# Policies leading to Zero Waste: Extended Producer Responsibility, Bans on Organics in Landfills, and other proactive waste reduction policies and programs

**Thompson, Nicol, Bonam and Stewart**
**Natural Resources Institute**
**University of Manitoba**
**S_thompson@umanitoba.ca**
**scott@mopia.ca**

Prepared by
Shirley Thompson, University of Manitoba
Natural Resources Institute

# Overview

- Super size waste or zero waste?: findings from the national landfill survey
- Zero wasting of organics through Composting
- Zero Consumer products waste through EPR

# To move towards Zero waste -We need **waste management policies** that:

- **Reduce consumption**
- **Prevent pollution**
- **Conserve resources**
- **Foster sustainable products**
- **Exploit all possible avenues for waste reduction (*i.e.*, source reduction, recycling, material substitution, education, etc.)**

# Are we sustainable?


# How long can this go on??

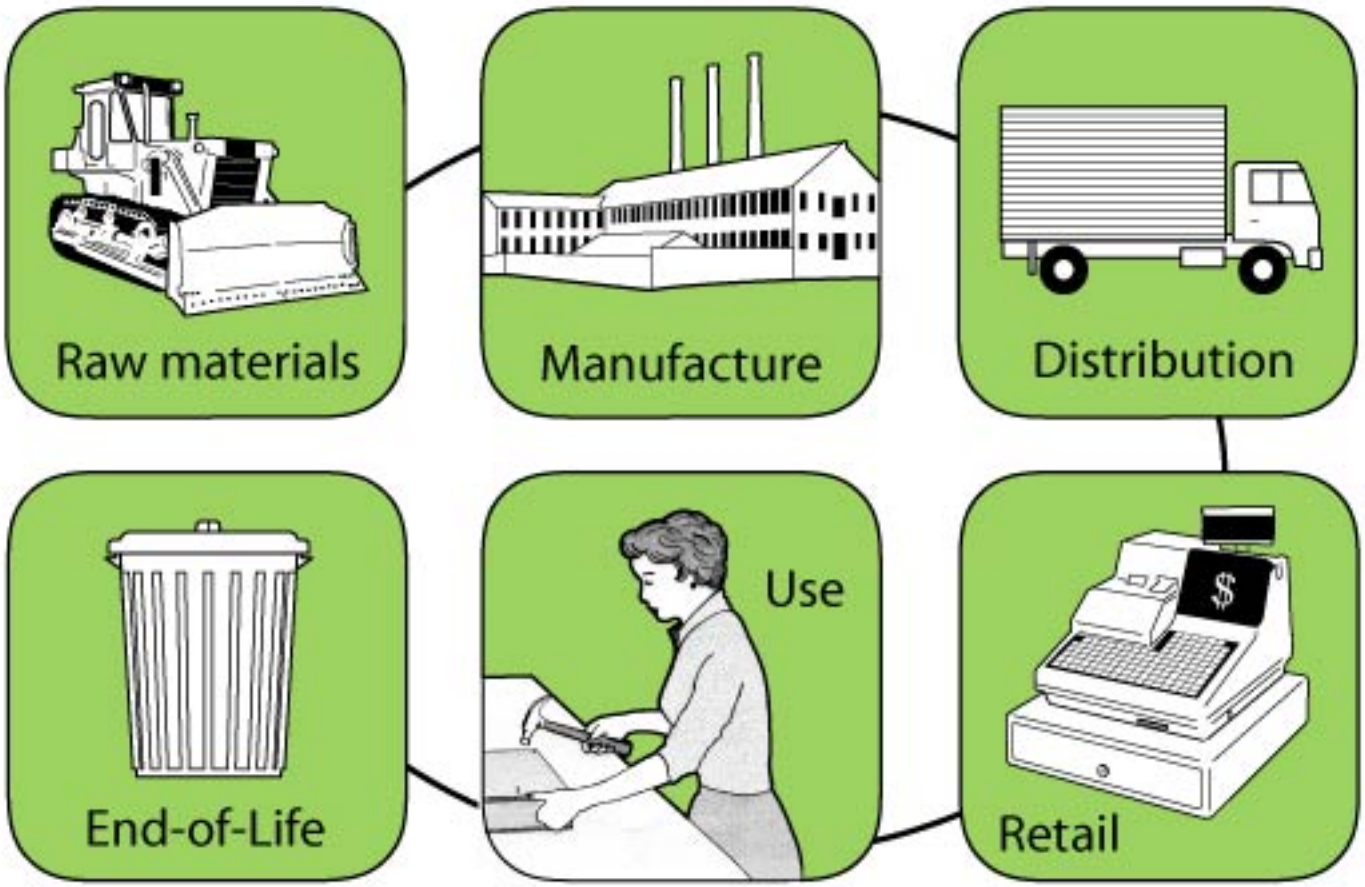
# Are we sustainable?

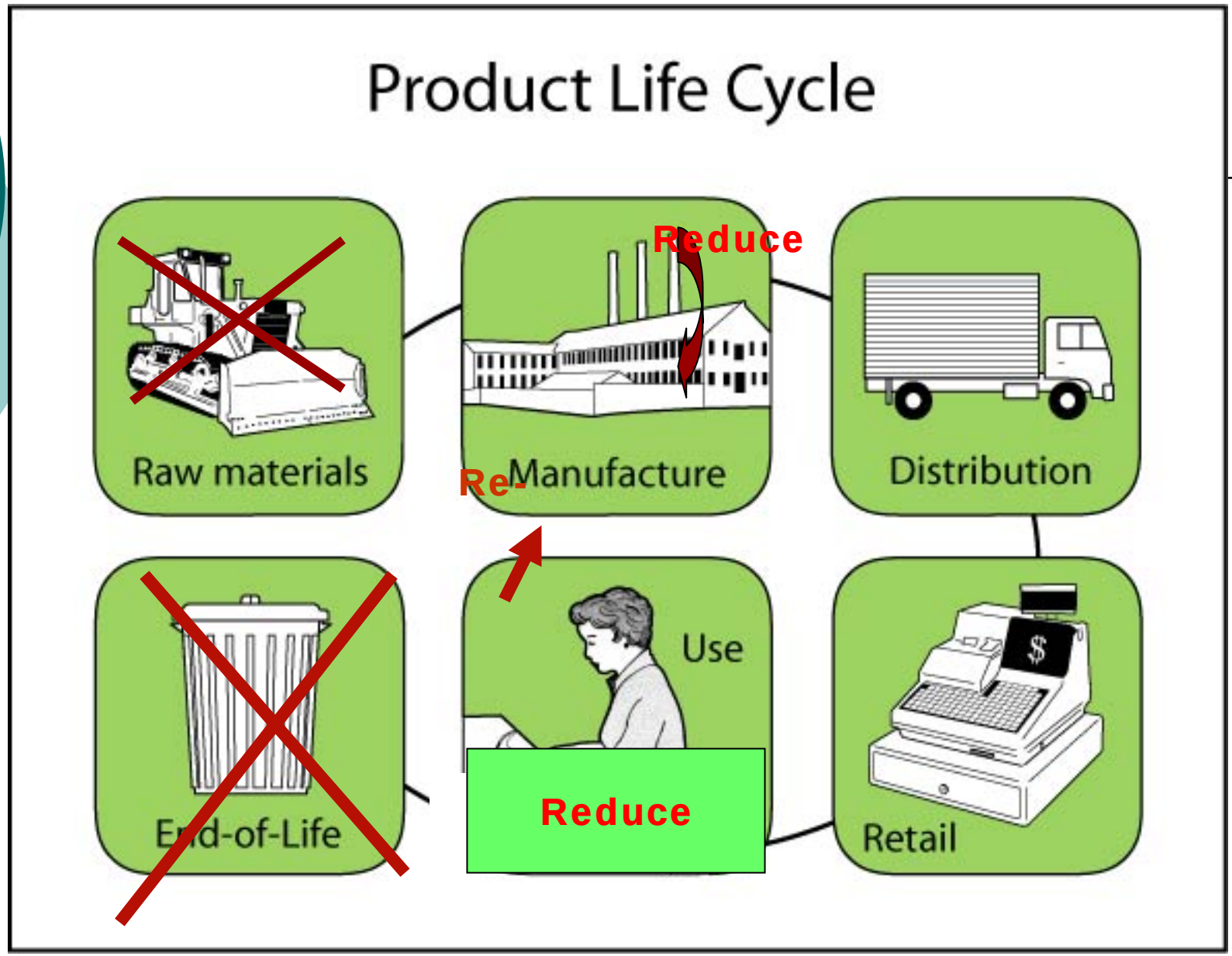

# How long can this go on??

# Reuse benefits

- Diminished demand for new products with their requirement for virgin raw materials
- Saves embodied energy
- Less packaging per unit,
- Increases affordability for low income people of products, and
- Diminished use of landfills.

# Product Life Cycle




Product Life Cycle
Raw materials
Manufacture
Reduce
Re-
Distribution
Retail
Use
Reduce
End-of-Life

# Reduce, reuse, recycle City: Are we enroute?

- Do present waste policies and programs move towards zero waste?
  - Which ones?
  - Where?
  - Can we learn from those?

# National Survey Results: Surveyed 300 landfills in 2006/07

(43% response rate)

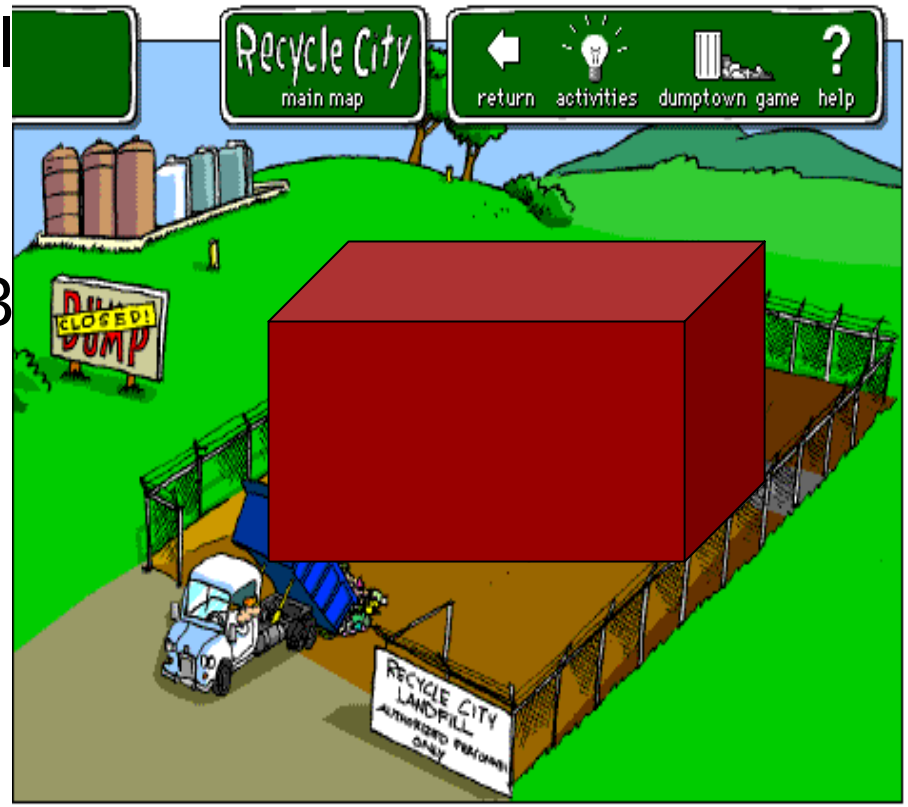
7 provinces participated in the landfill survey

| Province | Closed | Active | Total |
|---|---|---|---|
| **British Columbia** | **9** | **6** | **15** |
| **Alberta** | **0** | **30** | **30** |
| **Quebec** | **3** | **15** | **18** |
| **Ontario** | **20** | **34** | **54** |
| **New Brunswick** | **0** | **5** | **5** |
| **PEI** | **0** | **1** | **1** |
| **Nova Scotia** | **1** | **6** | **7** |
| | **33** | **97** | **130** |

# Results of the National Survey: How much did we divert in 2005?

- 88% of the total waste generated went to landfill
- 12% diverted (1.7 million tonnes)
- 6.1% composted (839,33 tonnes), saving 7.3 kt of methane gas
- 5.9 %recycled (804,975 tonnes), saving 100 kt methane gas
- Diversion less then 1%

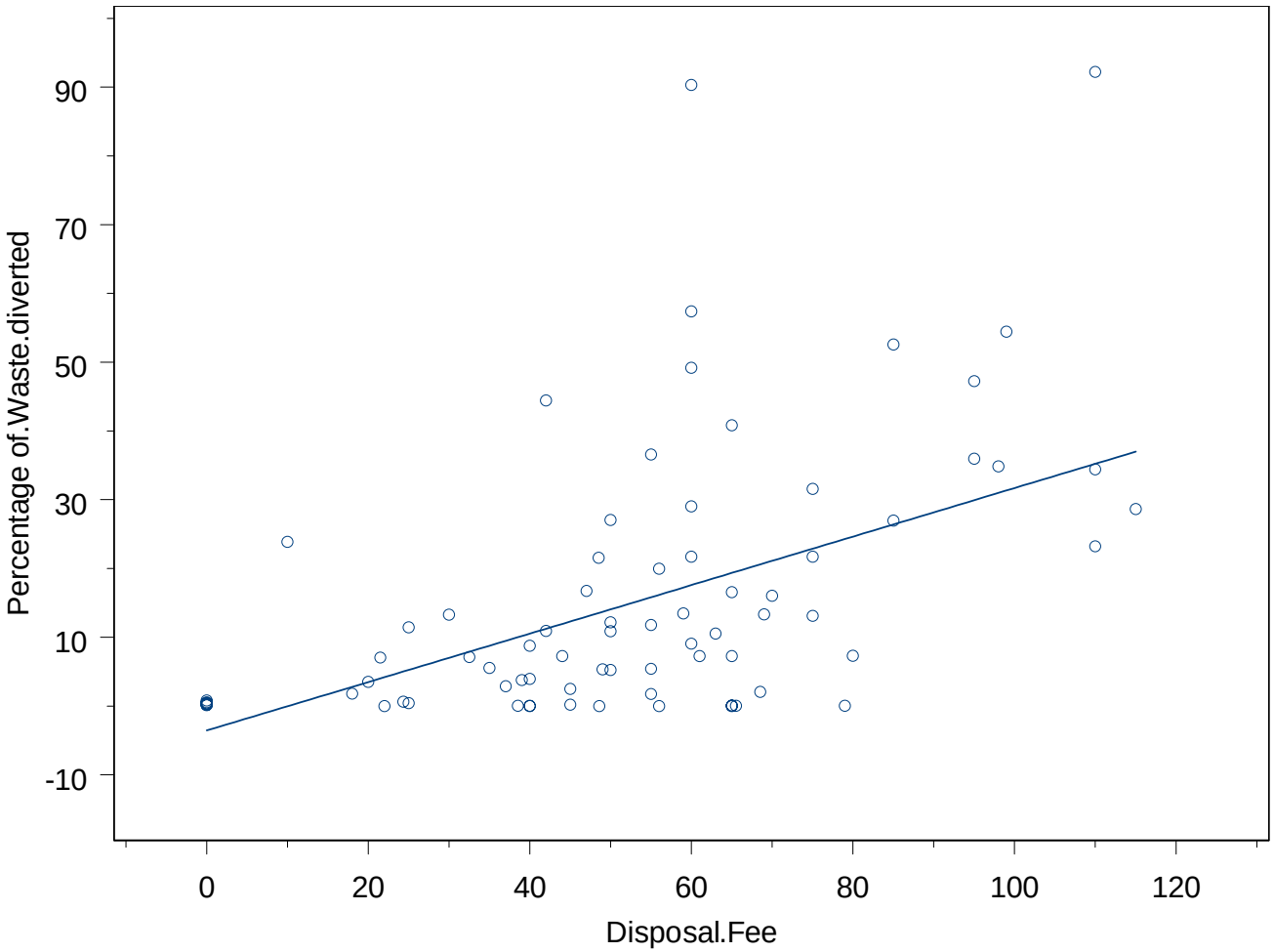
at private landfills (n=15)



# Who are the zero-waste stars to follow?

- Prince Edward Island (54%),British Columbia (29%) and Nova Scotia (22%) have highest diversion rates.
- Otter Lake landfill, Halifax, Nova Scotia - $115.00/tonne disposal fee diverted 30% of its total waste (2005).
- City of Orillia landfill, Orillia, Ontario - $110.00/tonne disposal fee diverted 35% of its total waste (2005).

# Waste diversion versus Disposal fees



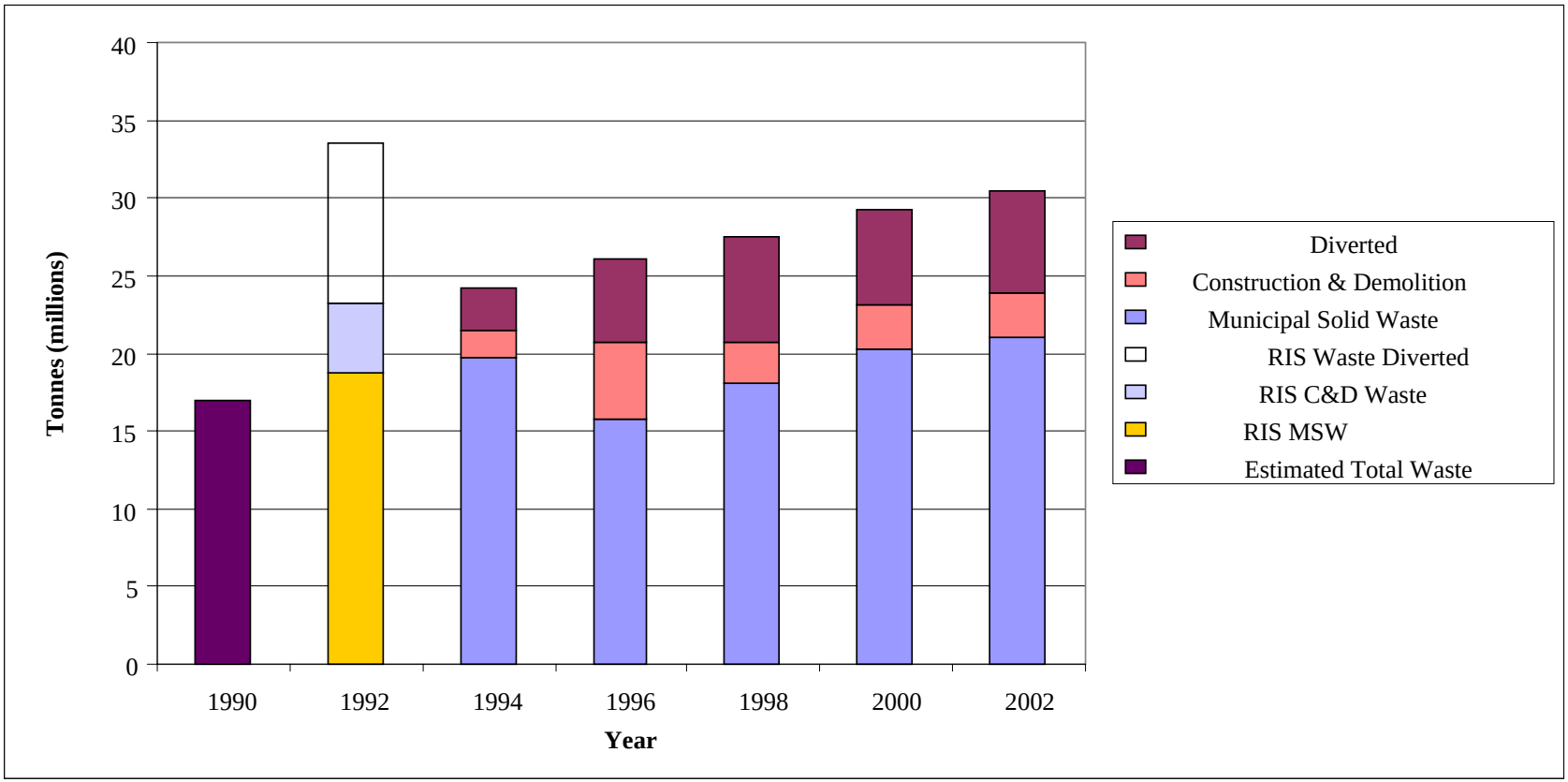

Higher disposal fees = higher waste diverted

# Why aren't we doing more?: Comments from landfill managers

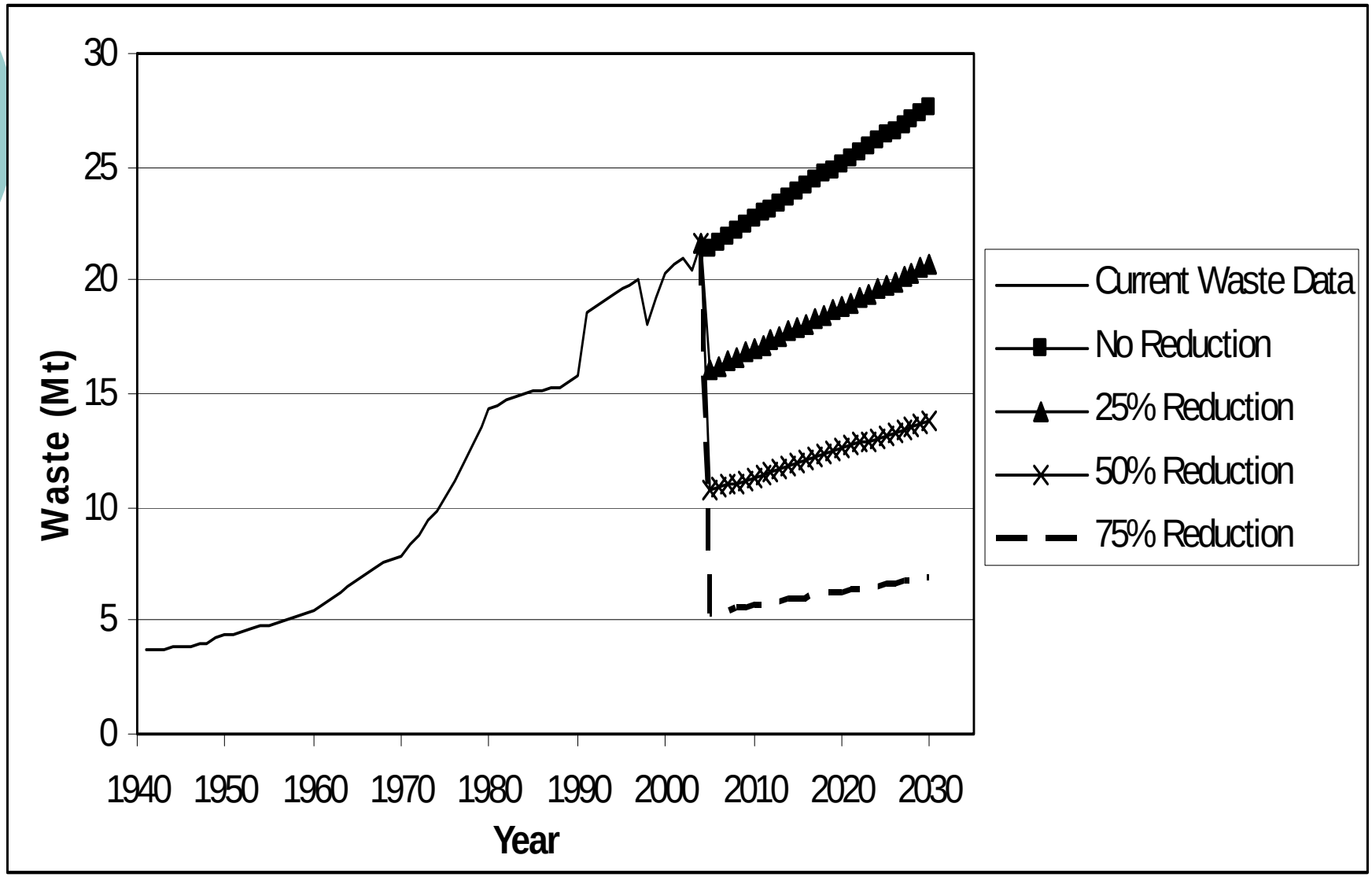
- Recycling/organics
  - High transportation costs key issue
  - Landfills serving rural communities have limited business opportunities to recycle products: why separate without markets?
  - "Funding is a main constraint limiting waste diversion activities".
- Landfill gas
  - "Not enough methane is generated in order to make it feasible to set up and operate LFG capture systems"

# Growing Waste, Wasting Organics

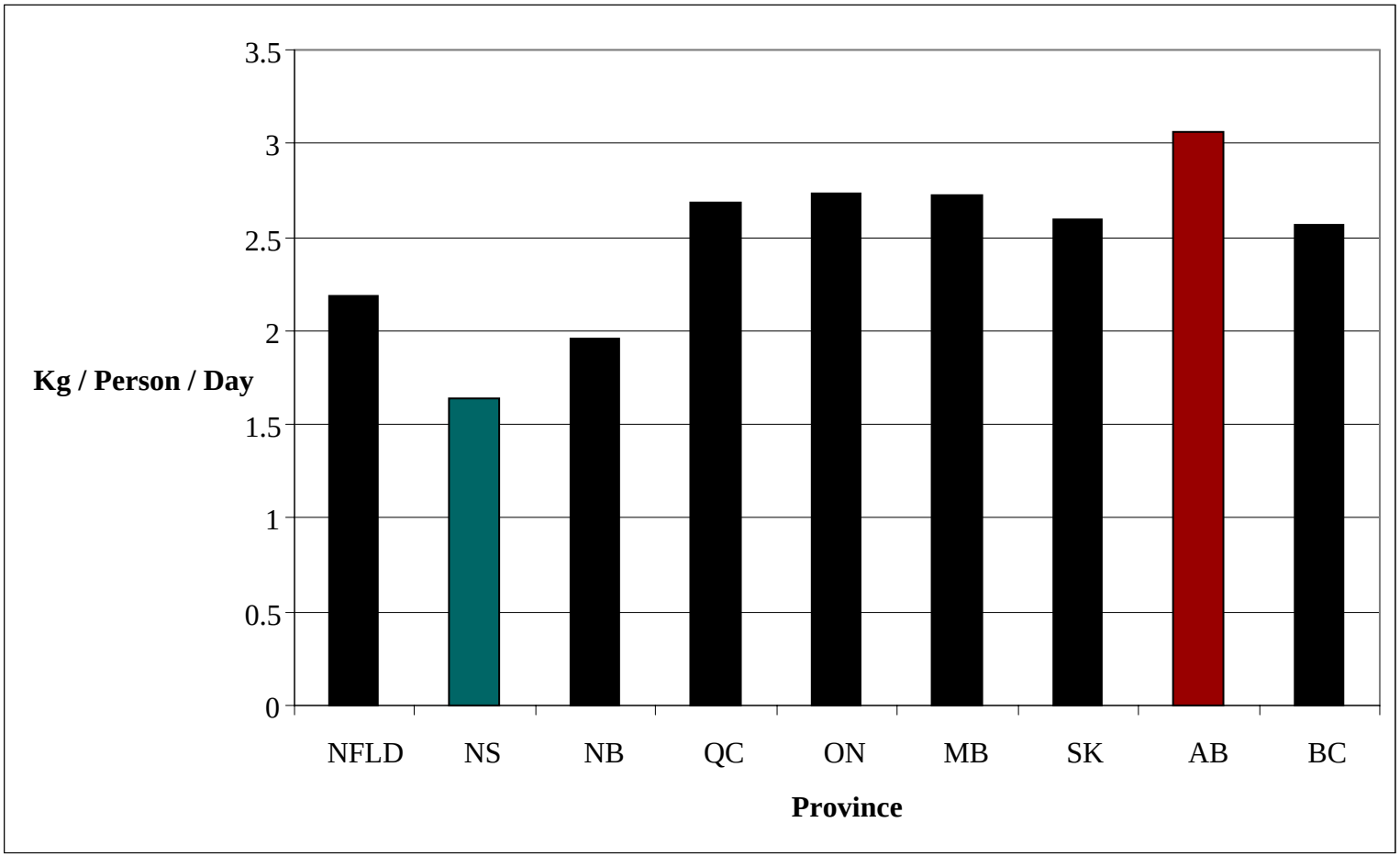
- The overall quantity of waste disposal has increased by 8% between 2003 and 2005.



# Historical Waste Disposal: Projecting different diversion rates (0 to 75%)

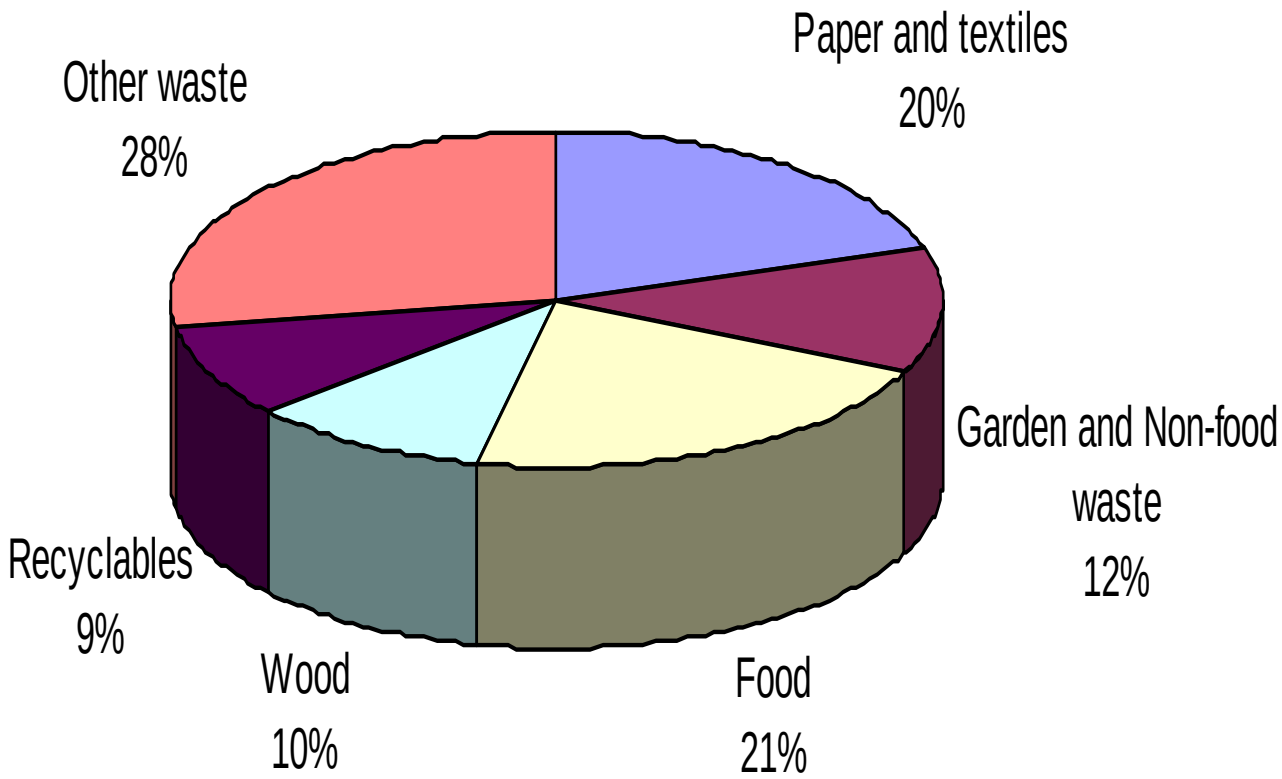


# Canadian Provincial Per Capita Amounts of Municipal Solid Waste Generation

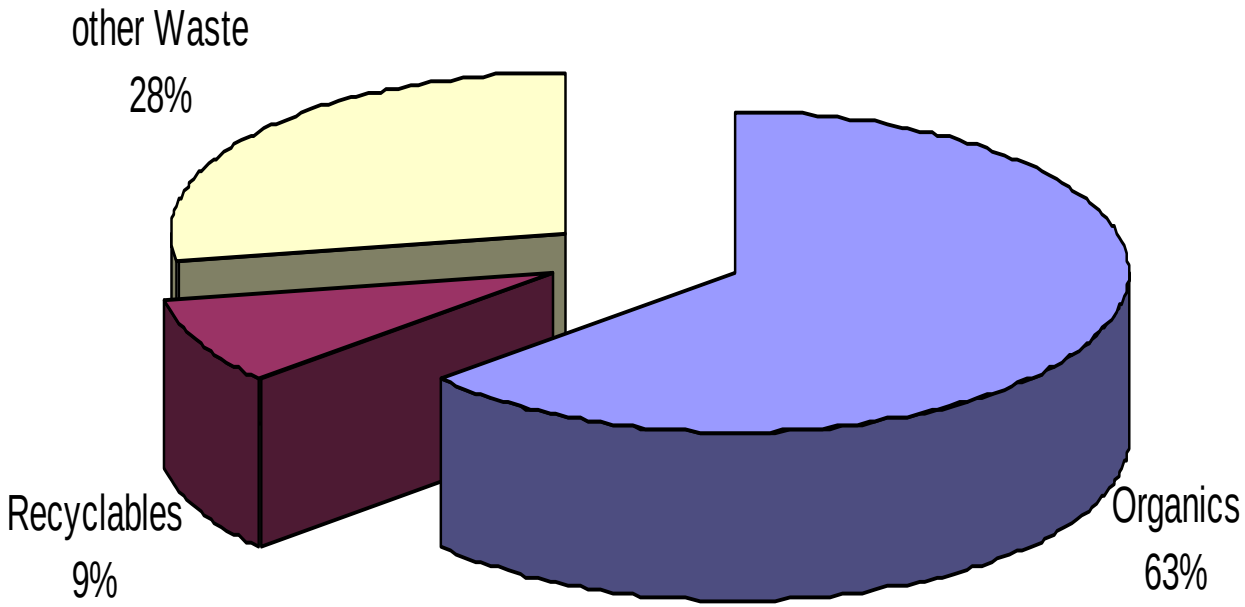



Source: Statistics Canada, 2002.

# What are Canadians wasting?: Results of 17 Landfill Composition Studies in 2005/06



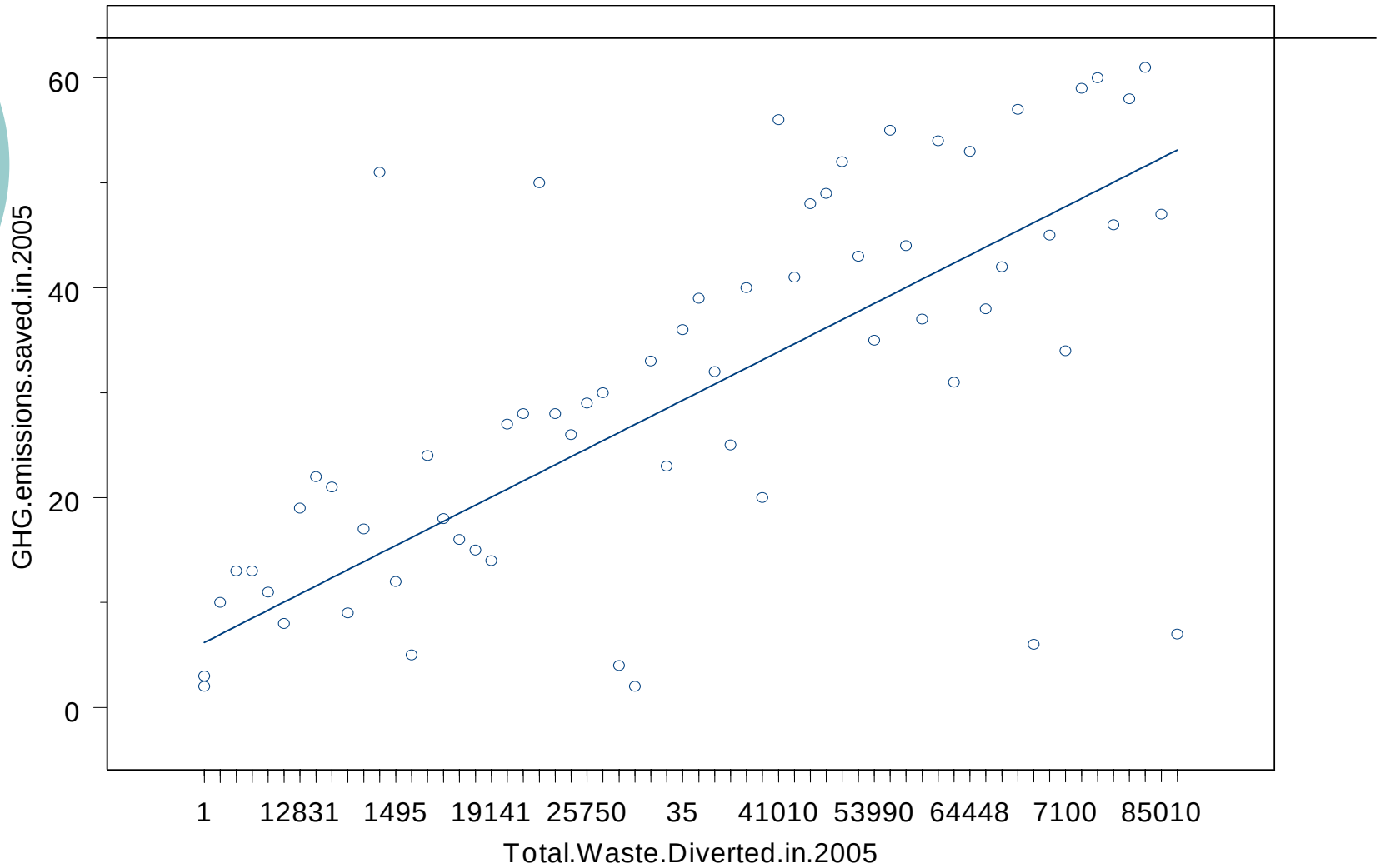
# Zero Waste: Removing the Filling from the Pie



# Organics: To waste or not to waste?

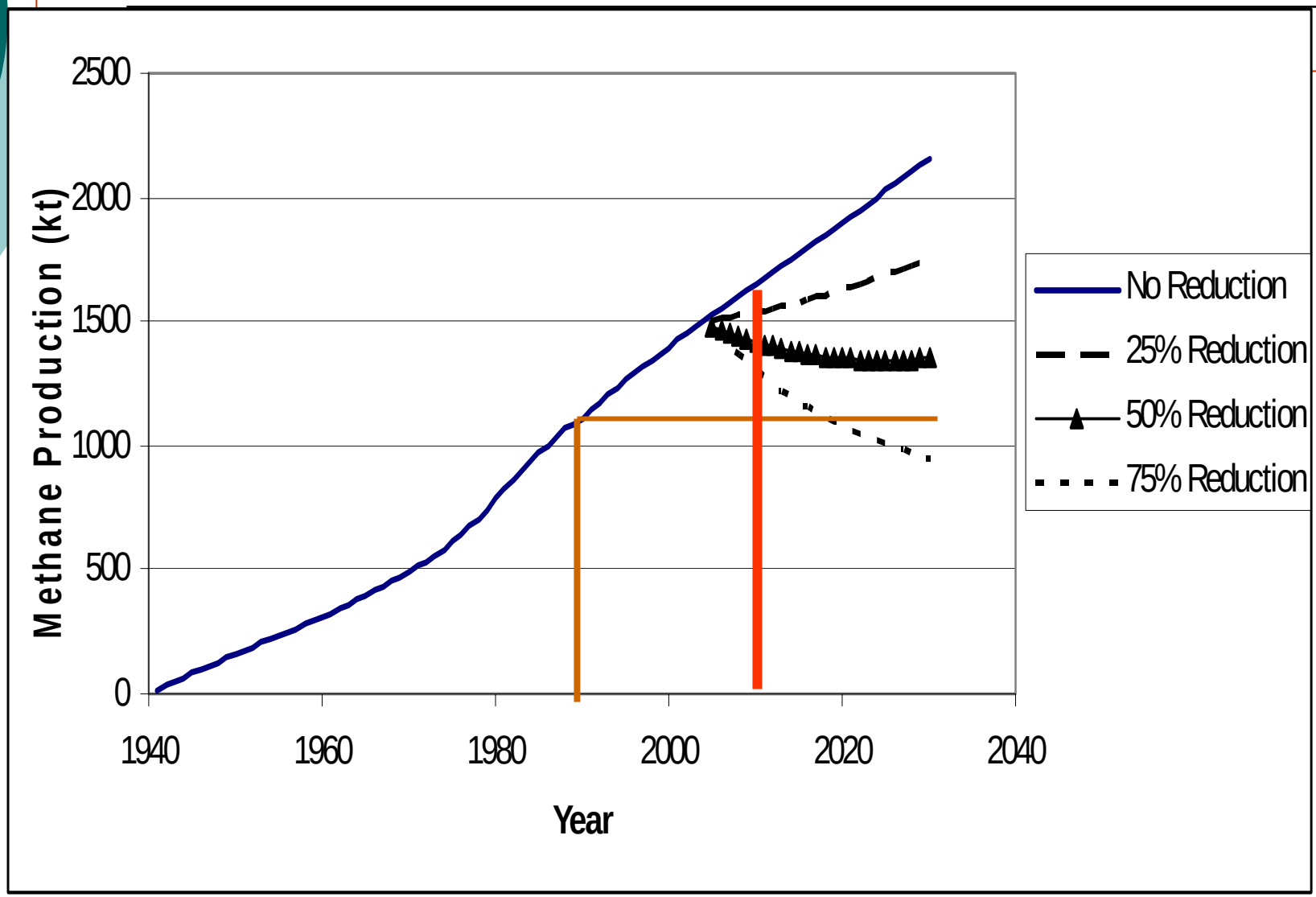
- Canadians generate about 7Mt of organics each year of which 66% ends up in landfills (Thompson et al., 2006)
- Austria's bio-waste recycling results in only 13% of organics going to landfill
- Nova Scotia's landfill ban on organics stimulated composting programs (EEA, 2002) and reduced organic waste by 67% (33% organics go to landfill).

# Waste Diverted versus Methane Emissions




(based on eC02 saved from producing virgin materials versus recycled and composting)

# Waste Diversion's Impact on Methane Emissions from Canadian Landfills from 2005-2030 based on the Scholl Canyon model.



# Shepard Landfill Gas Utilization Project, Calgary


# Landfill Gas

- GHG emissions from 97 active and 33 closed landfills
  - In 2005 methane emissions are 757 kt
  - In 2004 methane emissions are 735 kt
  - In 2003 methane emissions are 715 kt
- 52 recovery projects in Canada (30 active and 22 closed)
- Of the 757 kt of methane 318 kt (i.e. 42%) was captured in 2005
- 50% of those capturing use it for energy, remainder flared
  - 67.6 MW of electricity is produced and 2,118,920 million BTU of heat is generated

# What is the solution to waste?

Solutions are available BUT first need:

- Political will
- Legal framework,
- Collection system,
- Financial commitment,
- Reuse and recycling systems.
- Design for the environment incentives.

# Policies/Programs to Divert Organic Materials

1. Subsidizing composters for residents
2. Collecting yard waste
3. Curb side pickup of food and yard waste
4. Ban organics from landfills
5. Enforcement (e.g., Refusal to pick up garbage (clear bags) that contains organics)
6. School composting requirements
7. Education programs

# Halifax Regional Municipality -- 67% of Organics Composted – over 50% of total waste diverted

## Organics Green Cart

Collected every two weeks (even if not full)

Place the following items in your organics green cart:

**Food Waste:** Fruit & vegetable peelings, table scraps, meat, fish, dairy products, cooking oil & fat (cool, wipe with paper towel, place in green cart), bread, rice, pasta, bones, coffee grounds, filters, tea bags, eggshells.

Use boxboard or one sheet of paper to wrap wet food waste.

**Yard Waste:** Excess leaves, brush and plants.

**Boxboard & Soiled Paper:** Cereal boxes (remove inner liner), shoe, cracker & cookie boxes, paper towel rolls, food napkins, paper towels, tissue boxes (remove plastic) and soiled paper.

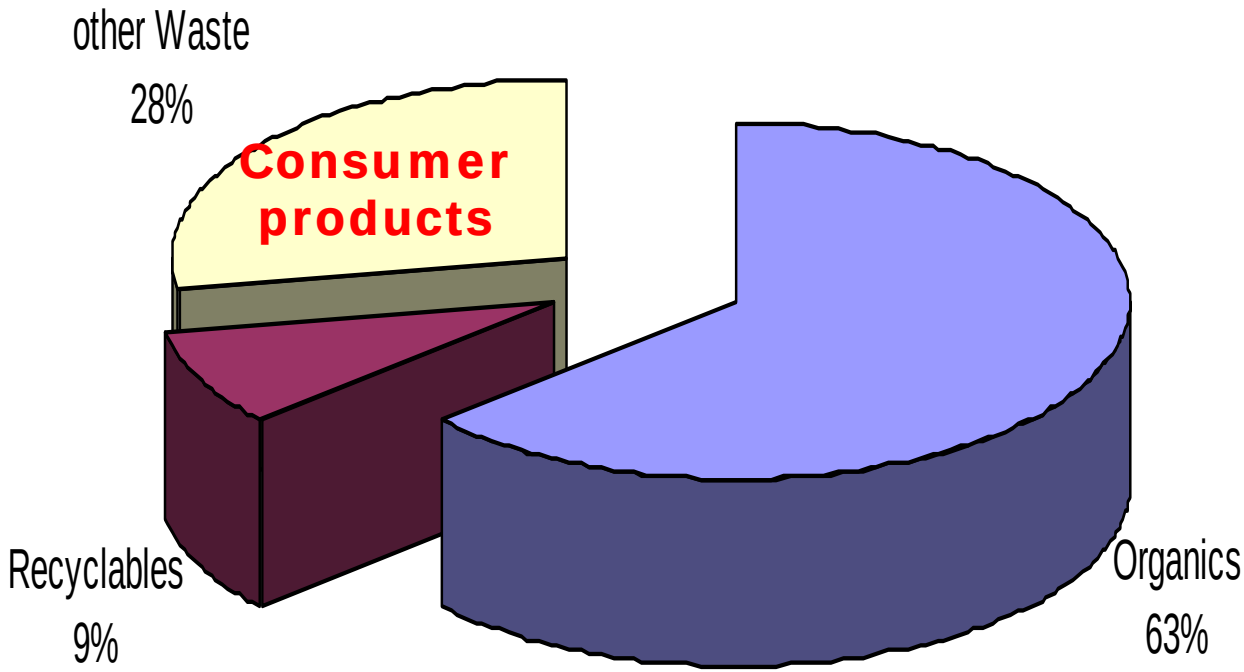
**Other:** Sawdust & wood shavings.

**Not for the Green Cart:**

- No ashes
- No waxed/film packaging or frozen food containers or packaging
- No corrugated cardboard (e.g. pizza boxes)
- No plastic bags (including 'biodegradable')
- No glass
- No decorations or wire wreaths
- No newspapers, magazines
- No paper or Styrofoam drinking cups
- No rocks, logs or tree trunks
- No soil/sods

HALIFAX
REGIONAL MUNICIPALITY

# Zero Waste: Removing the Fill from the Pie



# Extended Producer Responsibility Definition

A policy approach where a producers responsibility, physical and/or financial, for a product is extended to the post consumer stage of the products lifecycle (OECD 2001).

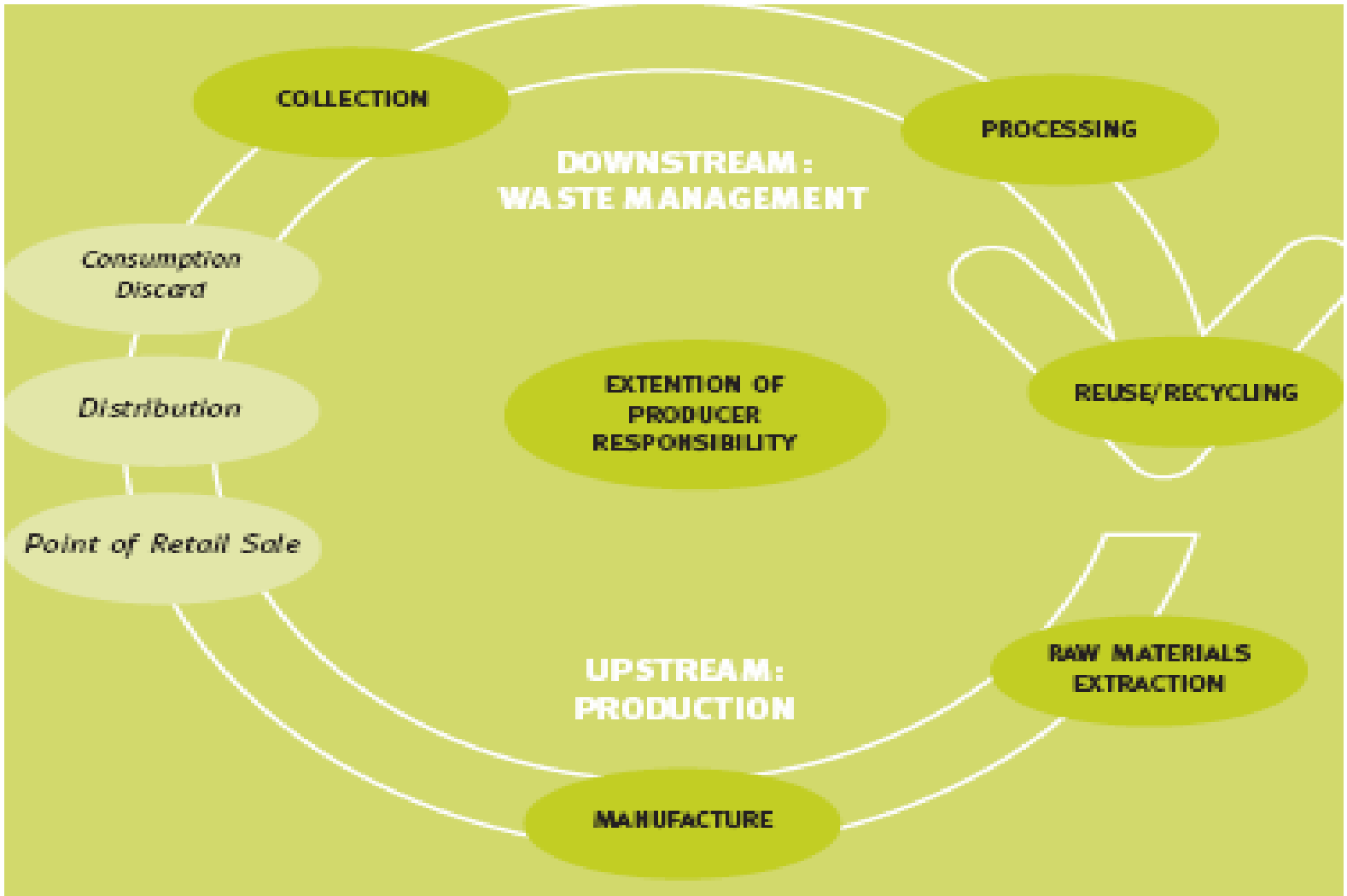
EPR policies:

1) shift physical/financial responsibilities from municipality to producer for end of life waste management;

2) impose explicit targets and deadlines on producers for waste reduction; and

3) provide incentive for green production (DfE).

# EPR includes both upstream and downstream in Product Life-Cycle



## REPORTED RECYCLING RATES IN THE US AND GERMANY, 1997

| | US TOTAL PACKAGING | GERMANY SALE PACKAGING |
|---|---|---|
| Glass | 28% | 89% |
| Steel/Tinplate | 61% | 84% |
| Aluminum | 48% | 86% |
| Plastics | 9% | 69% |
| Paper/ Paperboard | 54% | 93% |
| Composites | NA | 78% |
| **TOTAL** | **39%** | **86%** |

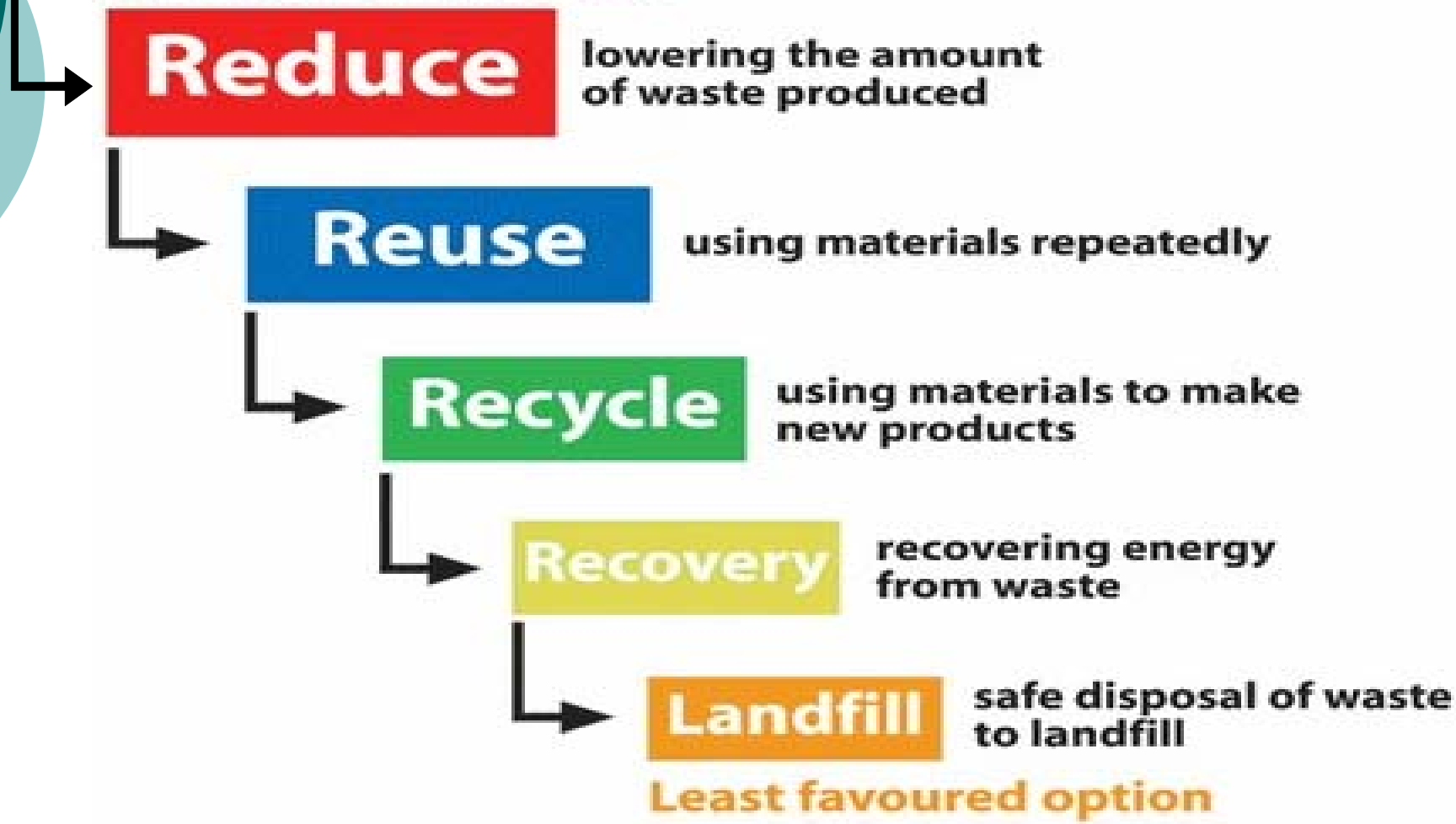
*US data is for all packaging. German data excludes transport and secondary packaging.*

*(Source: INFORM. Extended Producer Responsibility: A Materials Policy for the 21st Century. 2000)*

Source: http://www.cleanproduction.org/library/EPRtoolkitColourFinal.pdf

# Waste Hierarchy

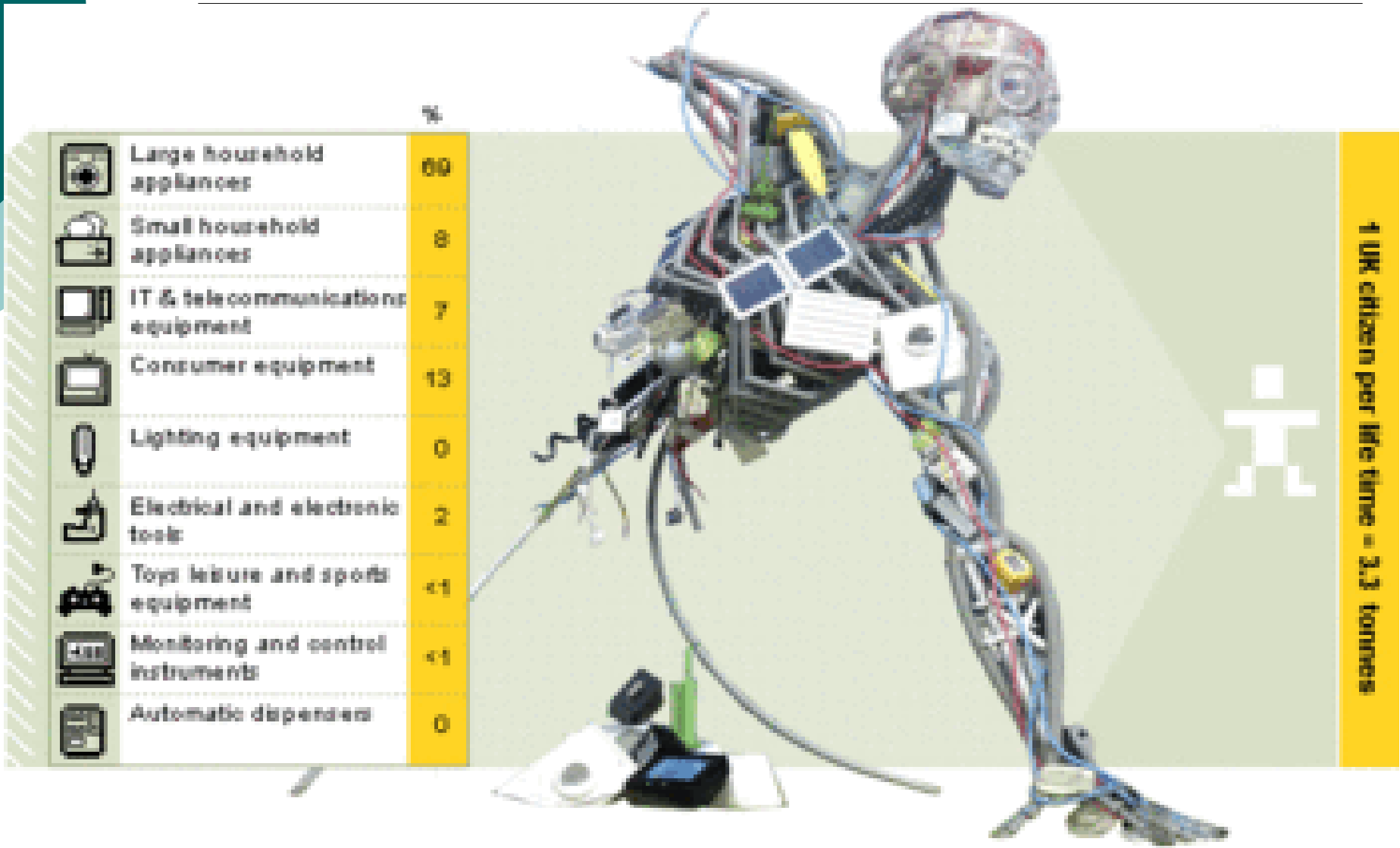
**Redesign products for reuse**




Adapted from www.businessperthshiremagazine.com/3R

# Case Study: Electronics – Refrigerators, Computers, TVs, etc

# 1 UK Citizen per lifetime = 3.3 tonnes



TECHNICAL REPORT SERIES

# Implementation of the Waste Electric and Electronic Equipment Directive in the EU

EUR 22231 EN

## Applied to electrical goods (refrigerators and other applicances) as well as electric goods

EUROPEAN COMMISSION
DIRECTORATE-GENERAL
Joint Research Centre

Institute for Prospective Technological Studies

# Case Study: Computers

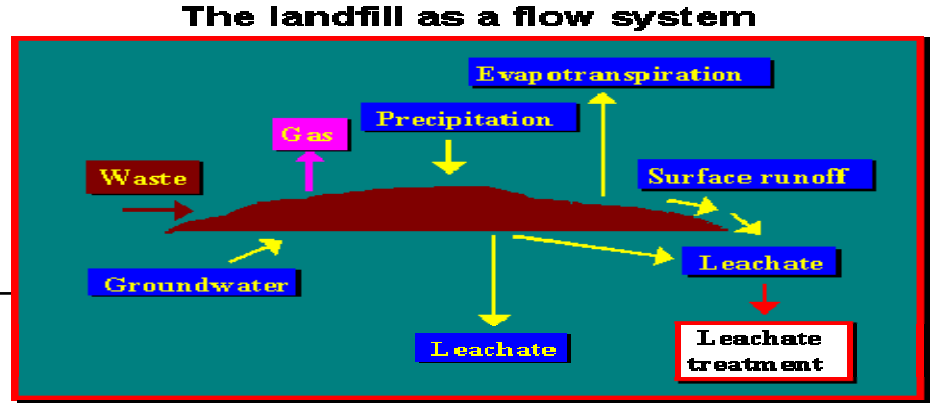




# E-waste: A valuable source for secondary raw materials, OR a major source of toxins?

- **volume**, (160, 000 per day in US, 4% of total waste stream, growing 2 – 3 x faster than other waste streams)
- **toxicity** (lead, mercury, cadmium, flame retardent in plastic. European Commission estimates that consumer electronics constitute 40% of the lead found in landfills) and
- **product design for obsolescence** – live span of computers has been reduced to 2 years.

# Remanufacture or Recycle or Trash?




- RECYCLE? Estimated $25 to 50 per unit cost for proper disposal with removal of hazardous materials and recycling of materials.
- REMANUFACTURE? Lund (1985) estimates that a remanufactured product only requires 20-25% of the energy used in its initial formation and can be resold into lower-priced markets at 60% of the original production cost.

# REFRIGERATORS: Where We are At - Manitoba and North America

Manitoba

-No regulated approach – absent from current electronics regulation

-Municipal responsibilities – 202 management plans

-Need for public awareness

-No framework for return of surplus refrigerant – white goods absent from RMC

North America

-Shredding of PU foams – release of ODS to environment

# Importance of Studying White Goods: Pollution Prevention

- Prevent fugitive emissions of ODS/GHG
  - CFC's, HCFC's, HFC's
  - 1kg CFC-12 = 10,500 kg CO2
  - Montreal/Kyoto Protocol's
- Hazardous components
  - Mercury, PCB's, Refrigerant oil (20% residual ODS), PU Foam
- Energy consumption
- Recycling – nearly 100% recyclable

# Where We Can Go: United Kingdom Refrigerator Recycling Tours

September 25, 2006 - *M. Baker Recycling*
September 26, 2006 - *Sims Metal*

# Regulation (EC) No 2037/2000 … on Substances that Deplete the Ozone Layer

## Emission Control

### Recovery of Used Controlled Substances

*"Controlled substances contained in domestic refrigerators and freezers shall be recovered and dealt with ….*

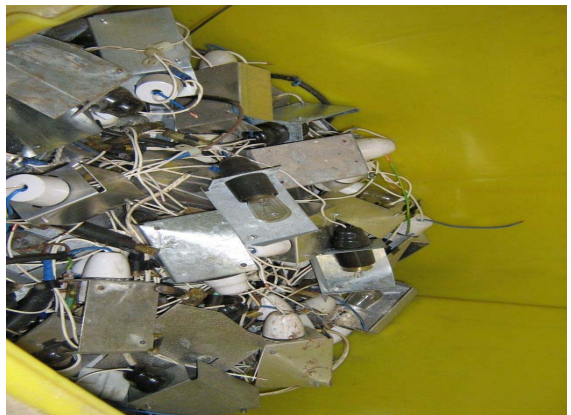
*for destruction by technologies approved by the Parties or by any other environmentally acceptable destruction technology, or for recycling or reclamation during servicing and maintenance of equipment or before the dismantling or disposal of equipment…*

*after 31 December 2001"*

**Note: 4,000,000 + refrigerators disposed of in the UK each year**


Linde


COMPRESSOR
OIL
TANK




NITROGEN


DRYING SCREW 1


Rekusolv


PLASTIC

# Lessons Learned

- CFC Residual in PU Foam: 38mg per 1 kg
- CFC Plant Emissions: allowed 5g per 1 hour (60 units/day) - actual < 1g per hour = 99.9% CFC recovery rate
- Foams attached to: metal < 1,000 mg/kg - plastic < 5,000 mg/kg
- Recycle nearly 98% of each unit: only PU Foam and magnetic door gaskets landfilled.

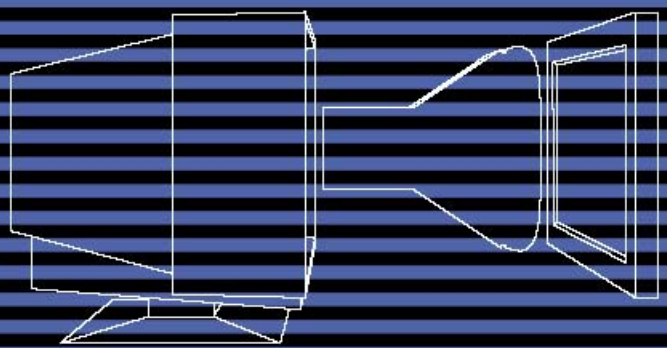
*Sims 2004*

# Current Initiatives: *WEEE Directive*

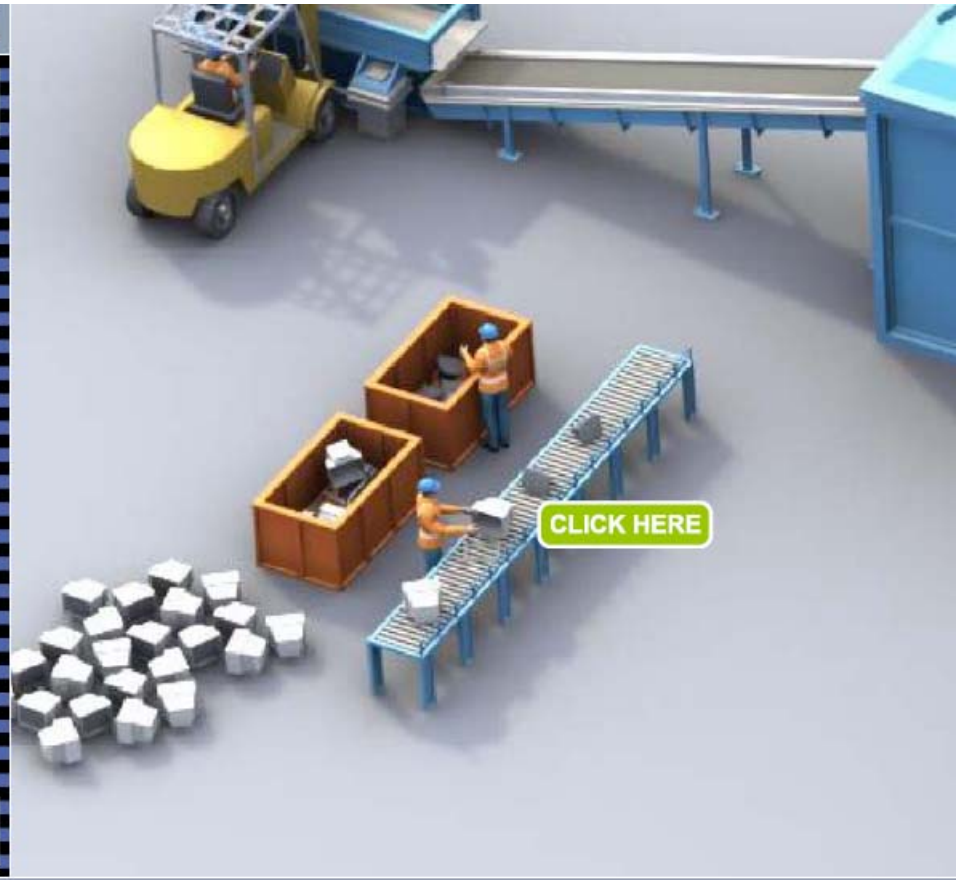
- Producer assume disposal/recycling responsibility
- Treat fridge's with best available technology and in accordance with 2037/2000
- Recover 80% of appliances by weight and reuse/recycle 75% of component parts - priority also given for reuse of whole appliance
- Design for Environment (DfE): Electrolux - switch from HFC 134a to 'greenfreeze' hydrocarbon refrigerant and blowing agent

# Recycling at SIMS in Europe

## Separation of Monitor Body and Cathode Ray Tube



The tube and screen is removed and sent for processing through the Cathode Ray Tubes (CRT) operation.

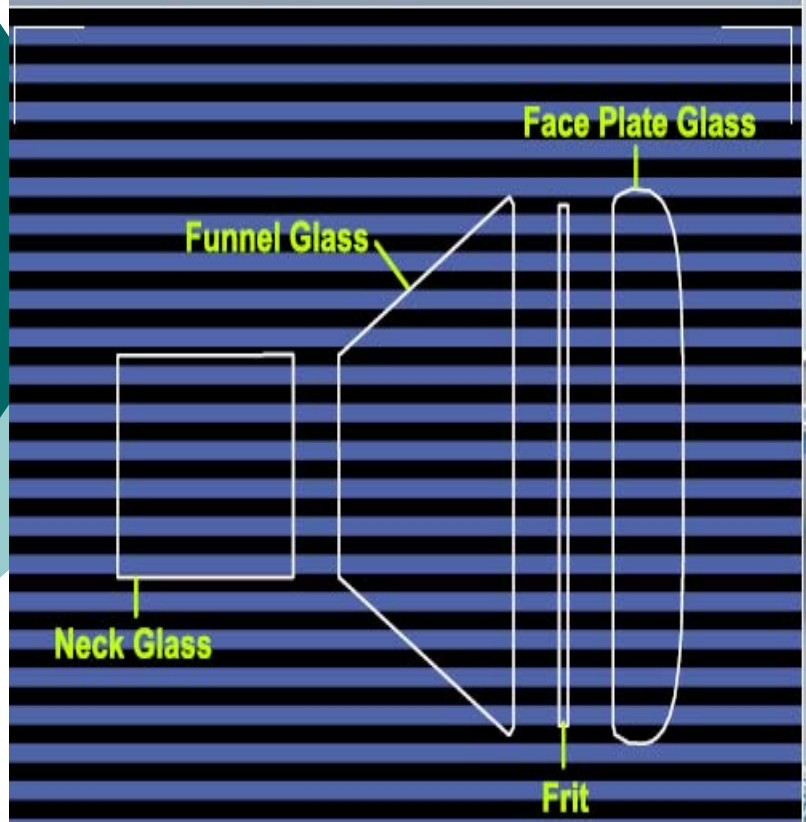



Select a stage


CRT - HAZARDOUS AND DIFFICULT RECYCLING AND RECOVERY OF WEEE WASTE INCLUDING CATHODE RAY TUBES

SIMS GROUP

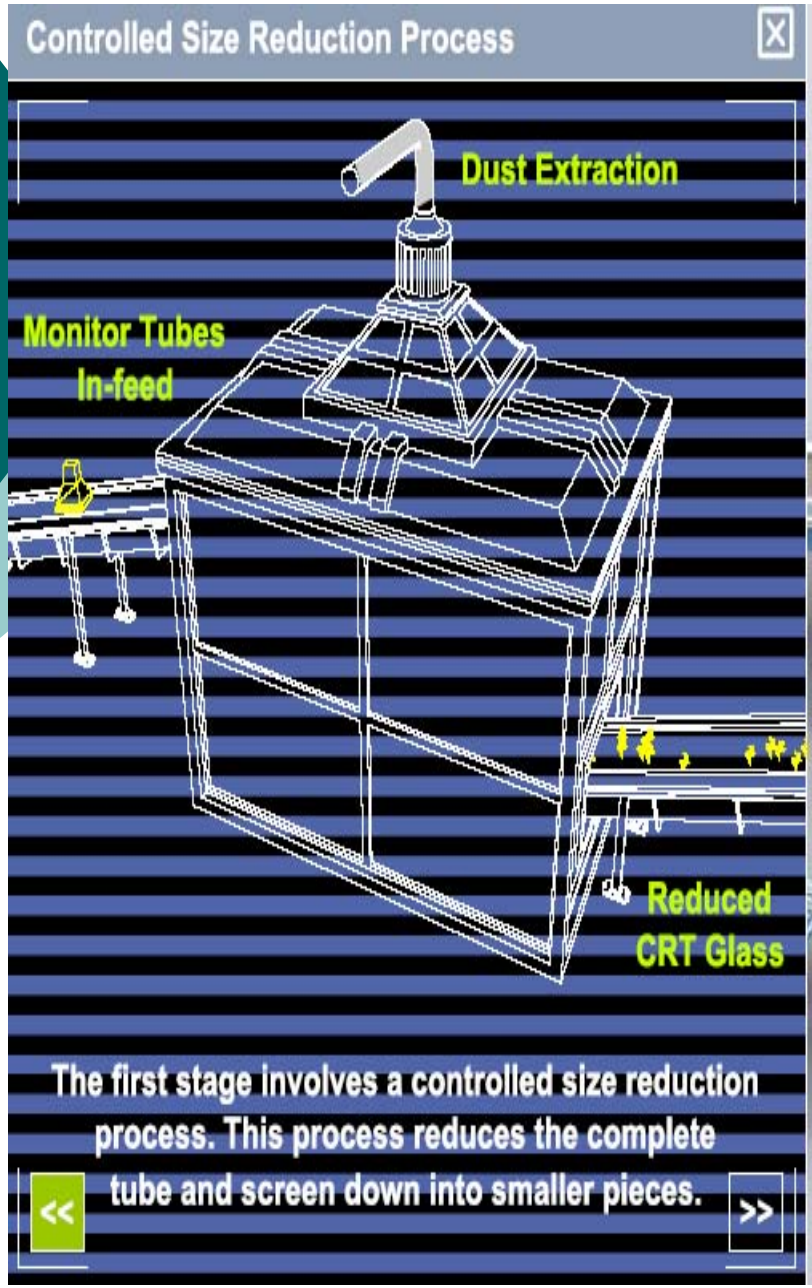
## Controlled Size Reduction Process



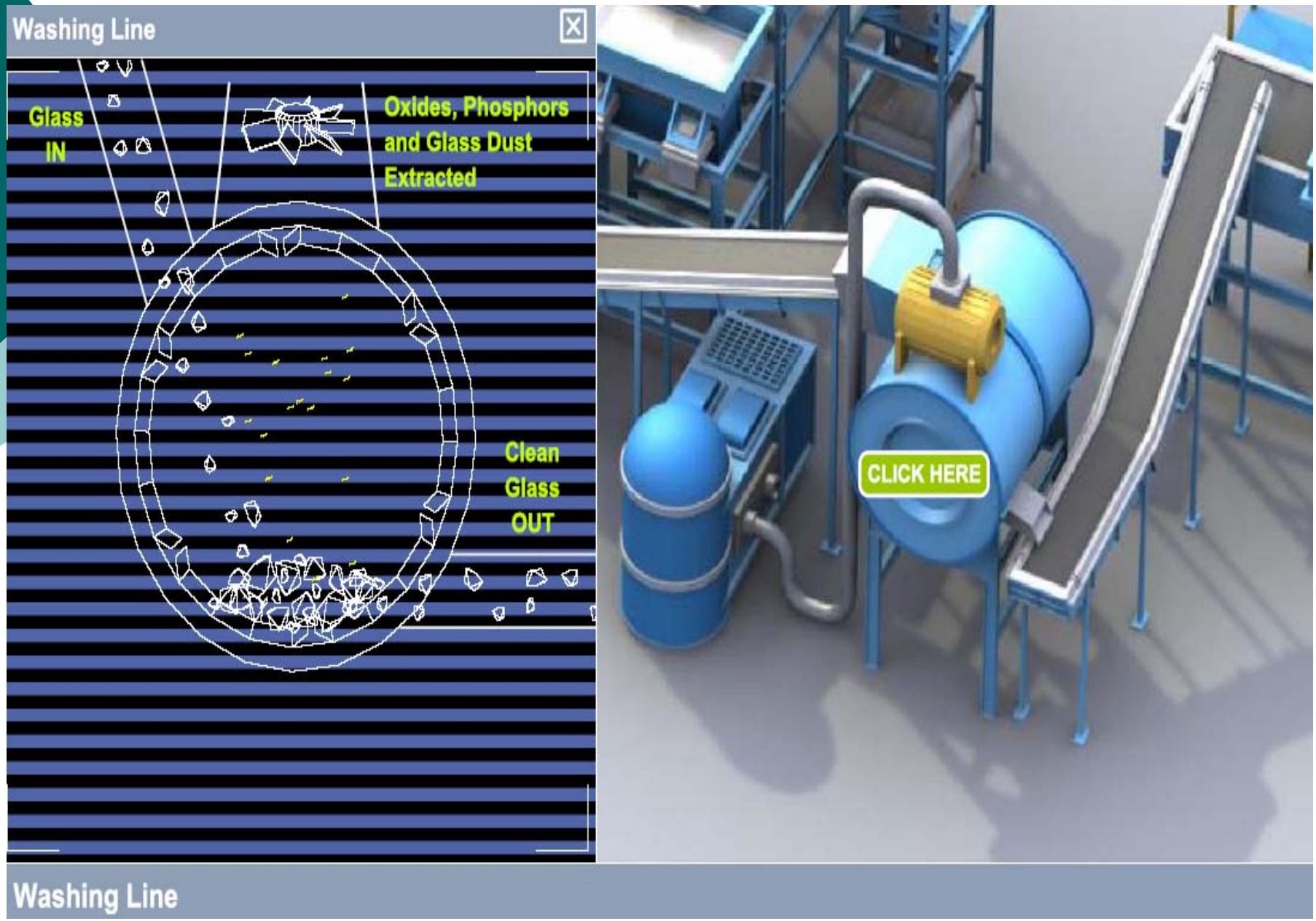

To achieve the maximum of recyclate, it is necessary to separate the "leaded" from "unleaded" glass i.e. the Face Plate from the Frit, Funnel and Neck.

<< >>


Select a stage


Controlled Size Reduction Process
Dust Extraction
Monitor Tubes
In-feed
Reduced
CRT Glass
The first stage involves a controlled size reduction process. This process reduces the complete tube and screen down into smaller pieces.
<<
>>


CLICK HERE


Washing Line
Glass
IN
Oxides, Phosphors
and Glass Dust
Extracted
Clean
Glass
OUT
CLICK HERE
Washing Line

# Effectiveness: Recycling rates in the EU and NA for Refrigerators and Computers

| Effectiveness | **EU** | **North America** |
|---|---|---|
| Targets to encourage full recycling/reuse | Refrigerators:<br>Minimum 75-80% per unit.<br>Computers: 75% recovery/w and 65% components | None for collection or recycling – education only |
| Recycling rates | Exceed 80% reaching 97% in Switzerland | Much less – e.g., 5.6% for batteries (Environment Canada,2006) |

# Infrastructure in the EU and NA

| | **EPR in WEEE Directive – EU** | **Product Stewardship -- North America** |
|---|---|---|
| BAT for Recycling | Yes | No |
| Adequate funding for collection and BAT. | Yes Producer Pays. | NO -- US municipalities paid $43.5 billion/yr managing product waste but no inclusive refrigerator facilities. Smelters used for computers |

# Ozone Depleting Substances (ODS) Recovery in the EU and NA

| ODS | **EU** | **North America** |
|---|---|---|
| ODS recovered | Yes -- 99% of foam and Refrigerant ODS in inclusive refrigerator recycling facilities (MeWA/SEGA technology). | 75% in foam – NO (Manual disassembly reduces emissions<br>25% in refrigerant –YES (with 10% non-compliance) |

# Regulation of Toxics and Pollution Prevention

| Monitoring and regulation | **WEEE Directive EU** | **N. America** |
|---|---|---|
| ODS | Yes – 0.05 grams per hour, strict regulation. | Yes - rarely enforced |
| Basel Ban | No – can ship out of country but have to meet EU BAT to recycle | Yes – restrictions for some chemicals |
| Prohibit toxic materials | Yes– RoHS | No |
| Toxics recovered (e.g., Mercury switches, lead, PCB, etc) | Yes | Computers – now starting. Freezers: some– recycler checks. |

# Take-back

| | EU | North America |
|---|---|---|
| Take-back paid by producer | Yes | REFRIGERATORS: Costs consumer Free-$115 at disposal. Full cost $115-130. No ADF<br>COMPUTERS: to recycle costs government or industry $35 (total cost $50-60 but recoup some) $15/monitor. No ADF. |
| Collection systems | Yes | Usually municipal solid waste or computer recycling depots |

# 5Rs - Re (eco)design, reuse, remanufacture, reduce, etc.

| | EU | North America |
|---|---|---|
| DfE Incentives | **Yes** | **No** |
| Promotion for Reuse/repair/ Remanufacture | **Yes** | **Refrigerators: No – discourages as uses 2X energy**<br>Computers: Some. (e.g., Computers for Schools (Manitoba) re-deploys 5000 computers/yr to schools, libraries, and non profits. Receives 14,000 of an estimated/year for disposal). |
| Landfill Ban | Yes | A few jurisdictions. |

# Conclusion

- Composting policies (e.g., landfill ban on organics, curbside composting) can eliminate a big chunk of waste.
- As waste disposal costs increase waste diversion increases, extending life of landfill.
- For EPR to be effective targets are needed for collection and recycling rates.
- Should extend electronic waste to electrical.
- Producers should pay for collection and recycling versus taxpayers or residents paying for collection/disposal/recycling.
- For EPR to receive signals to redesign should charge cost of recycling each computer type.

Thank you!