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Responsible Packaging Solutions  
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# Reaching for Zero Waste with Bioplastics

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# Outline

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- # The zero waste movement
  - # Plastics wasting
  - # The promise of bioplastics
  - # Definitions:
    - Biodegradable Vs. Degradable
    - Biobased Vs. Biodegradable
  - # “Sustainability” challenges for bioplastics
  - # Sustainable Biomaterials Collaborative and sustainability guidelines
  - # Focus on end-of-life issues
    - San Francisco example
    - Recycling and bio-based bottles
    - Labeling
    - Recommendations
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# Communities with Zero Waste Goal

## **California, USA**

Del Norte County \* San Luis Obispo County \* Santa Cruz County  
City of Oakland \* San Francisco City and County \* Berkeley  
\* Burbank (informally) \* Palo Alto \* San Bernardino County \* San  
Diego County (Citizens Advisory Committee only) \* Sonoma  
County (Local Task Force, citizens committee only) \* California  
Integrated Waste Management Board

## **Other USA**

Boulder County, CO \* Carrboro, NC \* Central Vermont Waste  
Management District \* New York City (Citizens ZW Plan) \* Seattle,  
WA \* Summit County, CO

## **Other North America**

Halifax, Nova Scotia Regional District \* Nelson, British  
Columbia Regional District \* Kootenay Boundary, British  
Columbia Regional District \* Central Kootenay, British Columbia \*  
Smithers, British Columbia Regional District \* Cowichan Valley,  
British Columbia \* Nanaimo, British Columbia \* Toronto, Ontario \*  
Sunshine Coast Regional District, British Columbia

# Zero Waste Is an International Movement

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## **South America**

Buenos Aires, Argentina

## **Australia**

Eurobodalla Council \* Willoughby Council \* South Australia State Government \* Canberra \* The State of Western Australia \* The State of Victoria

## **New Zealand**

Over 50% of cities adopted ZW as a goal

## **Europe**

Doncaster Metropolitan Borough Council \* Bath and NE Somerset District Council \* Wales \* Blaenau Gwent County Borough Council

## **Africa**

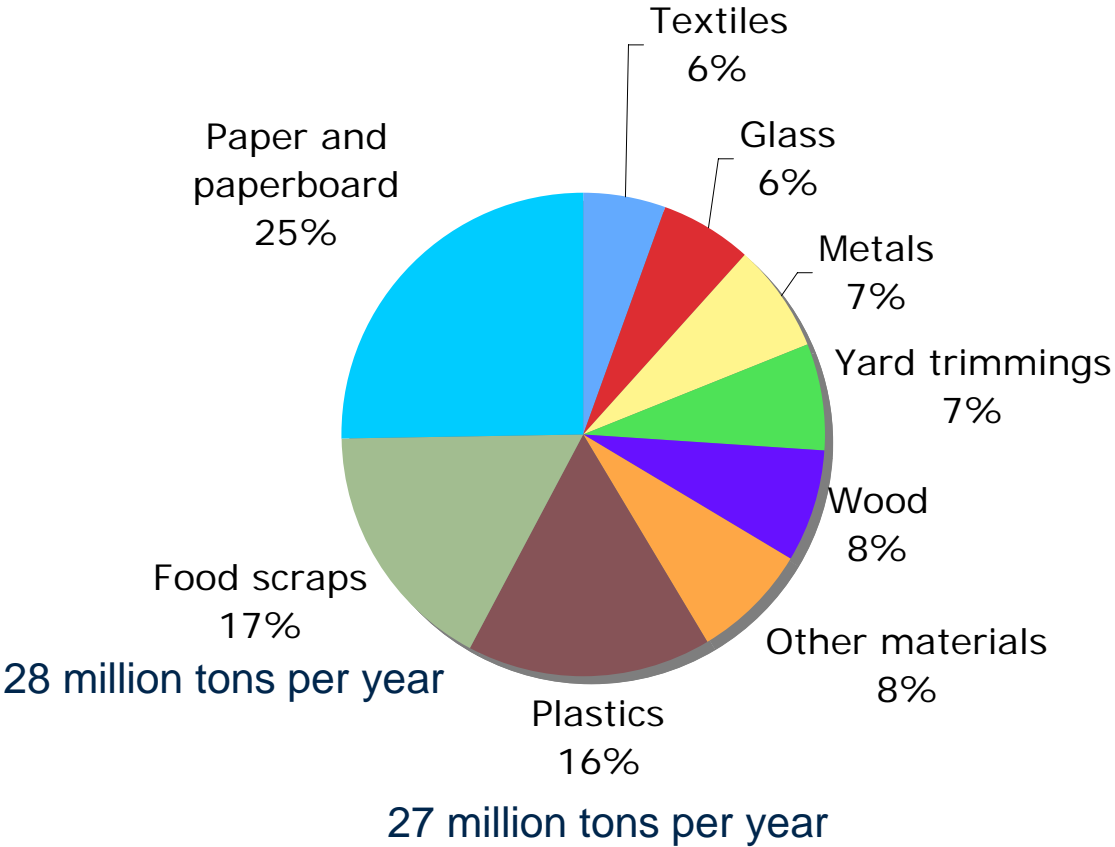
South Africa, adopted the Polokwane Declaration on Waste Management at first National Waste Summit in 2001

## **Asia**

Candon City, Ilocos Sur, Philippines \* San Isidro, Sueva Edija, Philippines \* Pilar, Sorsogon, Philippines \* Linamon, Lanao del Norte, Philippines \* Sigma, Capiz, Philippines \* Kamikatsu, Japan \* Kovalam, India \* Kanchrapara Municipality, West Bengal, India

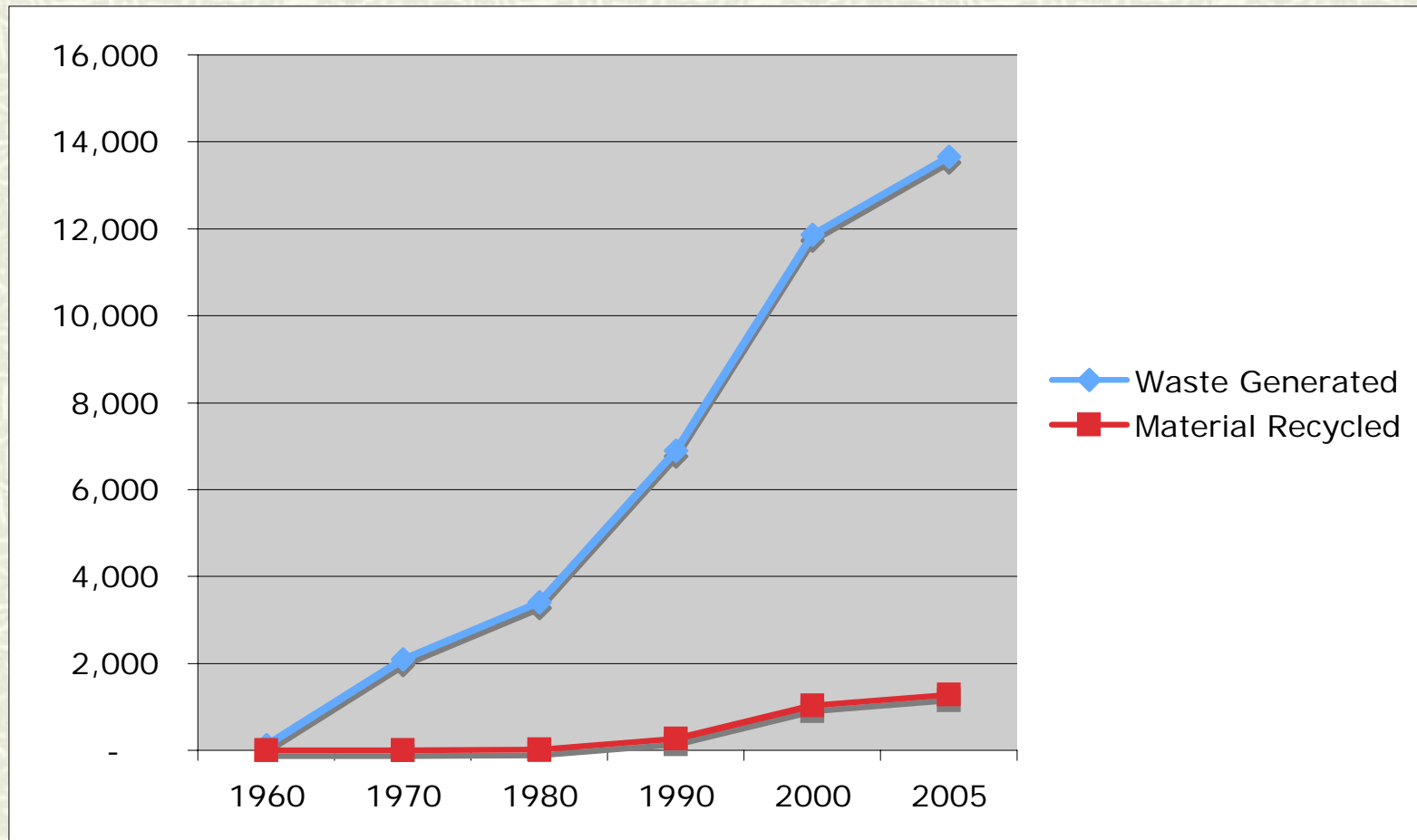
167 million tons per year in 2005

# Municipal waste disposed



# Plastic Packaging Discarded

Thousands  
of tons



# Plastics Recycling Low

	Generation (thousand tons)	Recycling (thousand tons)	Recycling Level (percent by weight)
PET	2,860	540	18.9%
HDPE	5,890	520	8.8%
PVC	1,640		0.0%
LDPE/LLDPE	6,450	190	2.9%
PP	4,000	10	0.3%
PS	2,590		0.0%
Other resins	5,480	390	7.1%
<b>Total Plastics in MSW</b>	<b>28,910</b>	<b>1,650</b>	<b>5.7%</b>

Source: US EPA, 2005 data

## OAKLAND CITY COUNCIL

Ordinance No. \_\_\_\_\_ C.M.S.

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**DRAFT – JUNE 13, 2006**

**AN ORDINANCE TO PROHIBIT THE USE OF POLYSTYRENE FOAM  
DISPOSABLE FOOD SERVICE WARE AND REQUIRE THE USE OF  
BIODEGRADABLE OR COMPOSTABLE DISPOSABLE FOOD SERVICE  
WARE BY FOOD VENDORS AND CITY FACILITIES**

This ordinance will institute two distinct practices by all food vendors and City Facilities in Oakland. The first is that the use of polystyrene foam disposable food service ware will be prohibited. The second is that all disposable food service ware will be required to be biodegradable or compostable, as long as it is affordable.

**WHEREAS**, the City of Oakland has a duty to protect the natural environment, the economy, and the health of its citizens; and

**WHEREAS**, effective ways to reduce the negative environmental impacts of throw-away food service ware include reusing food service ware and using compostable and biodegradable take out materials made from renewable resources such as paper, corn starch and sugarcane; and

**WHEREAS**, polystyrene foam is a common environmental pollutant as well as a non-biodegradable substance that is commonly used as food service ware by food vendors operating in the City of Oakland; and

**WHEREAS**, there continues to be no meaningful recycling of polystyrene foam food service ware and biodegradable or compostable food service ware is an affordable, safe, more ecologically sound alternative; and

**WHEREAS**, affordable biodegradable or compostable food service ware products are increasingly available for several food service applications such as cold cups, plates and hinge containers and these products are more ecologically sound than polystyrene foam materials and can be turned into a compost product; and

**WHEREAS**, the Oakland Coliseum has successfully replaced its cups with biodegradable corn starch cups and has shown an overall cost savings due to organics recycling; and



# Degradable Vs. Biodegradable

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## Degradable

May be invisible to naked eye

Fragment into smaller pieces

No data to document  
biodegradability within one  
growing season

Migrate into water table

Not completely assimilated by  
microbial populations in a  
short time period

## Biodegradable

Completely assimilated into  
food and energy source  
by microbial populations  
in a short time period

Meet ASTM D6400 spec

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# Biodegradable Product Cos.

Novamont, Mater-Bi™	Variety of products from modified starch such as corn
Cereplast	Manufactures biodegradable resins for injection molding from wheat, corn, and potato starch
NatureWorks	Produces PLA from corn starch
Biosphere Industries	Rigid packaging primarily from starches such as tapioca and potatoes and a small amount of grass fiber
Innovia	Film packaging from wood-pulp derived cellulose
Earthcycle Packaging	Packaging from palm fiber
BASF, Eco-Flex™	Plastic film from aliphatic aromatic copolyester

Source: [www.bpiworld.org](http://www.bpiworld.org) and company Web sites





# Sample Products

Greenware cups  
(PLA)



Biosphere  
Industries



BioBag (Mater-Bi)



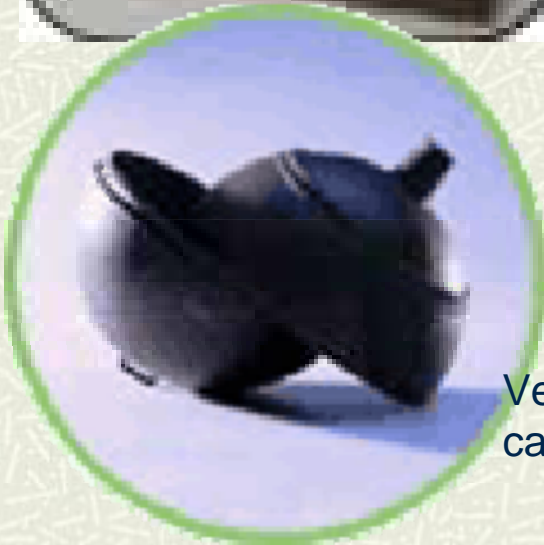
Earthcycle



# Other Bioplastic Products



CD case made from hemp plastics



Vegemat fireworks case



Rodenburg BioPolymers

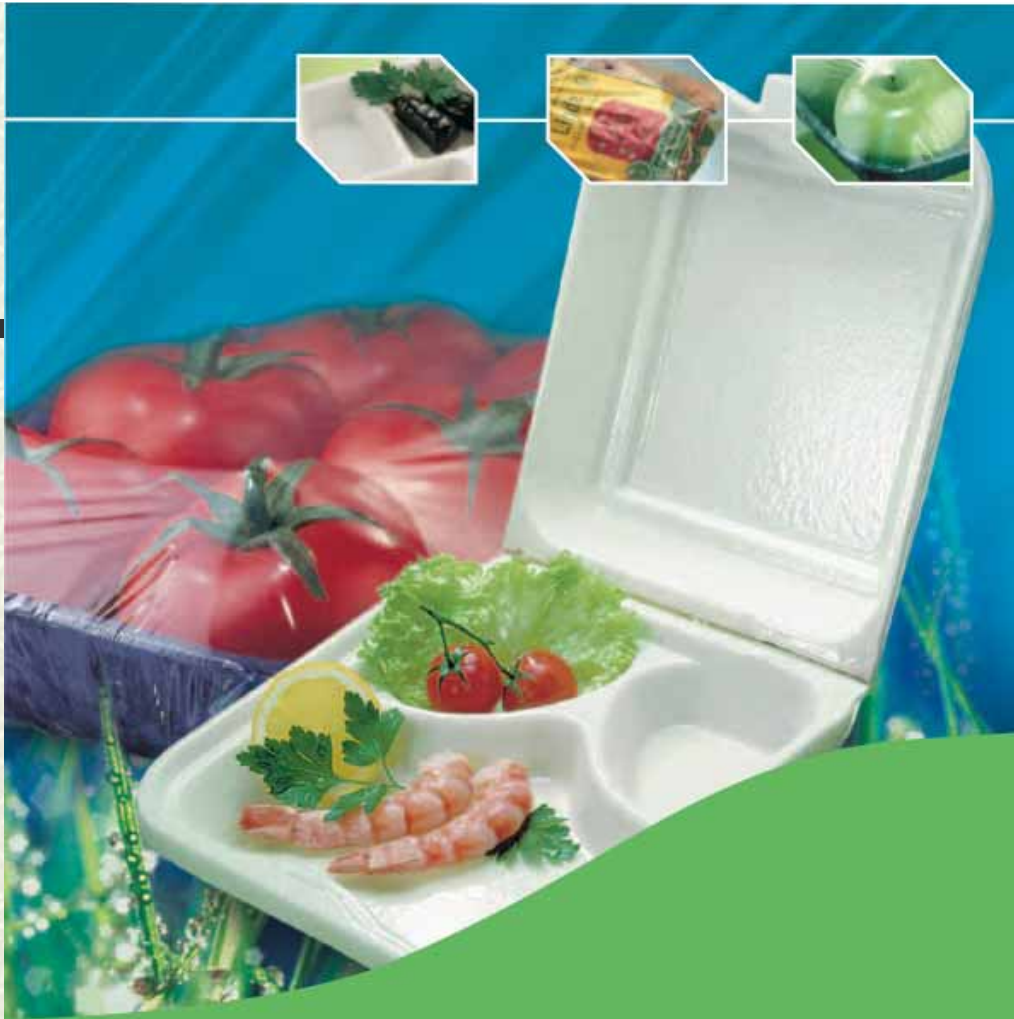
# More Bioplastic Products



Plantic confectionery trays



Innovia film packaging



## Ecoflex®

Biodegradable Plastic

Applications  
Range  
Properties  
Processing



BASF Plastics  
key to your succes

 **BASF**

The Chemical Company

# USDA Terminology

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**Biobased Product**: “A product determined by USDA to be a commercial or industrial product (other than food or feed) that is composed, in whole or in significant part, of biological products or renewable domestic agricultural materials (including plant, animal, or marine materials) or forestry materials.”



# Biobased Content

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Mass of biobased *carbon* in the product

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Mass of total organic *carbon* in the product

# What is the biobased content?

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Product 1: fiber reinforced composite with 30% biofiber (cellulose) + 70% PLA (biobased material)

Product 2: fiber reinforced composite with 30% glass + 70% PLA

Product 3: fiber reinforced composite with 30% biofiber (cellulose) + 70% polypropylene

# Biobased content

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Cellulose biocarbon content = 44.4%

Polypropylene carbon content = 85.7%

$$\begin{aligned} \text{Biobased content} &= \frac{\text{biocarbon content} \div}{\text{total carbon content}} \\ &= \frac{30\% \times 44.4\%}{(30\% \times 44.4\%) + (70\% \times 85.7\%)} \\ &= 18.17\% \end{aligned}$$

# ASTM Standards

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- # D 6866 – defines and quantifies biobased content
  - # D 7075 – evaluates and reports on environmental performance of biobased products using LCA methodology
  - # D 6400 – biodegradation specifications
  - # D 5338 – test method for biodegradation
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# Challenges with bioplastics

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- # Concern over genetically modified organisms (GMOs)
- # Desire for sustainably grown biomass
- # Need to develop composting programs
- # Concern with nanocomposites and petro-plastic blends
- # Lack of adequate labeling
- # Concern over contamination of recycling systems



# The Framework for Sustainable Biomaterials

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- # Sustainably grown feedstocks
  - # No hazardous inputs and impacts during production
  - # Healthy and safe during use
  - # Recyclable or compostable and actually recycled and composted
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# Sustainable Biomaterials Collaborative

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- As You Sow
- Center for Health, Environment and Justice
- Clean Production Action\*
- Green Harvest Technologies
- Health Care Without Harm
- Healthy Building Network\*
- Institute for Agriculture and Trade Policy\*
- Institute for Local Self-Reliance\*
- Lowell Center for Sustainable Production\*
- Sustainable Research Group
- Pure Strategies
- RecycleWorld Consulting
- Seventh Generation, Inc.
- National Campaign for Sustainable Agriculture

\*Steering Committee

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# Choosing Environmentally Preferable Food Service Ware

Reusable and Sustainable Biobased Products



## HCWH Food Service Ware Materials: Environmentally Preferable Purchasing Hierarchy

Preference Hierarchy	Criteria
Most Preferred	Reusable
More Preferred	Biobased products - <b>Beyond Baseline</b>
Preferred	Biobased products - <b>Baseline Sustainability Criteria</b>
Less Preferred	Biobased products (do not meet sustainability criteria)
Least Preferred	Fossil fuel & disposable



# HCWH Food Service Ware Materials: Baseline Sustainability Criteria for "Preferred" Biobased Products

## Criteria

1. 100% biobased carbon content
2. No highly hazardous additives. No: PBTs, Carcinogens, Repro/Developmental toxicants, Organohalogens, Endocrine Disruptors
3. No engineered nanomaterials
4. No chlorine or chlorine compounds in production processes
5. Certified compostable
6. GMO-free or offset program
7. For wood-based feedstock:
  - a. non-food contact: 100% recycled content
  - b. hot beverage cups: 10% post-consumer content
  - c. other food contact: 100% recycled content

# Focus on San Francisco

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- # 67% diversion already achieved
  - # 75% diversion goal by 2010
  - # Zero waste goal by 2020
  - # Has organics collection and composting infrastructure in place
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# Composting & Recycling Collection System Designed For High Diversion



Courtesy of City of San Francisco

# Designed for Easy Participation



Kitchen Pail



Labeled Lids



Wheeled Cart

Courtesy of City of San Francisco

# Stores Sell Compostable Kitchen Pail Bags



Courtesy of City of San Francisco

# Norcal's Jepsen Prairie Organics Regional Composting Facility



Courtesy of City of San Francisco



How to label?

# Tiny #7 & PLA

Photo courtesy of Sunset Scavenger, San Francisco



# SPI Resin Identification Code

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- # “Make the code inconspicuous at the point of purchase so it does not influence the consumer’s buying decision.”
- # Do not make recyclability or other environmental claims in close proximity to the code.

# Design used for Oakland Coliseum

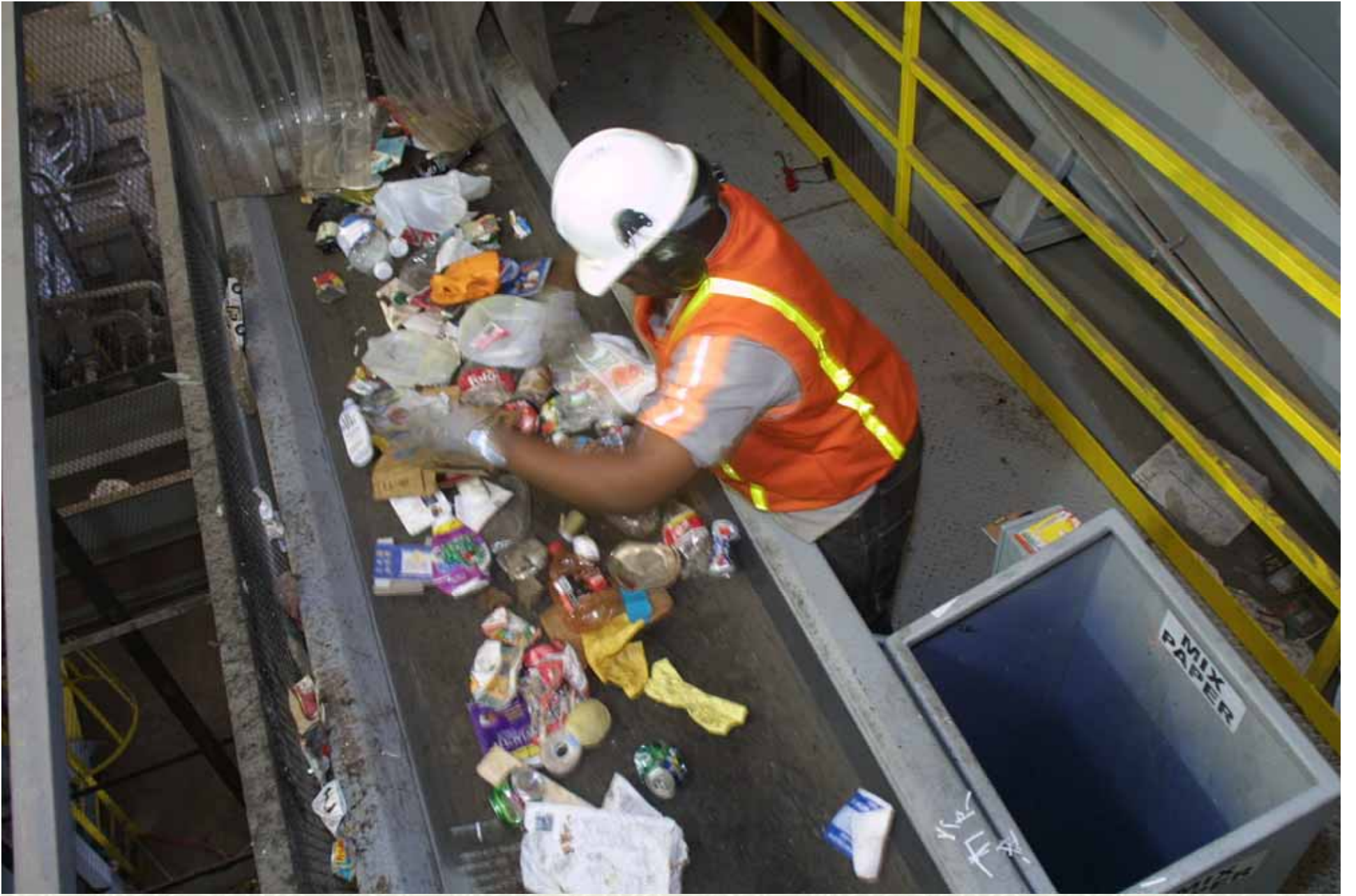


Courtesy of City of San Francisco

# Color-coded compostable design for 400k at SF Festival



Courtesy of City of San Francisco



# Where's Waldo?

## Identifying and Sorting Bio-Bottles



**EUREKA!**  
RECYCLING



# Where's Waldo?

## Identifying and Sorting Bio-Bottles



**EUREKA!**  
RECYCLING

# Not just PET



**EUREKA!**  
RECYCLING



# Recommendations

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- # Don't forget reuse and source reduction
  - # Encourage non-bottle applications
  - # Focus on substituting for PS, PVC, and PC
  - # Focus on substituting for non-recyclable packaging/products
  - # Composting serve as a transition solution
  - # Labeling focused on compost capture
  - # Support composting of compostable bioplastics with food scraps and yard trimmings
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**Natural Choice**  
California Strawberries  
Fraises de Californie  
**ORGANIC**  
Product of U.S.A.  
NET WT 8 oz. POIDS NET 227g

**Driscoll's**  
Raspberries  
Product of MEXICO  
NET WT 170g  
POIDS NET 170g

**Be Wise**  
ORGANIC  
Strawberries  
Fraises  
NET WT 8 oz

# Plastics Recycling Vs. Composting

	1990	2005
<b>Plastics in Containers &amp; Packaging</b>		
Generated (thousand tons)	6,900	13,650
Recycled (thousand tons)	260	1,280
Recycling Rate (%)	3.8%	9.4%
<b>Yard Trimmings</b>		
Generated (thousand tons)	35,000	32,070
Composted (thousand tons)	4,200	19,860
Composting Rate (%)	12.0%	61.9%
<b>Food Discards</b>		
Generated (thousand tons)	20,800	29,230
Composted (thousand tons)	0	690
Composting Rate (%)	0.0%	2.4%

Source: US EPA, 2005 data

# PLENTY

IT'S EASY BEING GREEN

HE COULD BE THE ONE - HE DRIVES A HYBRID... BUT DOES HE COMPOST?



THE UNLIKELY ENVIRONMENTALISTS