

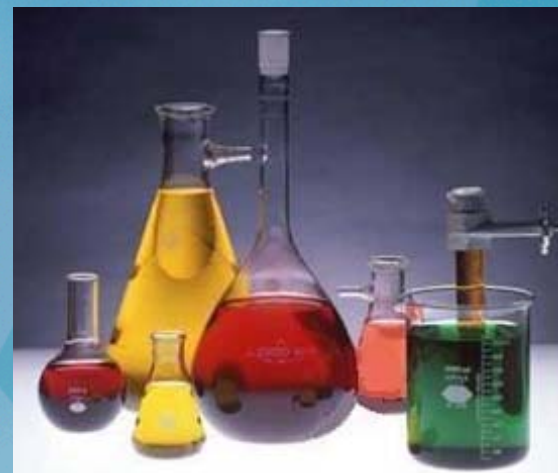
Substitution and Alternatives Assessment: Framing, Practice and Opportunities

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Our current chemical and material systems are not sustainable.

For some 30-40 years we have relied on government regulations and prohibitions to phase out the worst substances.

...now, we need to move towards more positive and more innovative "Substitution Strategies"



Why focus on Substitution?

- **Substitution.....**
 - **is a natural part of market behavior**
 - **always occurs when a chemical is restricted**
 - **is positive rather than negative**
 - **shifts focus from exposure to business development**
 - **focuses attention on consequences of interventions**
 - **promotes research and innovation**



What is Substitution?

- **Okopol Institute definition**

“..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.”

- **Substitution – seeking safer alternatives is a proactive approach to science and policy that asks a new set of questions and requires a new set of capabilities**



Swedish “Substitution Principle”

“Anyone handling or importing a chemical product shall take such steps and otherwise observe such precautions as are necessary to prevent or minimize harm to human beings or to the environment. This includes avoiding chemical products for which less hazardous substitutes are available.”

----Swedish Act on Chemical Products Sec. 5:426, 1985



Substitution and Precaution

- **A substitution strategy is intended to avoid unintended and regrettable replacements**
 - **CFCs replacing flammable refrigerants**
- **A substitution strategy places the burden on private actors to seek appropriate alternatives**



Substitution and Innovation

- **A substitution strategy encourages research, innovation and the adoption of new and safer chemicals**
- **Substitution opens up opportunities for Green Chemistry and Green Engineering**
- **However, substitution also promotes the diffusion of safer chemicals in products, workplaces and waste streams**



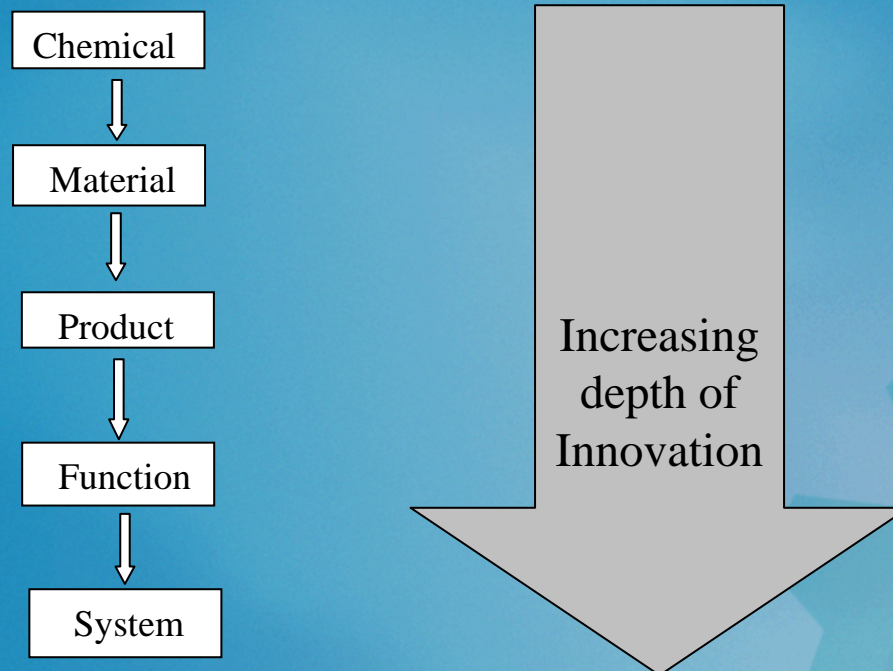
Substitutes

- **Risk reducing substitutes for undesirable substances may result from:**
 - **Drop in chemicals**
 - **Changes in production processes**
 - **Changes in product design**
 - **Changes in how functions are preformed**
 - **Non-chemical solutions**
 - **New systems of consumption**



Substitution Strategies

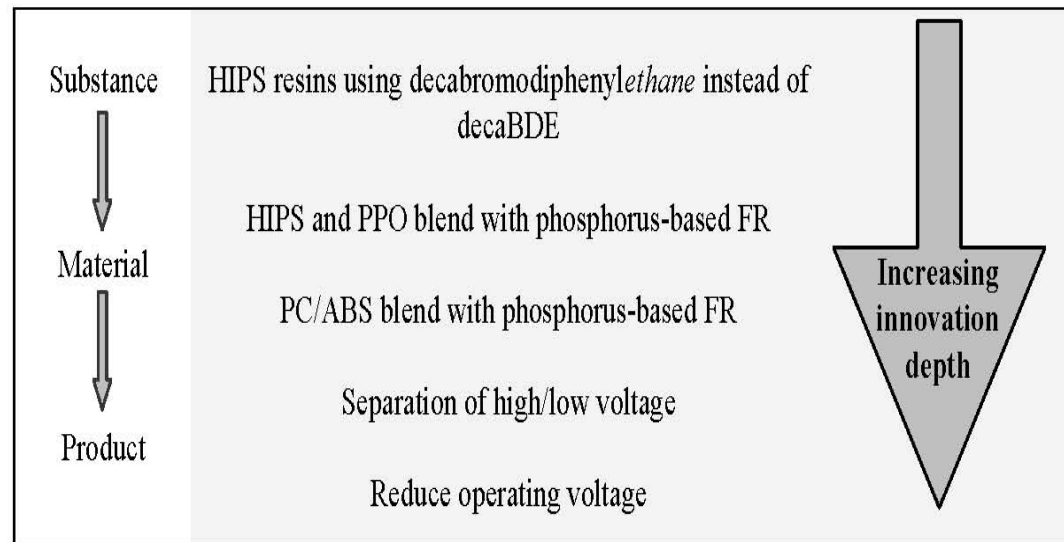
- **Substitution Strategies are defined by the points of intervention where an alternative is considered**



Substitution Strategies for decaBDE in televisions housings



Figure 5: DecaBDE Substitution Strategies

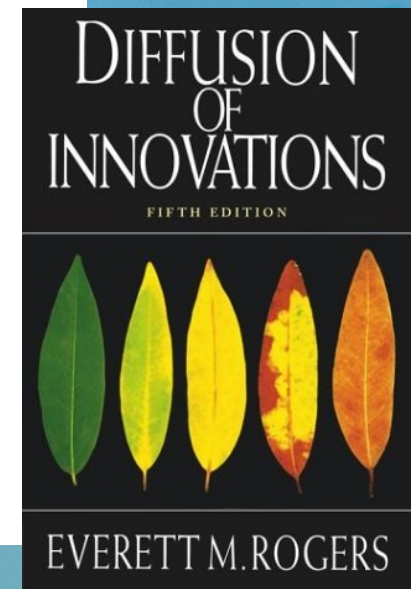
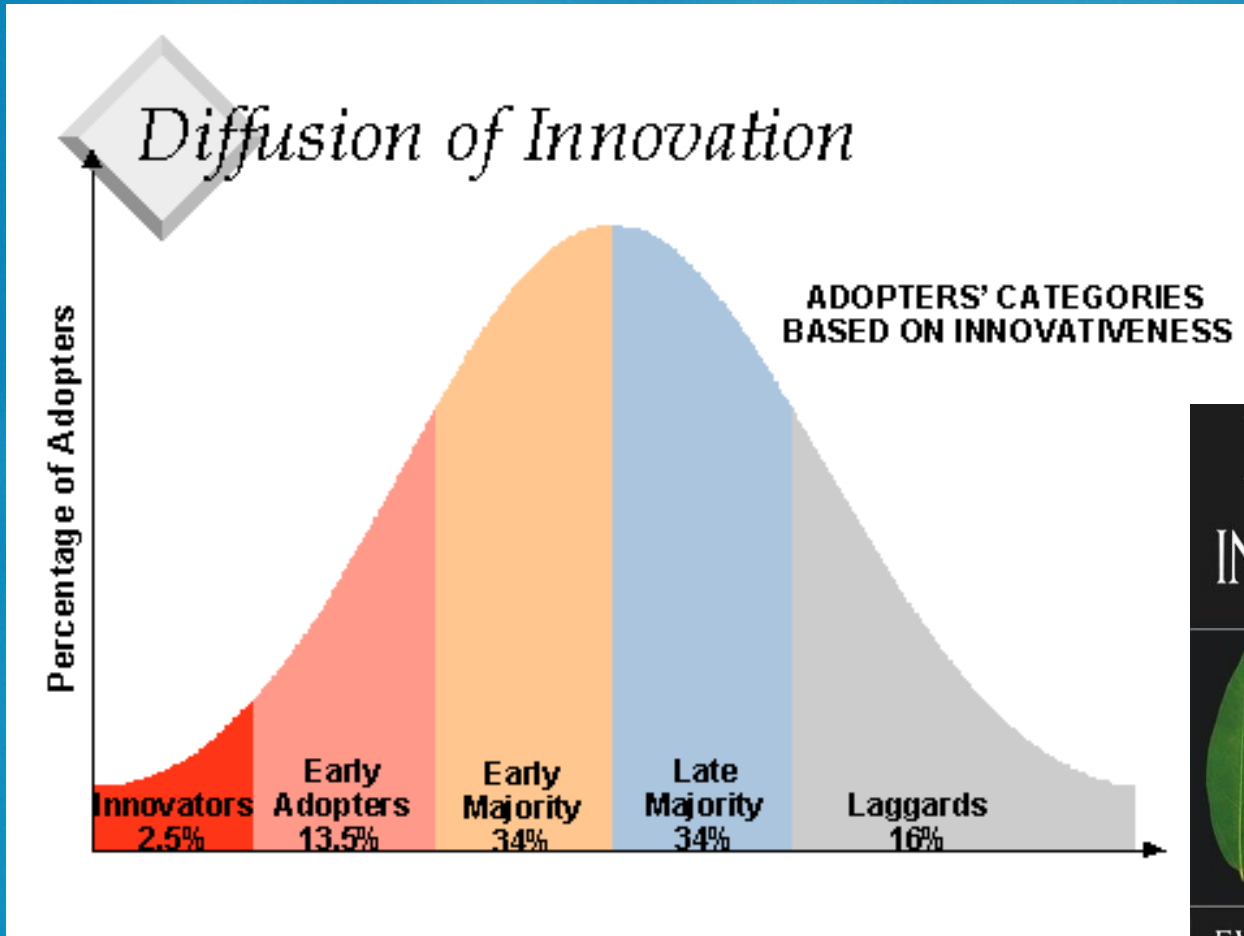


Source: Oko-Institut 2003



Rate of Adoption of Substitutes

(after Everett Rogers: *Diffusion of Innovations*)



Why consider Alternatives Assessment?

- Rather than focus on one bad option, we focus on choices and opportunities
- We move from problems to solutions
- We assure ourselves that the solutions we are advocating are preferable to the hazards we are replacing
- We encourage transparency and documentation
- Leading firms and governments are already experimenting with alternative assessment tools



Alternatives Assessment

- **Definition**

Alternatives Assessment is a process for identifying and comparing potential chemical and non-chemical alternatives that can be used as substitutes to replace chemicals or technologies of high concern.

- **Produces a clear, documented and replicable record of option development, comparison and selection**
- **May be used to inform existing selection decisions or to inform future design decisions**
- **Requires some life cycle perspective**





TURI Five Chemicals Study

- **2005– Massachusetts Legislative sought a one year Alternatives Assessment on five chemicals of high concern**
 - lead
 - Perchloroethylene
 - Formaldehyde
 - di (2-ethylhexyl) phthalate
 - hexavalent chromium
- **The goal was to identify and assess the alternatives in terms of cost, performance and health and environmental attributes**





Steps in TURI Five Chemicals Alternatives Assessment Study

- **Step 1: Identify chemical uses**
- **Step 2: Prioritize chemical uses**
- **Step 3: Identify full range of alternatives**
- **Step 4: Screen alternatives**
- **Step 5: Prioritize alternatives for study**
- **Step 6: Conduct assessments**
 - **technical (performance)**
 - **financial (costs)**
 - **environmental and health effects**
- **Step 7: Display results**



Opportunities for Alternative Assessment in International Environmental Policy

- **European Union REACH**
 - Requires Alternatives Assessment where appropriate controls in Authorization considerations cannot be established
- **Stockholm Convention**
 - Requires Alternatives Assessment for listing new substances by the POP Review Committee
 - Needs an Alternatives Assessment procedure for considering exemptions

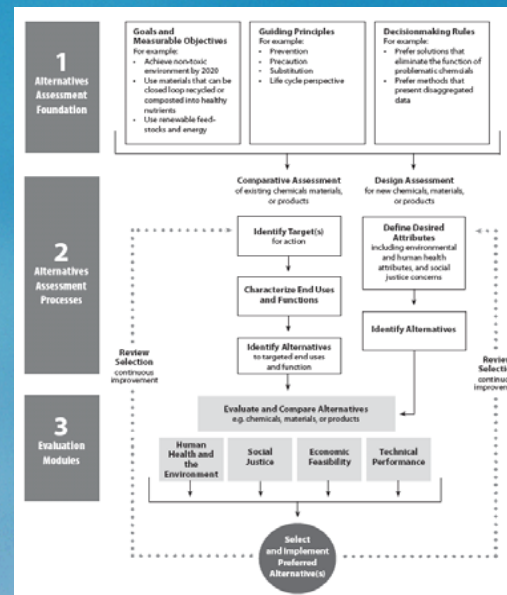


Six Steps to Developing a Substitution Strategy

1. Substitution processes need formal, replicable Procedures and Methods

2. Substitution processes need more and better Scientific Profiles of chemical hazards and risks

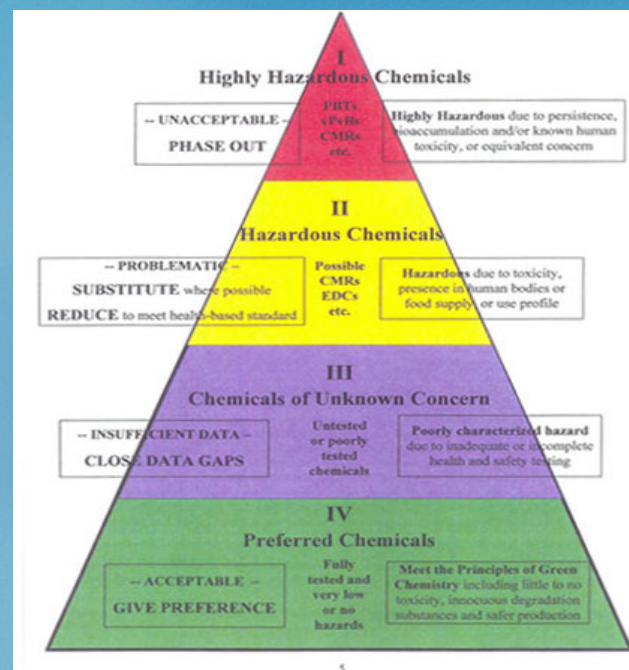
REACH, Canadian DSL
OECD/US HPV, etc.



Six Steps to Developing a Substitution Strategy

3. Substitution processes need annotated Inventories of preferred substitutes

4. Substitution processes need to take place within Comprehensive Chemicals Frameworks



Six Steps to Developing a Substitution Strategy

5. Substitution processes need to engage a broad range of Stakeholders across product chains



6. Substitution capacities need to be developed in all regions of the world, particularly in developing countries



Conclusions

- **We need to re-frame the chemicals issue in positive terms of innovation and change**
- **We need to develop innovative, new “Substitution Strategies”**
- **Risk reducing substitution provides a means for moving towards sustainable forms of production and consumption**
- **Alternatives Assessment provides the tools for assuring that we are moving in the right direction**



Thank You

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