworks for metabolism: biological and technical nutrients. So we ask a company, ‘Are your materials safe and healthy for human and ecological systems? Do you have reverse logistics – do we know where this stuff comes from, where it goes, and how to get it back and it onto closed, zero-waste cycles?’ ”

Biological Nutrients



Technical Nutrients

For example, plastics and metals



Cradle to Cradle, William McDonough and Michael Braungart



How would we navigate to zero waste?



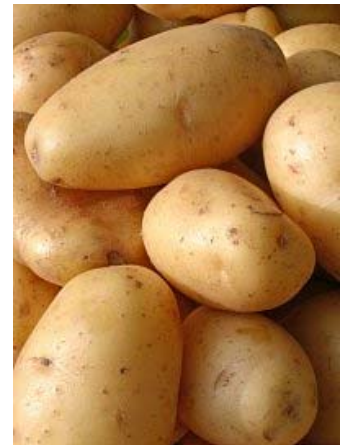
What are Green Plastics?

We learned:

Fossil plastics are 100% **HYDROCARBON** polymers that **DON'T** biodegrade in many lifetimes.

Green plastics contain **CARBOHYDRATE** polymers that **can be designed** to biodegrade.

It is now technologically possible to make plastics using green cells rather than fossil fuels.



Carbohydrate Polymers Are Biopolymers

The source for the biopolymer is a green cell.

Biopolymers can be broken down by microorganisms like fungi and bacteria. They can compost and become part of the soil again.



Sources of Biopolymers for Green Plastics

Cellulose (Ag
and forest
wastes)

Wood

Cotton

Corn

Wheat

Soy

Tapioca

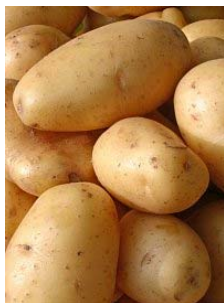
Potatoes

Etcetera



Zero Waste Mission- USDA Ag Service

Commodity



Product

Cheese, juice, ethanol, flour, vegetable oils, biodiesel, eggs, textiles



“Waste”

Whey, pulp, glycerol, feathers, peel, sugar beet fiber



Biobased Packaging

Biopolymers, PLA, PHA, composites, films, coatings, monomers

Common polymers designed to recycle, not compost.

- PE (polyethylene) can be derived from a green cell; sugar cane being used by Braskem in Brazil.
- PP (#5, polypropylene) from biobased source being designed for use in Mazdas

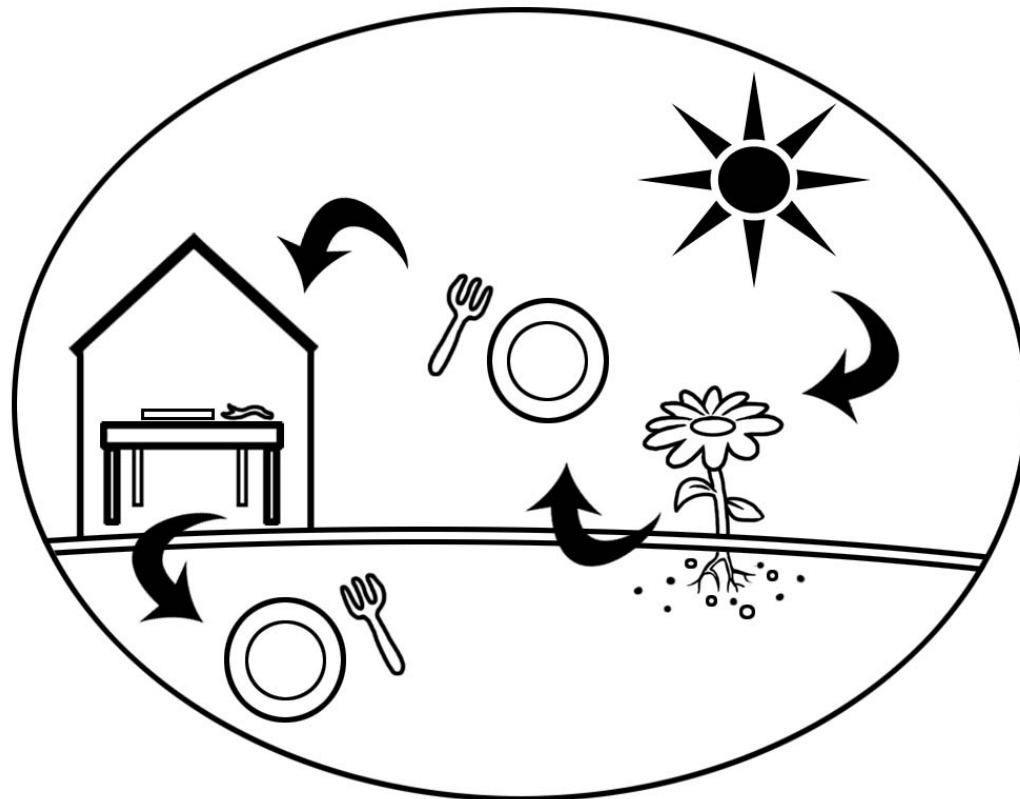
Green Plastics

- Biopolymer(s) +
 - Plasticizer(s) +
 - Other additives
- = BIOplastic

SOME bioplastics are certified compostable (ASTM 6400). Yet that does not mean marine biodegradability.





To Stop Accumulation of Waste We Must Focus on Two Principles

1. Live off current solar income
2. There is no waste (**waste is food for something else**).



Moving Materials Towards Sustainability

The following matrix describes a way to think about all the materials on earth. They range from very toxic and very persistent, to non-toxic and compostable. Sustainability implies making group four obsolete, and making group one the primary operating realm.

	More Degradable 	More Persistent 
Less Toxic 	Group One <ul style="list-style-type: none"> • Cellulose • Carbohydrates • Carboxylates (soaps) • Biopolymers 	Group Two <ul style="list-style-type: none"> • Iron • Silicon • Aluminum • Copper • Polyolefins
More Toxic 	Group Three <ul style="list-style-type: none"> • Acids and Bases • Ethers • Alcohols and Thiols • Aliphatic Amines • Aromatic Amines • Ethylene/Propylene • Ethanol/Methanol • Phenols • Aromatic Hydrocarbons 	Group Four <ul style="list-style-type: none"> • Halogenated Aliphatic Hydrocarbons • Lead • Mercury • Cobalt • Cadmium • Halogenated Aromatic Hydrocarbons (PCBs, DDT) • Dioxins and Furans

PLA is a molecule, not a brand. (**P**oly**l**actic **a**cid or **P**oly**l**actide)

- PHA, & PHB are also molecules.
- Green cell based “bioplastics”
- Also synthetic and biobased hybrids that refer to themselves as “green”
- Certified compostable: BPI, DinCertco, etc.
- Goal: non-GMO crop source

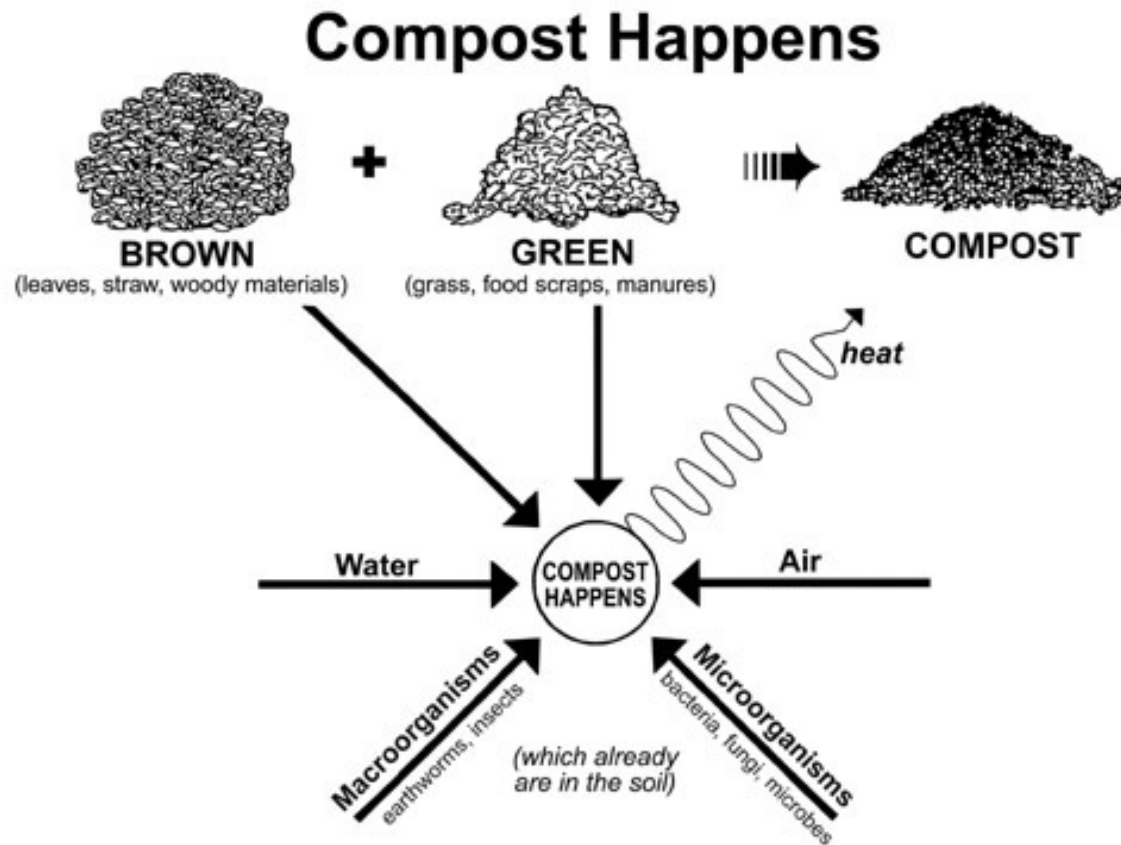
It deserves it's own identity
and number.



What is industrial-scale composting?

- Large-scale facilities designed to process organic “wastes” into stable, humified and re-usable products which can be used in landscaping, horticulture and agriculture and a number of specialized applications
- Controlled decomposition of organic “wastes” with minimum impact on air, soil and water quality
- Hot composting process –achieve pasteurization of materials (>55°C)
- Key infrastructure to recycle organic “wastes” into re-usable products, and to reduce our dependence on landfilling
- Facilities designed to process organic materials on a regional basis from municipal, commercial / industrial and construction / demolition sources

Food wastes blend with yard wastes.



So What is the Answer?

Changing Views, Taking Action

Problem:

Plastic Accumulation Worldwide

**Plastic doesn't biodegrade.
Beaches around the world are
inundated with fossil plastic
debris.**

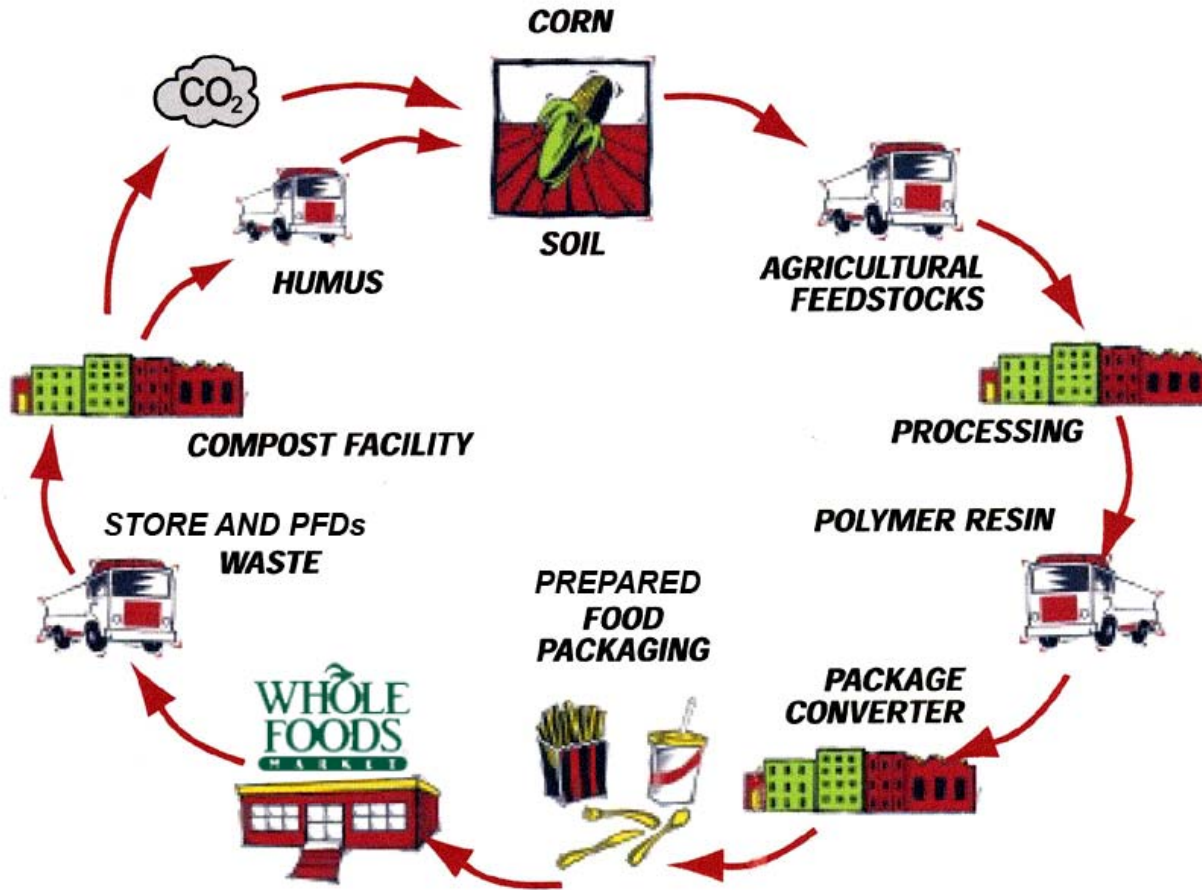


Solution:

Change How We Think About Plastic

**If civilization is to survive
healthily and indefinitely on this
planet, then we must change the
way we create, consume, and
discard plastic.**

We pack our lunch in a bag that will
be around long after we're gone.



The Green Cell Packaging Cycle

This is an example of moving towards group one.

Producers of Green Plastics

The list is growing. For information on compostable green plastics and 3rd party certifiers go to:

US: Biodegradable Plastics Institute

<http://www.bpiworld.org/BPI-Public/Approved.html>

European Union: DIN Certco Certification

<http://www.din-certco.de/index.php?lang=en>

Brussels: Vincotte International nv/sa

<http://www.aib-vincotte.com>

Japan: Biodegradable Plastics Society of Japan

http://www.bpsweb.net/02_english/03_new_e/what_g/what.htm

Green Products Now Available



cellulose films



We all have the choice.



Key Resources for this Presentation:

- <http://www.algalita.org/video-order.html>
- http://culturechange.org/e-letter-plastics_enemy.html
- <http://www.earthresource.org/>
- http://www.organicconsumers.org/articles/article_4414.cfm
- <http://www.mindfully.org/Plastic/Biodegrade/Green-PlasticsAug00.htm>
- <http://www.container-recycling.org/>
- <http://www.sustainablepackaging.org/>
- <http://greenplastics.com/>

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