Il caso dei silossani D4 e D5 nei prodotti a risciacquo per la cura della persona

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"L'analisi socio-economica nel Regolamento REACH"
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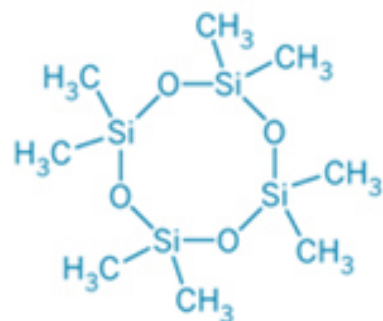11 – 13 ottobre 2017

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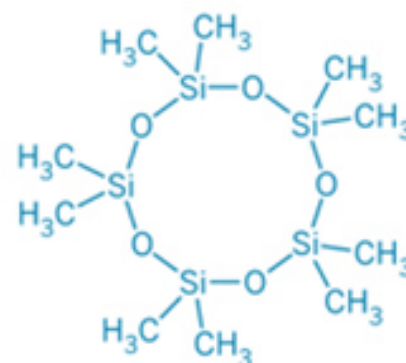UK Competent Authority

Contents of Presentation

- Substance and Use Overview

- Risk Management Options: Restriction

- Assessment of Benefits

- Assessment of Costs

- Recommendations for undertaking SEA

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Substance overview

- D4   D5

- D4 and D5 have PBT/vPvB properties
    - Agreed by PBT Expert Group in March 2013

- Restriction Proposal aimed specifically at reducing emissions to the environment
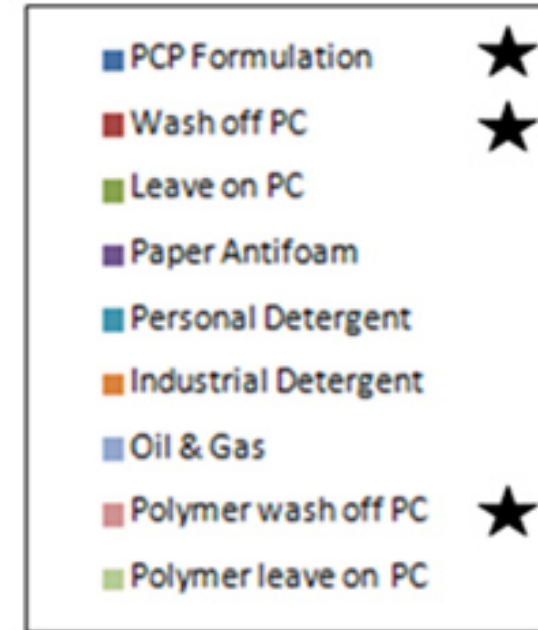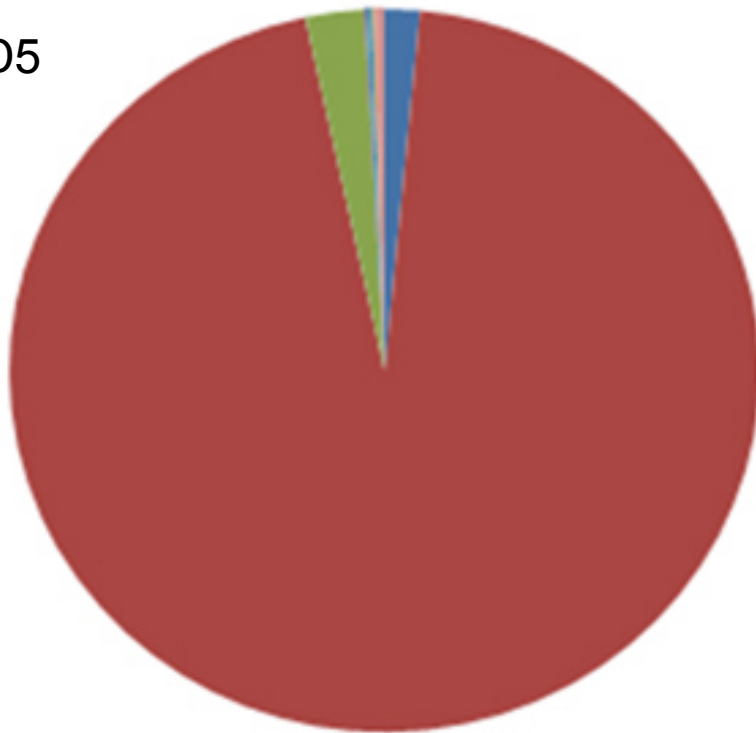
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Uses

- Registered tonnage:
  - D4 100,000 to 1,000,000 tonnes/year
  - D5 10,000 to 100,000 tonnes/year

- Main use: monomers for wide range of silicone polymers
  - Very important building blocks – limited synthesis options
  - Silicones can contain D4/D5 as impurities
  - Some silicone polymers can be released to water (e.g. antifoams in detergents)

- Important other direct uses in personal care products (PCPs), cleaning products (e.g. polishes), dry cleaning (D5 only), metal cleaning, etc.

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Shaping the Restriction Proposal

- In water, highly adsorptive so the substances partition to sediment and sludge
  - aquatic food chains most at risk as substances do not persist in soils and don't accumulate significantly in air-breathers

- Volatile: significant removal to the air compartment
  - Major loss pathway during service life of products
  - Treatment in WWTP removes ~95% from waste water
  - Once in the air they tend not to redeposit to surface media

- Restriction is targeted on uses that lead to the greatest <u>waste water</u> emissions according to the Chemical Safety Reports (CSRs)

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EU emissions to surface water

D5

D4

Legend:
- ■ PCP Formulation ★
- ■ Wash off PC ★
- ■ Leave on PC
- ■ Paper Antifoam
- ■ Personal Detergent
- ■ Industrial Detergent
- ■ Oil & Gas
- ■ Polymer wash off PC ★
- ■ Polymer leave on PC

(PC: personal care)

★ Use affected by the proposed restriction

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Other Risk Management Options considered

- Updating the registration dossiers to signify PBT/vPvB status and appropriate consequential action

- Authorisation under REACH (Article 57 d and e)

- POPs Regulation

- Water Framework Directive

- Targeted restriction is the only way of guaranteeing a significant level of emission reduction relatively quickly

- Only one concentration limit (0.1% w/w) considered as we consider it appropriate to remove these substances from wash-off PCPs

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Alternatives to D4/D5

- Industry has made clear that there is no 'one-for-one' replacement for D4 or D5 across every wash-off PCP product currently available

- Linear siloxanes appear to be the main option currently identified
  - Some of the alternatives might possibly have PBT/vPvB properties too, but until we have completed SEv we can't be sure.
  - There are lots of alternative products that don't contain siloxanes at all.

- There are very many wash-off PCPs that don't contain D4 or D5

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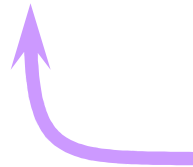# Assessment of Benefits

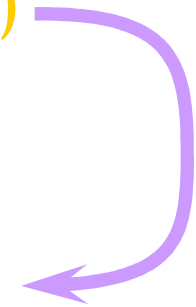well-being = f(Env, money)

From Bad ...
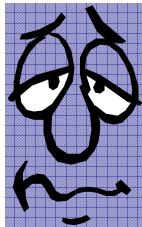
$u_0 = u(q_0, M)$

... to Good ...

$u_1 = u(q_1, M)$

$u_0 = u(q_1, M - WTP)$

... Maximum Willingness to Pay (WTP) is a monetary measure of change in well-being

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Techniques for Valuing Environment

Stated Preference …

Ask people
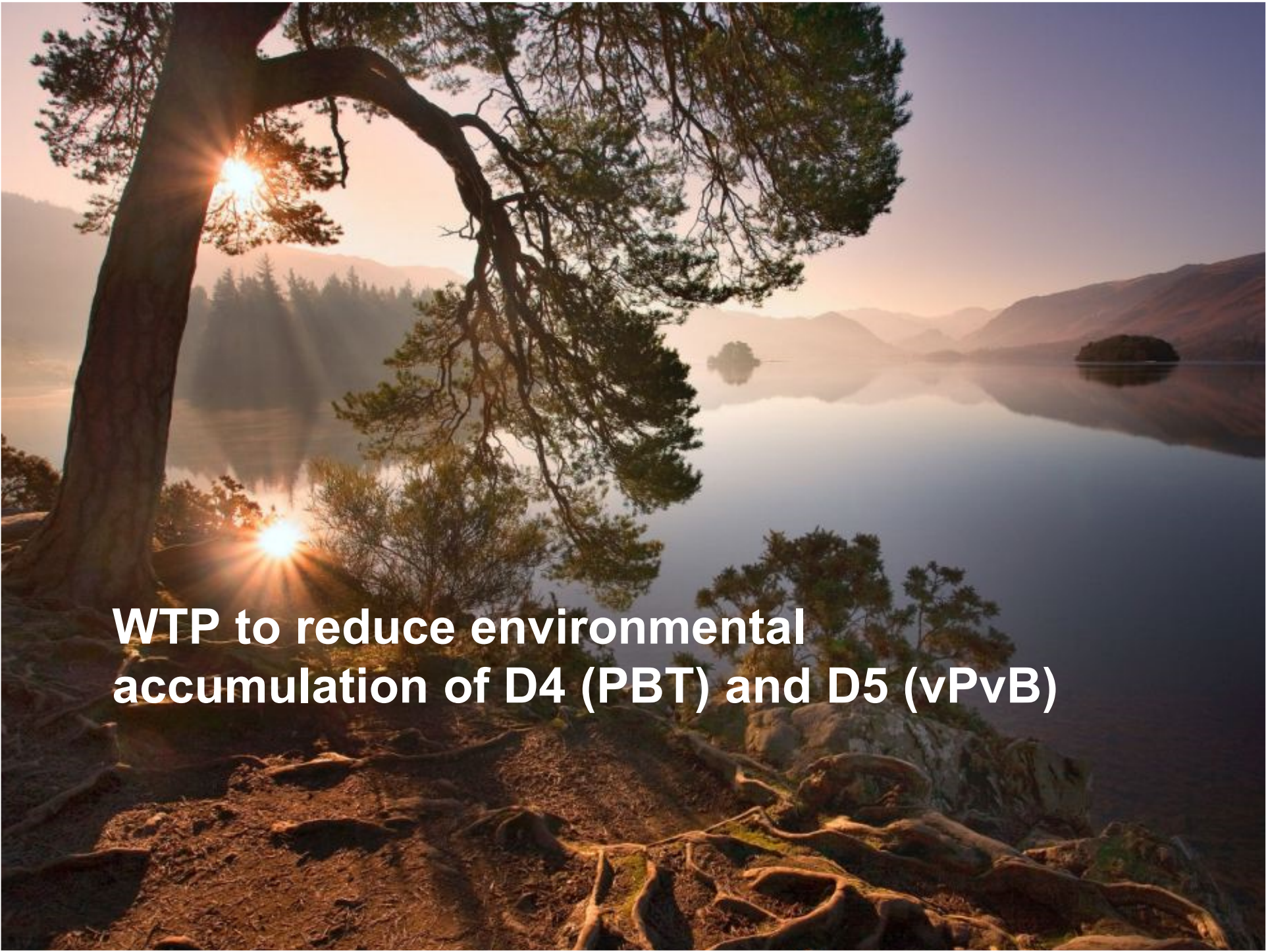

… describe change in Env

… answer questions that reveal how much would hypothetically be WTP

… hypothetical payments

Revealed Preference …

Observe people

… situations where actually trade off between money and Env

… actual payments

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WTP to reduce environmental accumulation of D4 (PBT) and D5 (vPvB)

Choice experiments

Assumes that the value of a good is a function of its characteristics

Individuals are asked to choose their preferred alternatives amongst various constructed scenarios

- Each scenario is a function of various attributes (including price)
- Each attribute varies at different levels
- Choices involve trade-offs
- WTP is inferred indirectly

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Objective

Estimate WTP for reduction in environmental accumulation of D4 and D5

- Web-based choice experiments
- Sampling: on-line panel representative of UK population (sex, age, income, region)
- 2 split-samples:
  - D4 sub-sample: N=415
  - D5 subsample: N=414
- July and August 2013

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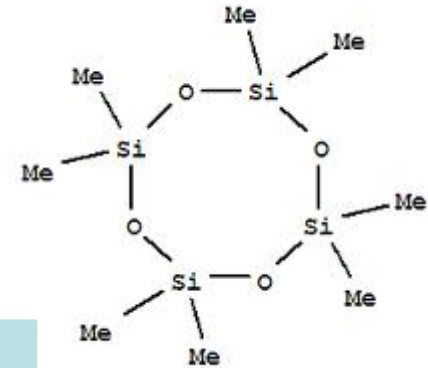
Outline of the questionnaire

- **Behaviour**
  - Personal care products, environmental behaviour
- **Attitudes**
  - Environmental concern, personal care products
- **Scenario description**
  - Current Situation: High accumulation of substances in environment
  - Proposed situations:
    - Substances no longer released into environment, although current levels will persist
    - Personal care product substitutes will have less desirable properties
    - Substitution of chemicals is costly
- **Value elicitation**
  - Choice experiment cards
  - WTP inferred indirectly from preferred option
  - Annual increase in household bills
- **Follow-up questions**
  - e.g.screen for protest responses
- **Demographics**
  - Sex, age, income, education

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Valuation Scenario

Respondents were shown detailed descriptions of product benefits:

- **Superior quality products:**
  - Apply smoothly, evenly
  - Dry quickly without feeling cold
  - Leave no residue or grease
  - Leave hair shiny and silky
  - Have a long shelf life
  - Safe for consumers
  - Have a silky dry feel
  - Low irritation
- **Standard quality products:**
  - Providing only some of the above

Respondents were shown detailed descriptions of environmental accumulation risks:

- **High accumulation:**
  - Substances are accumulating in the environment and aquatic food chain, may enter bird/mammal food chain, persistent
  - Toxic (D4) or not known to be toxic (D5)
- **Low accumulation:**
  - Substance no longer released into environment, but current levels persist for many years
- Effects largely unknown
- **Decrease in environmental accumulation is costly**

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Example choice card
(6 cards per respondent)

Please look at the options in the card below and choose the ONE option you prefer most on THIS card.

Option:	1	2	Current Situation
Environmental Accumulation of Tetrasiloxane	High	Low	High
Personal Care Product Quality	Superior	Superior	Superior
Annual Household Bills Increase	£1	£40	£0

Option 1	Option 2	Current Situation
○	○	○

Notes:
- Reminder description of attributes and levels shown alongside each card
- Reminders of budget constraints, other expenditures, be realistic
- Reminder that there are many other PBTs building up in the environment

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Attributes & levels

Attribute	Levels
Environmental accumulation	High$_{SQ}$, Low
Personal care product quality	Superior$_{SQ}$, Standard
Annual household bills increase	0$_{SQ}$, £1, £5, £10, £20, £40

Marginal WTP results

Variables	WTP		95% Conf. Int.	
Reduced environmental accumulation	£29.28	***	£25.42	£33.15
High product quality	£8.30	***	£5.78	£10.82
Toxicity*Reduced env. accumulation	£4.99	**	£0.57	£9.40
Donation* Reduced env. accumulation	£13.86	***	£8.73	£19.00
Age*High product quality	-£7.15	***	-£10.35	-£3.95

Notes:
- WTP in higher household bills per year
- *p ≤ 0.10; **p ≤ 0.05; ***p ≤ 0.01

Assessment of Costs

Components of Regulatory Cost:

• Compliance costs - eg. pollution control equipment; input & process changes; permit applications

• Government regulatory costs - eg. monitoring, admin & enforcement

• Social Welfare losses - Loss in Surpluses due to change in price and quantity/quality of goods

• Transitional costs - Reallocation of resources e.g. capital obsolescence due to plant closure; production disruptions

• Indirect costs - Changes in market structure; innovation; productivity

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Cost Estimation Methods

- ## Compliance costs
  - the cost of all policy compliance actions (e.g. abatement; process change).
  - may be sufficient when "behavioral response, transitional costs and indirect costs are small"

- ## Partial equilibrium/ behavioral response
  - Captures behavioral responses, but confined to effects on directly regulated firms or households

- ## General equilibrium/ Secondary effects
  - Where effects on large number of markets; the net burden once all good and factor markets have equilibrated;

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Impact of restriction on market for wash-off PCPs containing D4/D5

Producers (Supply):

→ reformulate product

→ remove product from market!

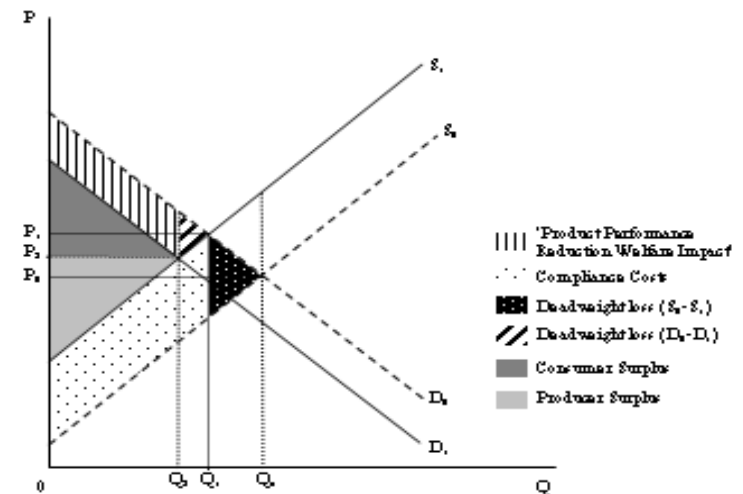Firms choose option that maximises their net benefits (profit)

$S_0 \rightarrow S_1$

Consumers (Demand):

Δ Price → Δ selection of products

Δ Quality → Δ WTP for product

$D_0 \rightarrow D_1$

Partial Equilibrium Analysis

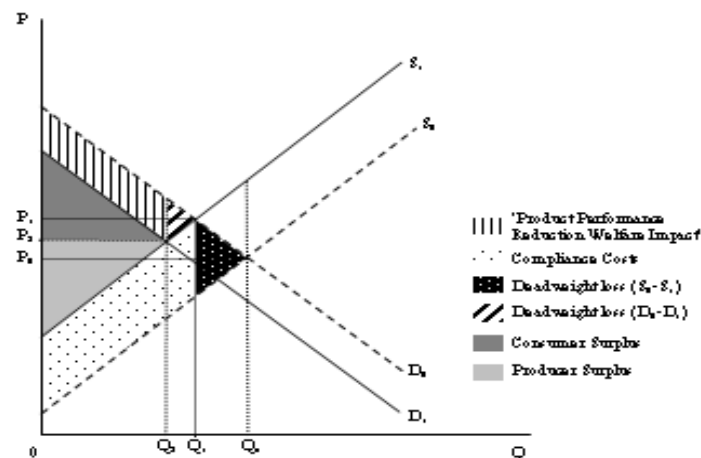REACH
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Cost Estimation (1)

Total Costs of Restriction =

1. Compliance Costs

+

2. Social Welfare loss
(Product performance/quality reduced)

Cost Estimation (2)

Compliance Costs Components:

1. Raw material substitution costs - additional costs from purchasing D4/D5 substitutes

   – Industry consultation suggests <50% Price ↑

   – No Direct 'like-for-like' substitute

   – Assume 100% Price ↑ to account for uncertainty

2. Reformulation costs – one time investment to reformulate products to replace D4/D5

   – Subtract 'baseline' reformulation costs

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D4/D5: Cost Estimation (3)

Social Welfare loss (Product quality reduced)

- Reformulated Products not of equal quality → Δ demand and hence in CS+PS

- Welfare loss = ΔCS +ΔPS
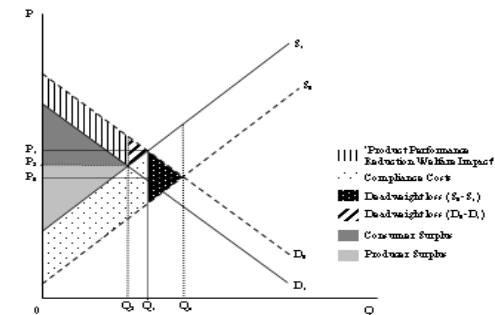
$\approx$ WTP for quality attributes of D4/D5

  – See Estimation of WTP based on stated preference survey earlier

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Socio-Economic Analysis (SEA) Results

- Benefits: direct benefits of reduced environmental accumulation estimated by "willingness to pay" study ~ €0.65 billion pa
- Costs: Compliance (see Table) + Social welfare loss (~ €45 million pa)

Compliance period (years)	Compliance Costs per annum			Cost-effectiveness (€/kg)	Total cost of compliance per kg of wash-off PCP sold (€/kg)	% Retail Sales Price increase (%)
	Raw material substitution Costs (€)	Reformulation Costs[1] (€)	Total cost of compliance (€)			
2	3,420,000	19,664,952 - 58,044,340	23,084,953 – 61,464,340	115.66 – 307.94	0.0636 – 0.1692	0.34 – 0.91
5	3,420,000	4,188,567 - 38,307,702	7,608,567 – 41,727,702	38.12 – 209.06	0.0209 – 0.1149	0.11 – 0.62

→ Benefits >> Costs

Recommendations for undertaking SEA

• Start with theory e.g. effects on Demand & Supply (comparative statics diagram)

• Ensure assessment is proportionate to magnitude of impacts – focus on most important sectors/cost elements in practice and use appropriate methodology

• Work with those who are affected and who have the data (industry/trade associations) - Build trust by bringing in at beginning of process and consulting/transparency throughout the process

• Use simplified models of behaviour/reactions and use assumptions, but recognise limitations and build into analysis

• Ensure transparency of all assumptions and highlight uncertainties (make use of worst case/scenarios/sensitivity)

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Thank you!