

# The Substitution Principle

Cornerstone of a Sustainable  
Chemicals Policy

# The Substitution Principle

- Substitution means the **replacement or reduction** of hazardous substances in products and processes **by less hazardous or non hazardous substances** or by achieving an **equivalent functionality** via technological or organizational measures.
  - Oko-Institute e.v, 2004.

# SP is Different to P2 – how?

It is based on comparative assessment of alternatives

Does not attempt to justify ongoing use of hazardous materials via exposure reduction (which P2 incorporates)

Uses Inherent Hazard Assessment (as does Green Chemistry methodology)

# Drivers for industry to substitute hazardous chemicals



- Regulatory drivers (eg RoHS Directive)
- Increased public awareness of products
- Demand from downstream users (H&M retailer's chemical specs)
- Liability
- Insurance incentives or requirements
- Competitive Advantage
- Company Ethics



# Promoting Use of the SP

- Phase out timetables from government
- List of substances ‘to be avoided’
- List of good examples ‘to give ideas’
- Dialogue with sectors
- Public and private procurement
- Ecolabels
- Green Chemistry/Eco-design

# Swedish Substitution Principle



- Enshrined in Environmental Code
- Government works collaboratively with industry sector most affected to implement safer substitutes via '7 steps to Substitution'
- On-line PRIO database for chemical comparisons

# 7 steps to substitution

***Step 1: Products of concern***

***Step 2: Alternatives – chemical or other***

***Step 3: Properties of alternatives***

***Step 4: Feasibility***

***Step 5: Substitution at what level***

***Step 6: Decision***

***Step 7: Monitor and assess the change***

# Substitution of different formulations

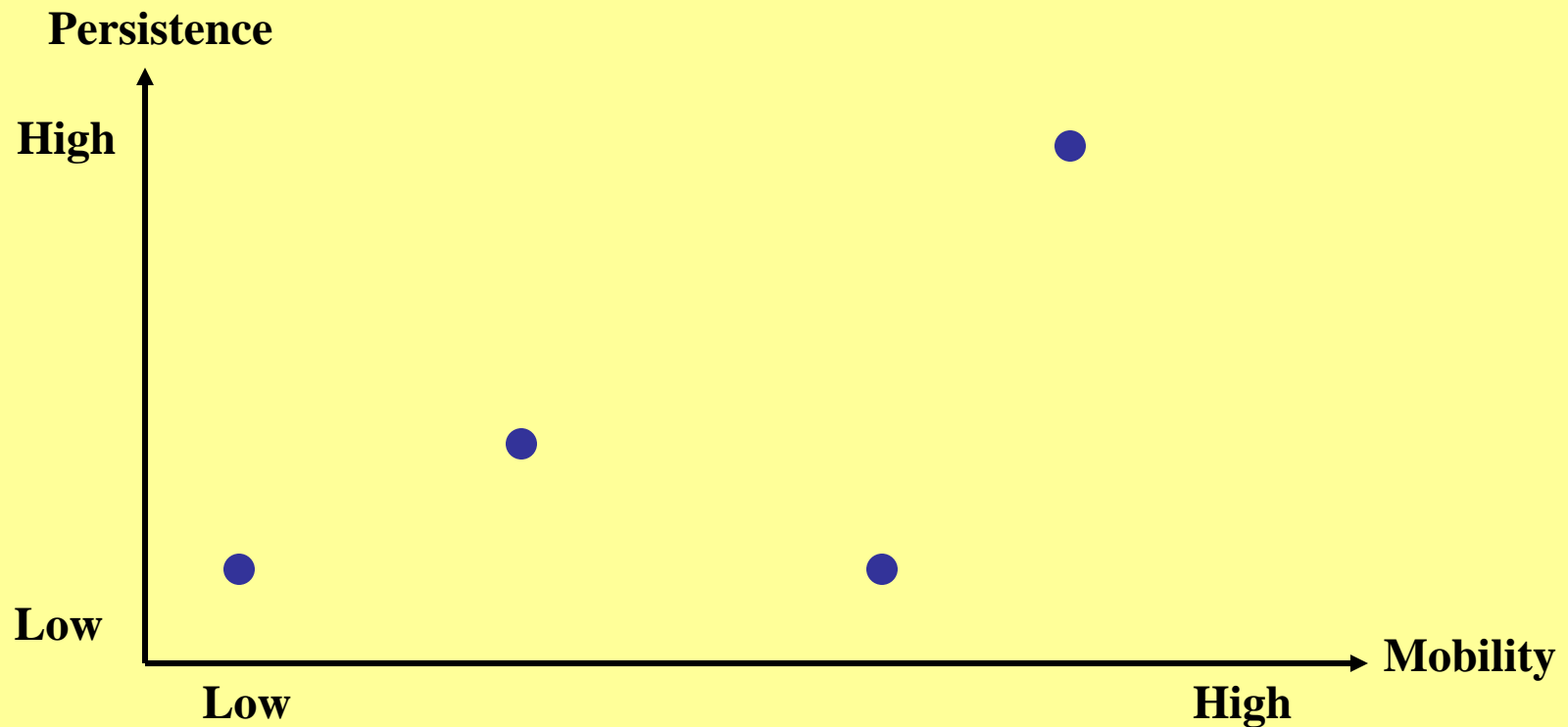




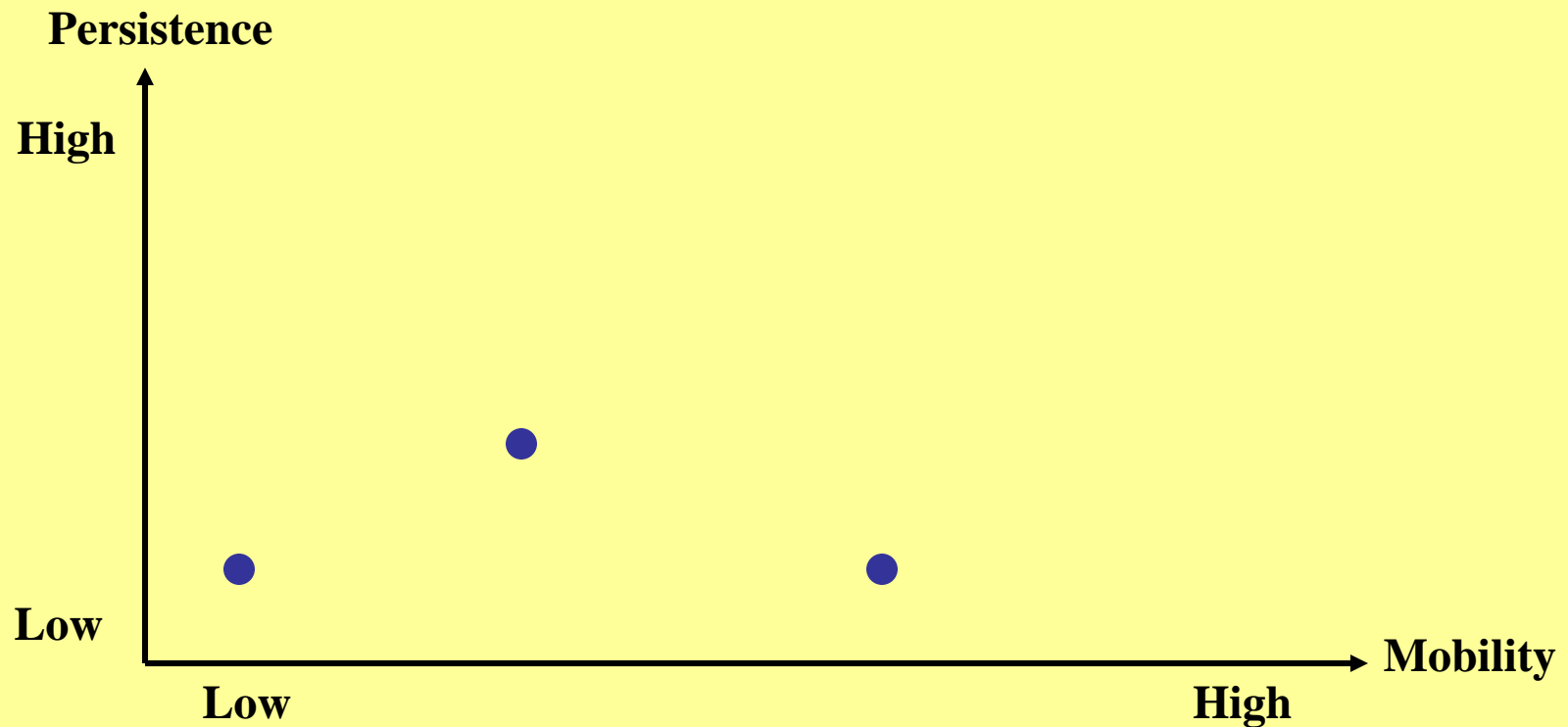
# Substitution of different formulations



# A group of chemically related substances



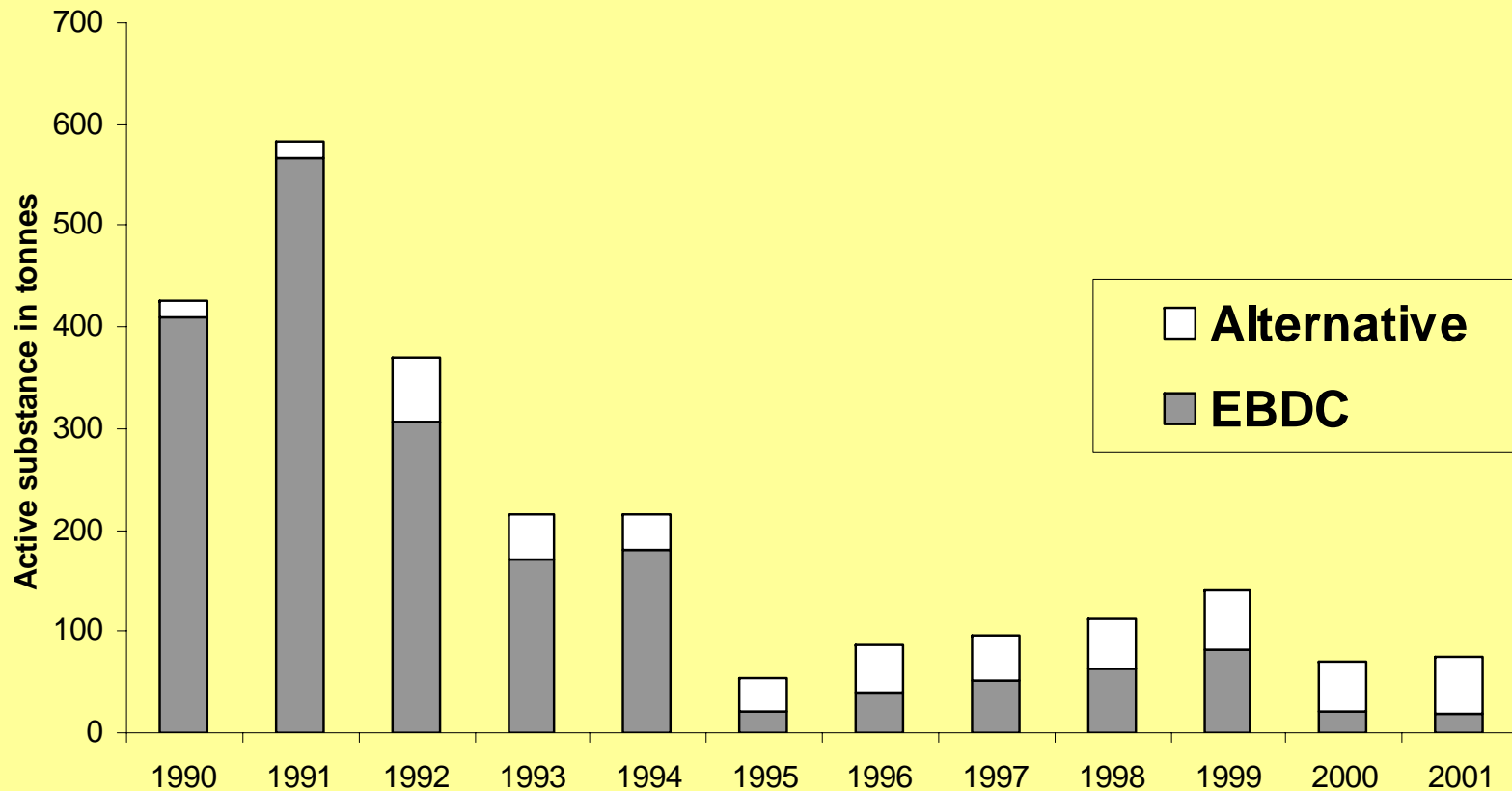
# A group of chemically related substances



# Pesticides in Sweden

- Every 5 years comparative assessment done of pesticides and available substitutes
- 1989: pesticides registered: 619
- 1990 Substitution requirement >> 343 registered only
- New and safer pesticides entered market; today 700 registered

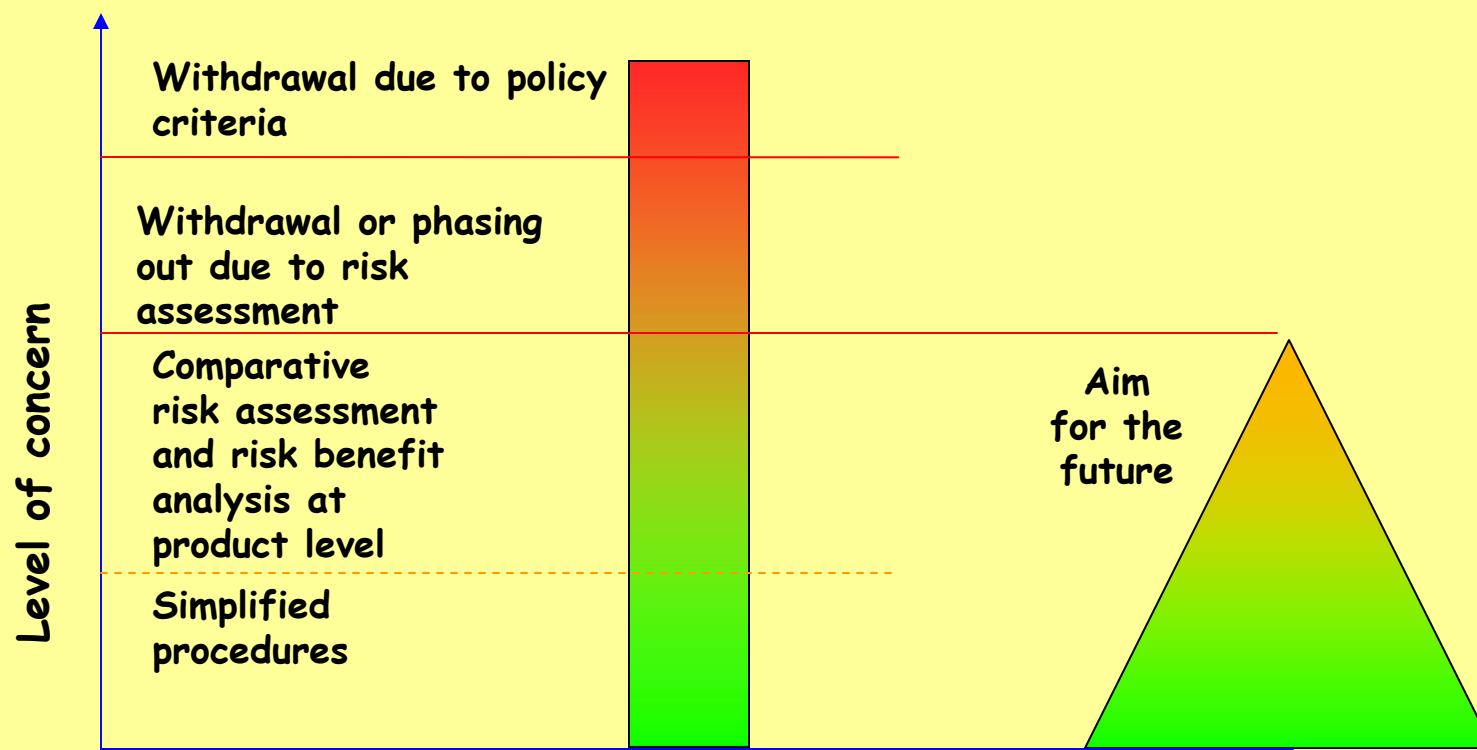
# potato late blight pesticide products sold in Sweden



## **Practising substitution and comparative assessment**

- Is most effective at the level of approval of products
- Shows that it is easier to rank and compare than to quantify potential risks
- Market promotion of development and use of more innovative products

# Comparative assessment in the decision-making process



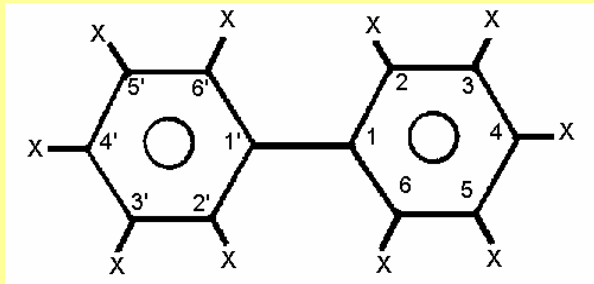
# Canadian P2 regs for PERC

- 2000 declared CEPA toxic
- Regs push PERC emission reduction, at cost to drycleaners
- No active promotion of substitutes – drycleaners now locked into 3<sup>rd</sup> generation Perc machines
- Yet PERC residues still on clothes, occupational health exposure, carcinogenic chemical production/use

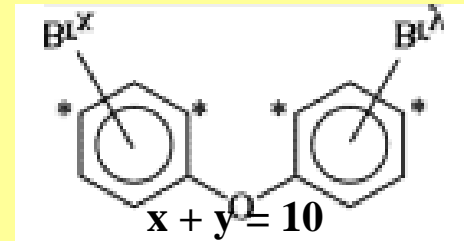
# PERC and alternatives

- Wet cleaning effective for 40-60% of items
- CO<sub>2</sub> efficient; initial investment high, available since 2003 with over 90 installations in US and Canada
- CO<sub>2</sub> detergents need improvement by green chemists (fluorinated cmpds used)
- International Committee of Textile Care proposed Wetcleaning label – voted on this year

# PBDEs: future phase out



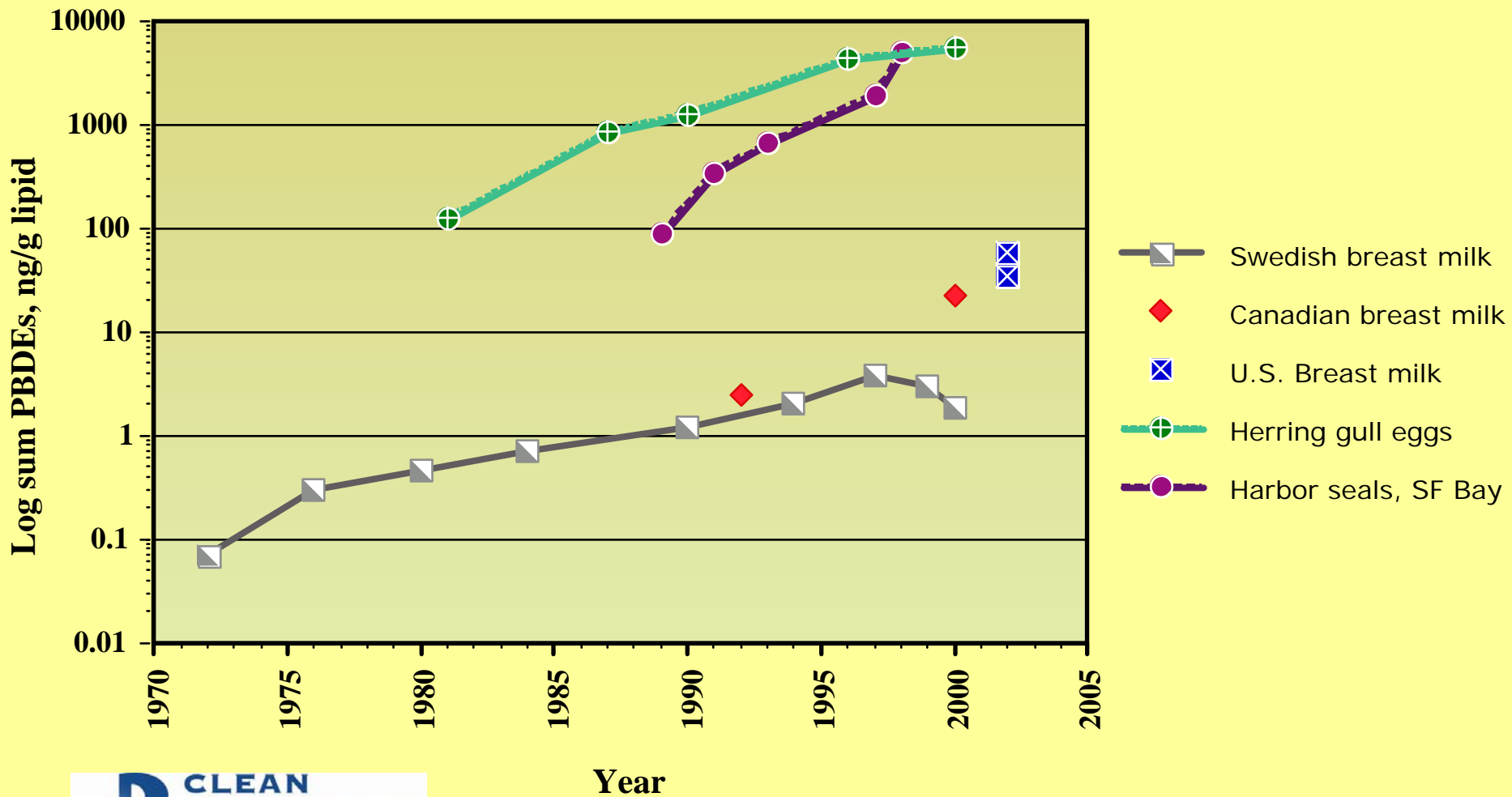
**PCBs**



**PBDEs**

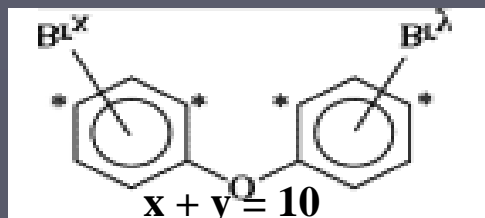
- PBDEs soon to be 'CEPA toxic'...then what?
- Exposure control of emissions?
- Replacement with other toxic flame retardant chemical? (bromine industry pushing other organo-bromine replacement)
- Or substitution using comparative assessment?

# Human and Wildlife Levels of PBDEs



Sources: Hites, 2004; Lunder 2003

# Polybrominated Diphenyl Ethers (PBDEs)



Flame Retardant

Product example

Million pounds produced, 2001

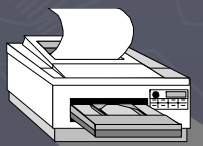
**Deca-BDE**



Housings for TVs, computers, & other electronics; textile backings, lighting, electrical boxes

124

**Octa-BDE**



Housings for fax machines, computers and other electronics; telephone handsets, small electronics parts

8

**Penta-BDE**



Polyurethane foams: mattresses, seat cushions, & other upholstered furniture; rigid foam insulation; foam packaging; carpet padding

17

- Research on substitutes:
- German
- Danish
- Swedish
- LCSP, USA

## Decabromodiphenylether:

### An Investigation of Non-Halogen Substitutes in Electronic Enclosure and Textile Applications

Prepared by Pure Strategies, Inc.

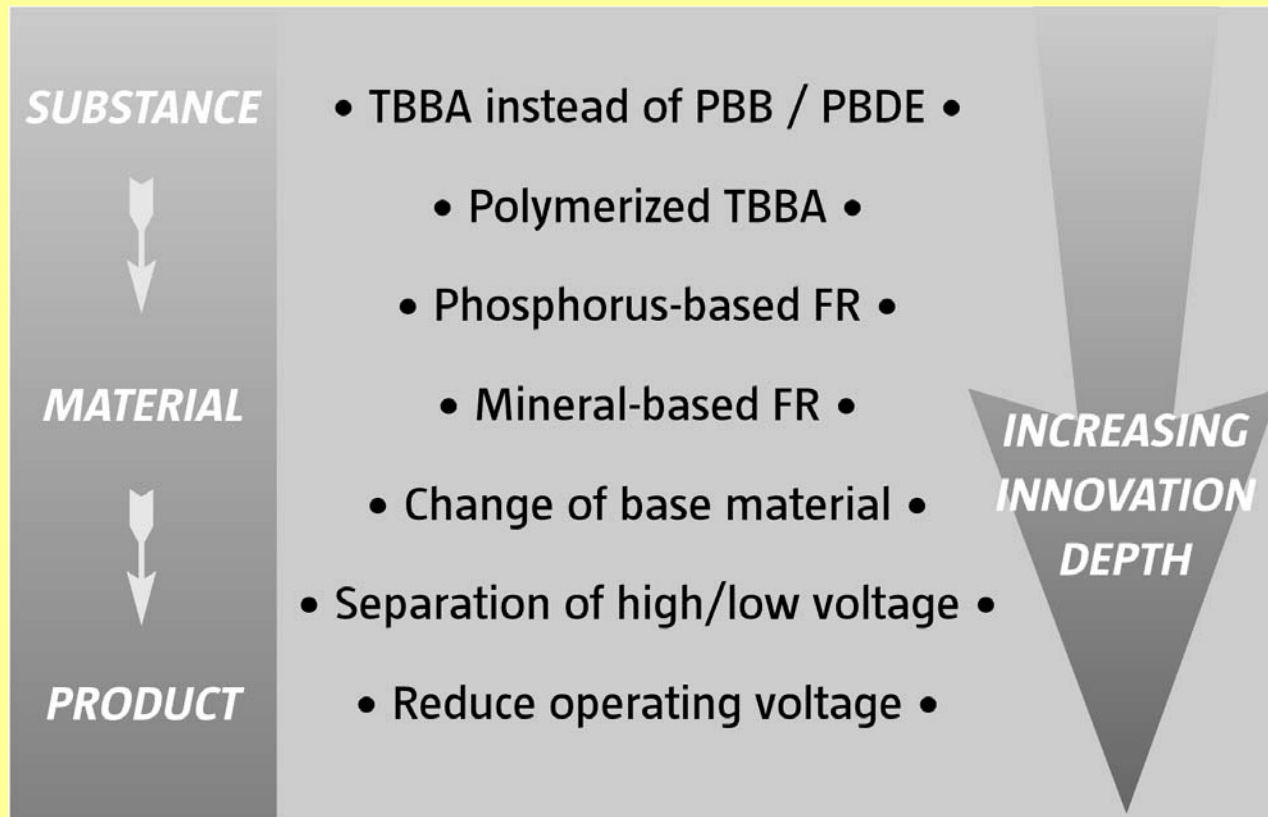
for  
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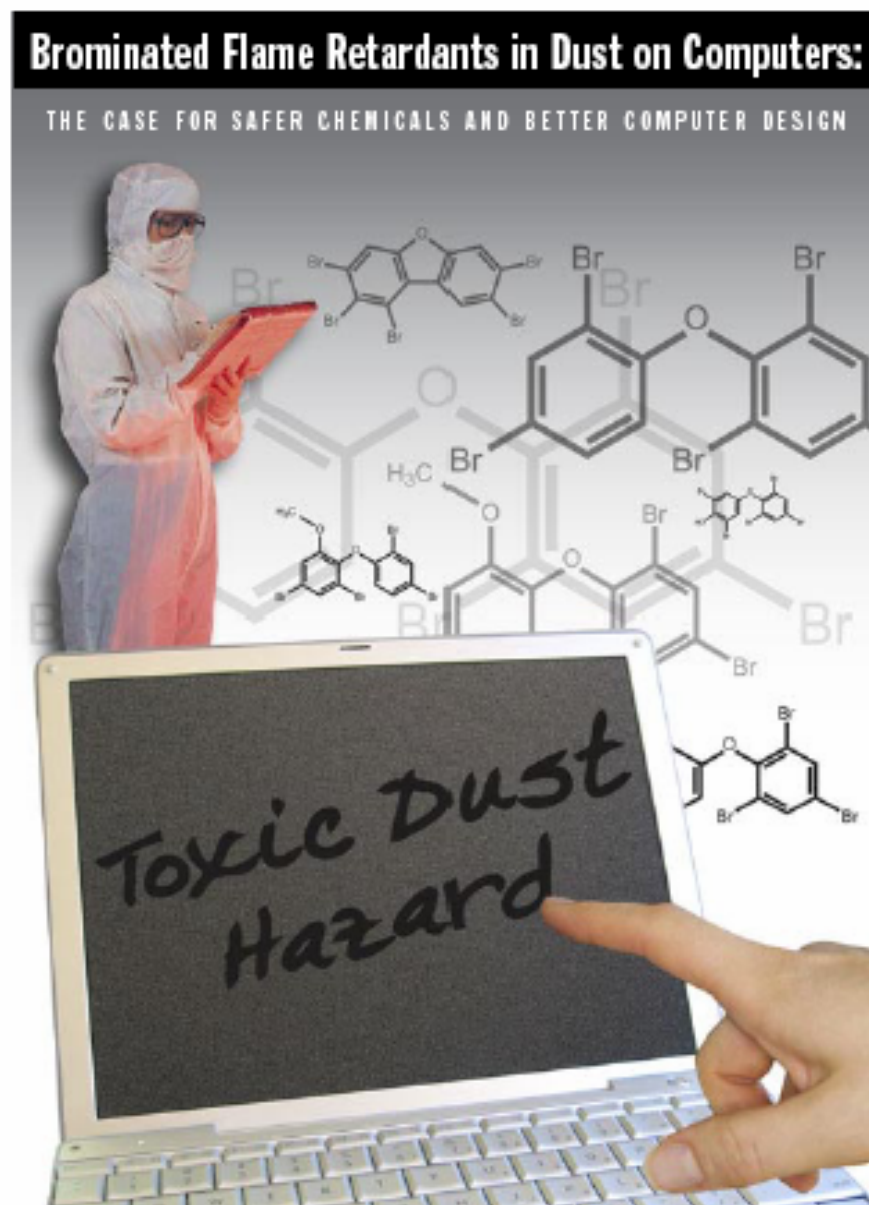
## SUBSTITUTION – CASE STUDY”BROM. FLAME RETARDANTS”



Company policies on BFR  
use researched

[www.cleanproduction.org](http://www.cleanproduction.org)

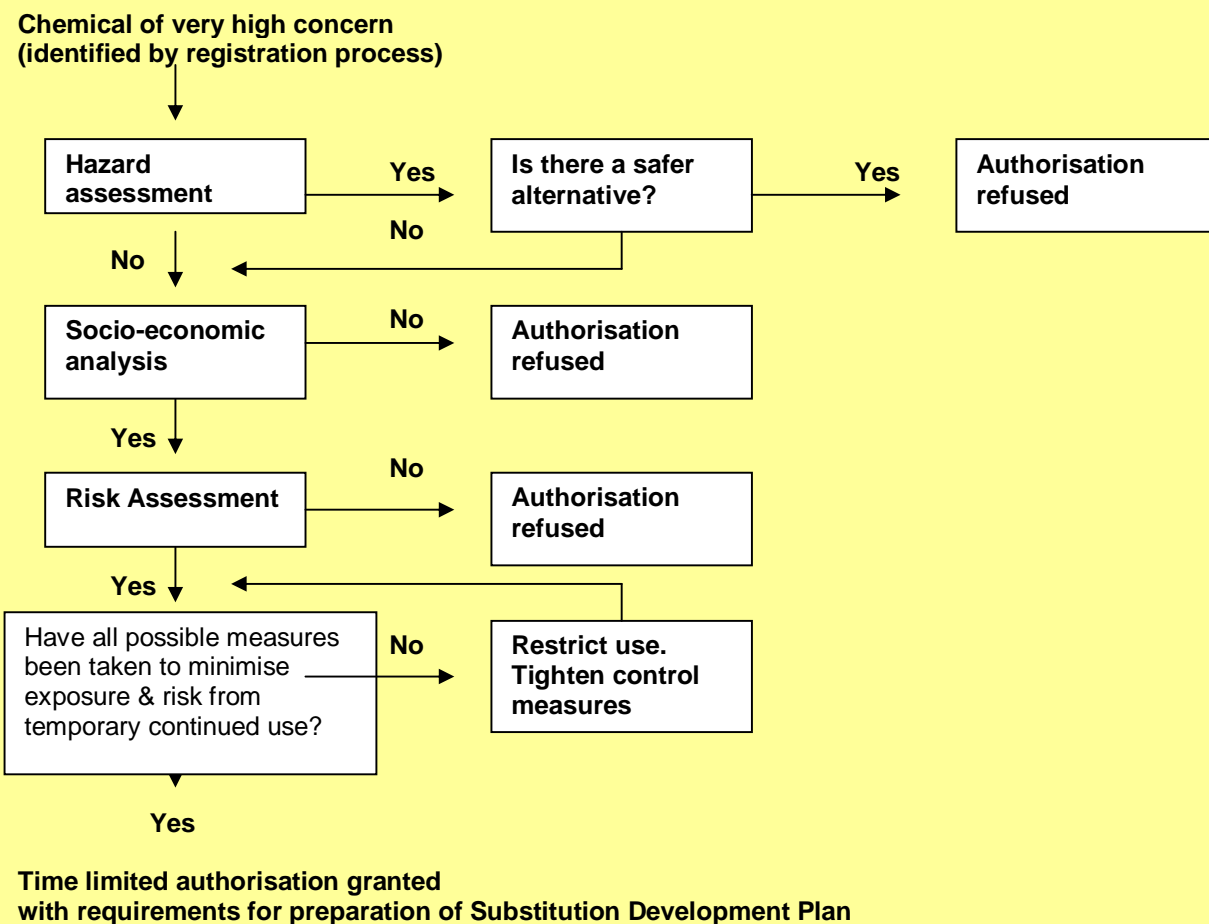
Results differentiate the  
leaders and laggards  
in chemical policy



# Promoting Substitution in new EU chemicals policy

- Downstream companies now lobbying with UK, Dk, S, B and D for stronger substitution under authorization process for chemicals of high concern
- European NGOs = SP is campaign focus
- NGOs increasingly test products to show use of hazardous chemicals then rank companies on substitution policy

# Proposed decision-making process for authorisation with substitution principle





**Common position with regard to the authorisation of substances of very high concern within REACH**

...

We share the view that a requirement within the authorisation procedure to substitute substances of very high concern if an acceptable alternative that does not fall into the very high concern category is available has the potential to drive innovation to the benefit of business, human health and the environment.

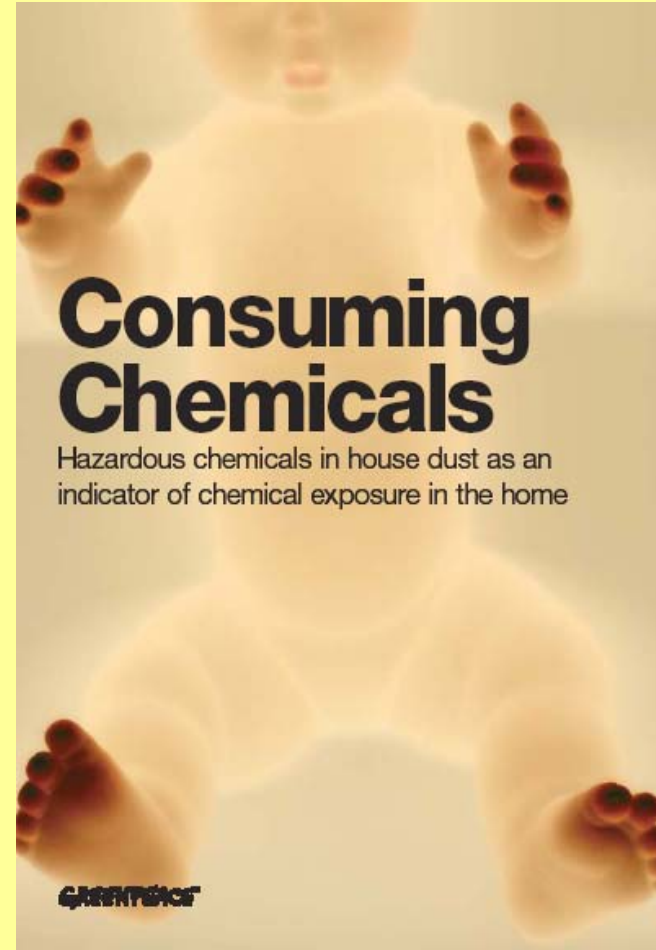
We therefore urge the Minister to press for substitution to be incorporated into REACH in such a way that the authorisation procedure is effective, but flexible, in progressively phasing-out substances of very high concern.

# Companies supporting substitution...

- *Without the strong support of the Substitution Principle, it will be difficult for an individual company that is a downstream user to be proactive in substituting substances.- Skanska AB, 2003. Skanska is the second largest construction contractor in the world*
- *"These two principles [precaution and substitution] are important principles in the Swedish national chemical policy and has proven to be a good basis for chemical control. Tetra Pak is therefore supportive to building the REACH system on these two fundamental principles. Precaution and substitution need to be introduced early in the text as guiding principles for the whole policy*  
- Tetra Pak June 2003

# Safer Products campaigns

- Getting the Real Dirt on Chemicals!
- [www.greenpeace.org.uk](http://www.greenpeace.org.uk) (Chemical Home)



# Greenpeace Chemical Home: Key campaign tool

- To raise concern on harmful chemicals in consumer products
- To encourage companies to commit to substitution using public leverage

**THE CHEMICAL HOME** **GREENPEACE**


▶ HOME      ▶ THE HUMAN BODY      ▶ THE CHEMICAL HOUSE      ▶ CHEMICALS AFFECT YOU  
 ▶ ABOUT THE CAMPAIGN      ▶ SCIENCE REPORTS      ▶ GET ACTIVE      ▶ SEND TO A FRIEND

**THE CHEMICAL HOUSE**      **SEARCH**       **GO!**

KITCHEN	BATHROOM	BEDROOM	LIVING ROOM
Dishwasher Tablets Floor Coverings Multi-Surface Cleaner Washing Powder Washing-up Liquid	Lipstick Perfume Shampoo Shaving Foam/Gel Shower Curtains Skincare	Bed Linen Mattresses Pyjamas Toys Trainers	Air Fresheners Carpets Computers Mobile Phones Paints Televisions Upholstered Furniture

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**WASHING UP LIQUID**      **ARIEL WASHING-UP LIQUID**



■ Ariel washing-up liquid  
■ Ecover washing-up liquid  
■ Fairy washing-up liquid

**RED**

This product is likely to contain:  
Artificial Musk  
Phthalates

Which are found in the:

**BLADDER**  
[VIEW THE HUMAN BODY](#)

**SKIN**  
[VIEW THE HUMAN BODY](#)

**Greenpeace rating: red**      **RED**

The manufacturer / retailer has told us the product does contain one or more harmful chemical pollutants and they have no plans to remove them OR the manufacturer/retailer has refused to supply us with any information about their product.

**Company position**

Despite being asked on more than one occasion the manufacturer has failed to supply sufficient information about the chemicals used in this product.

\* Environmental Issues | climate change | renewable energy      \*



## **Toxins in your TV? Poisons in your PC?**

**Many popular brands of electronic products contain toxic chemicals. Small amounts of these chemicals cause widespread pollution.**

**Fill in the make of your electronic product here and send a form letter to its manufacturer. Tick one or more boxes and optionally add the model so the company knows it is getting messages from its own consumers.**

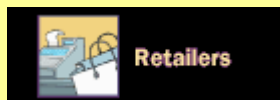
*Your pressure will help push these companies to follow the good example of companies like Samsung, Nokia, Sony, and Philips who have promised to remove toxic chemicals from their products in the future.*



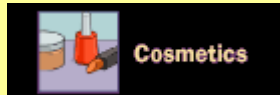
# Safer Products Project

Alternatives for a Healthy Home A Project of

[www.safer-products.org](http://www.safer-products.org)



Retailers



Cosmetics



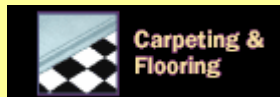
Televisions



Televisions



Mattresses



Carpeting &  
Flooring



Furniture



Hazardous chemicals in our house dust and the health risks they pose.



to read more.

Which brand name products contain hazardous chemicals?



for answers.

What you can do for a toxic-free future.



Take a look into our Chemical House. You'll discover things you never knew before.



# Integrating the Substitution Principle

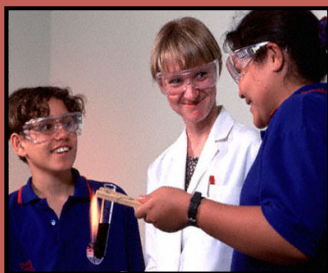
- Adopt Substitution Principle within CEPA and within provincial jurisdictions (TSCA and state level in USA)
- Trigger should be all P,B,T and equivalent chemicals of concern for phase out
- Mandatory Substitution Assessment Planning for PBT users
- Provide technical support for alternatives assessment

# Integrating SP

- Assess if financial incentives perpetuating end of pipe emission control only
- Public access to, and worker involvement in, alternatives assessment methodology
- Green Procurement
- Public Information on chemicals in products via Product Registers
- Promote and invest in Green Chemistry



Research



Education



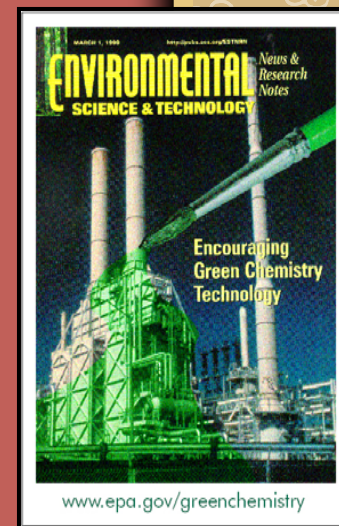
Awards



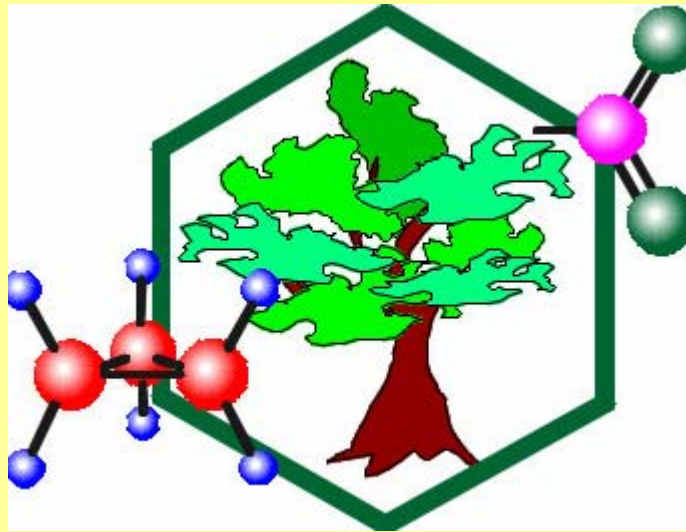
International  
Collaboration

## Green Chemistry Mission:

*“To promote the design of innovative chemical technologies that reduce or eliminate the use or generation of hazardous substances from the manufacture and use of chemical products.”*



Outreach



Thank you

Beverley Thorpe

Clean Production Action

[www.cleanproduction.org](http://www.cleanproduction.org)