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Substituting Hazardous Chemicals the American Way

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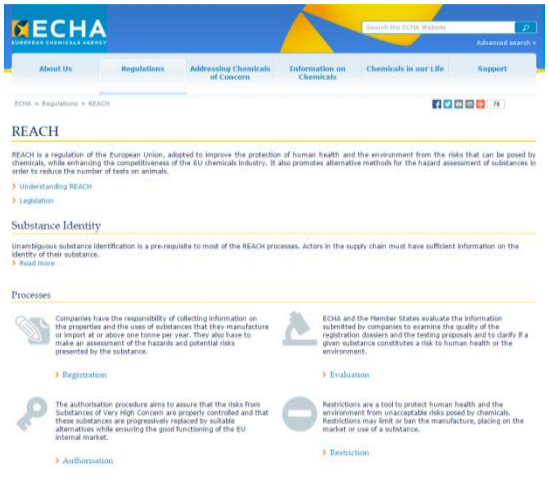
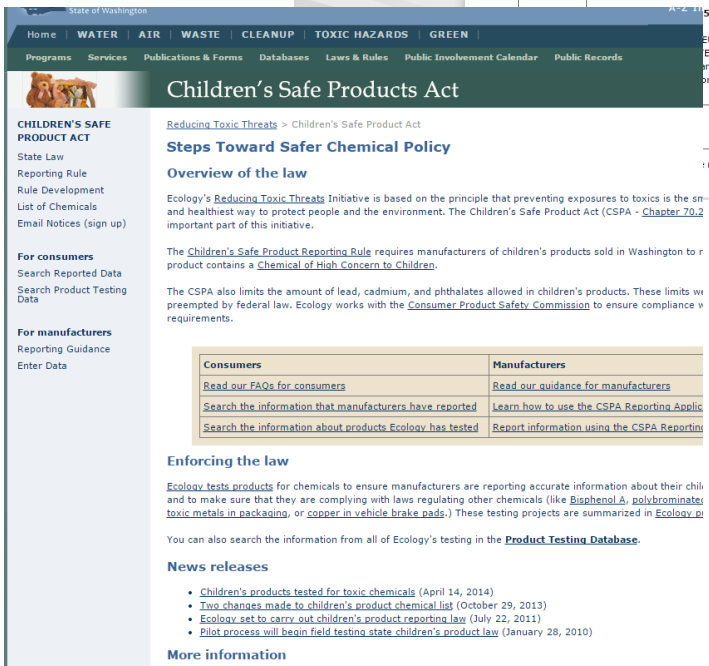
Overview

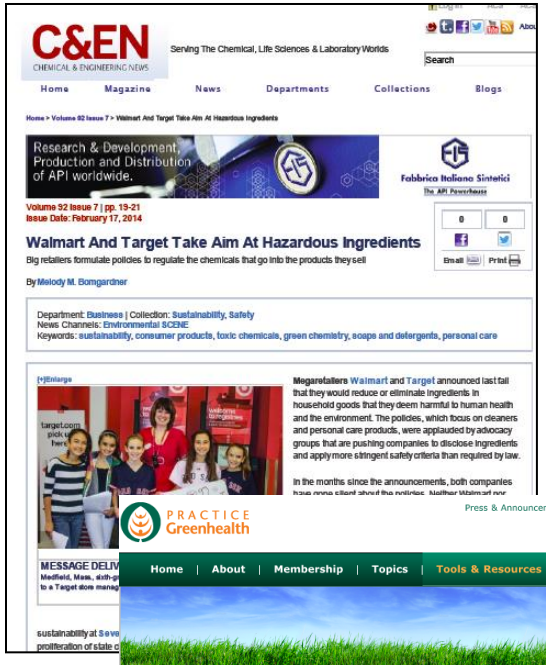
- Lots of drivers for chemical deselection – in US mostly market based
- Emerging focus on the process of substitution with policies requiring alternatives assessment
- Growing field of science policy discussion
- Lessons learned and areas for collaboration

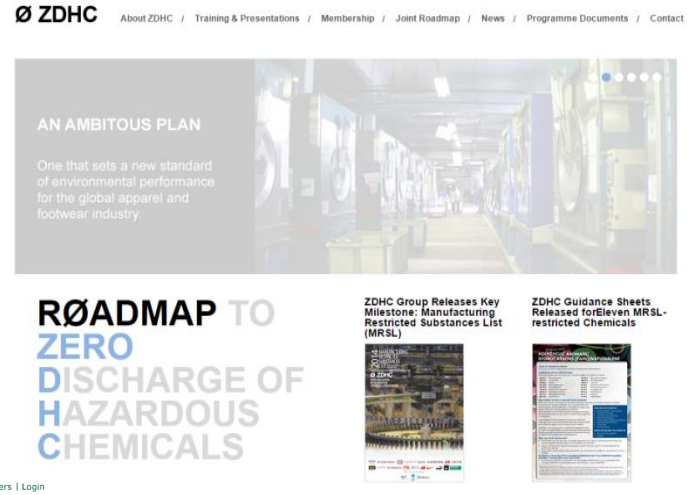
Regulatory Drivers

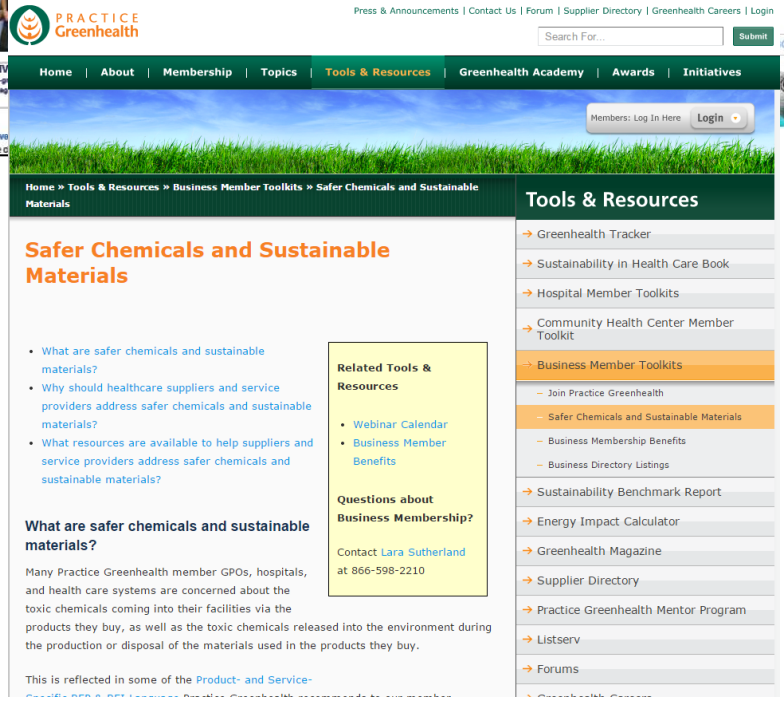


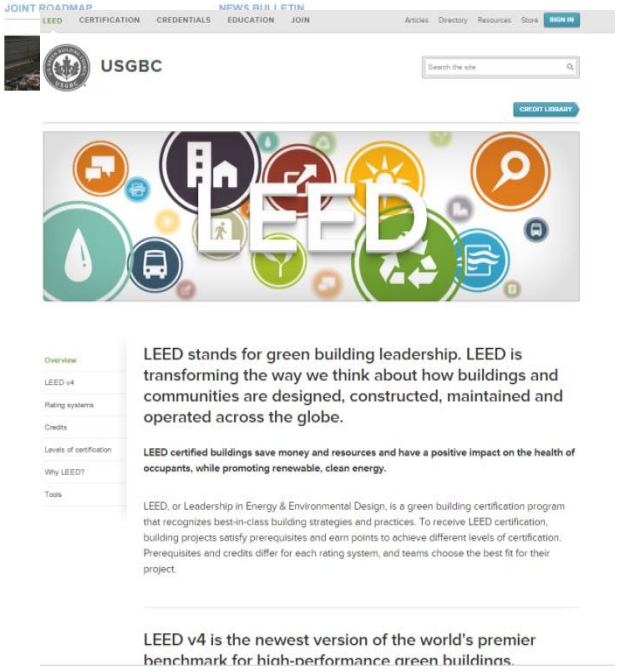


Market drivers









Regrettable Substitutions

A Few Examples

EDF Health

About this blog

Science, health, and business experts at Environmental Defense Fund comment on chemical and nanotechnology issues of the day.
Our work: Chemicals

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Regrettable, if predictable: Bisphenol S mimics estrogen just like its better-studied cousin, bisphenol A

By RICHARD DENISON | BIO | Published: JANUARY 17, 2013

Richard Denison, Ph.D., is a Senior Scientist.

A rule of thumb in chemistry is that chemicals that look alike will more often than not act alike. (If it looks like a duck … .) Indeed, when chemical companies are faced with testing requirements for one of their chemicals, they routinely argue that they should be allowed to submit test data on a structurally related chemical instead.

So when it was revealed that companies making products (such as thermal receipt paper) that contain the estrogen-mimicking compound bisphenol A (BPA) were switching to another chemical called bisphenol *S* (BPS), many scientists' eyebrows quickly arched.

Take a look at these two chemical structures:

Lynne Peeples ♥ Become a fan

lynne.peeples@huffingtonpost.com

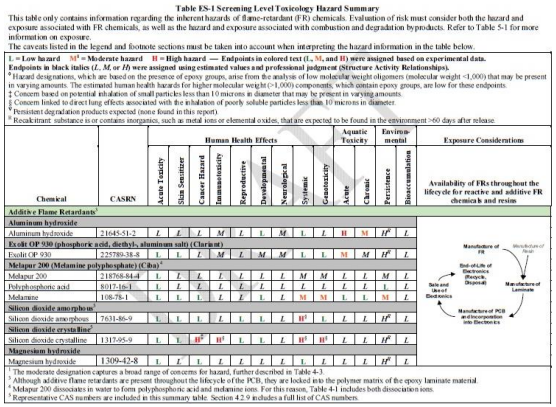
New Flame Retardants, Other Replacement Chemicals, Pose Same Problems As Predecessors

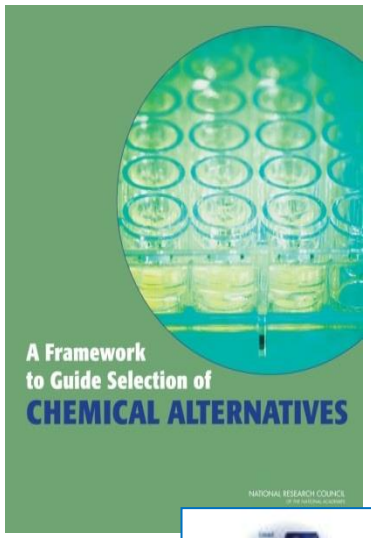
Posted: 11/28/2012 12:04 pm EST | Updated: 11/28/2012 10:06 pm EST

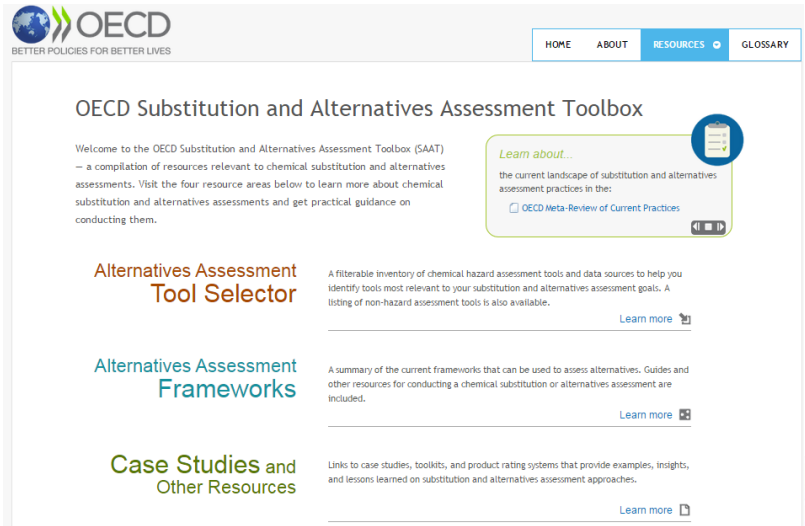
Evolution of Alternatives Assessment in the U.S.

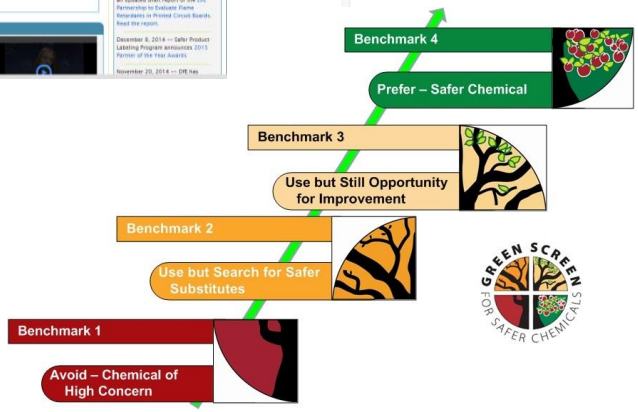
- Pollution prevention/cleaner production planning – 1990s (primarily process focus)
- Development of alternatives assessment frameworks and approaches – early 2000s (increasing product focus)
- Hazard assessment tools development – 2000s.
- Increased attention to tools and processes that consider exposure, lifecycle.
- Increased focus on applicability/application among a range of companies.

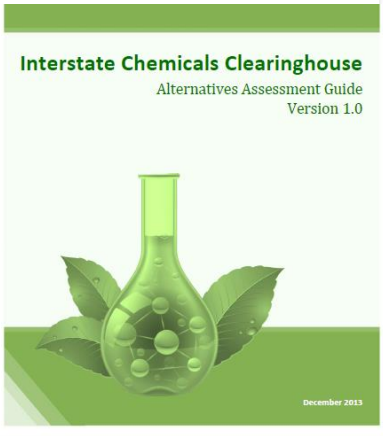
Evolving Efforts











Defining Alternatives Assessment

- A process for identifying and comparing potential chemical and non-chemical alternatives that could replace chemicals or technologies of concern on the basis of their hazards, performance, and economic viability
- Action orientation

Informed Substitution – EPA - 2010

- A considered transition from a chemical of particular concern to safer chemicals or non-chemical alternatives. The goals of informed substitution are to minimize the likelihood of unintended consequences, which can result from a precautionary switch away from a chemical of concern without fully understanding the profile of potential alternatives, and to enable a course of action based on the best information - on the environment and human health - that is available or can be estimated.

Focus of Alternatives Assessment

- Alternatives assessment is a step-defined, action-oriented process which may require several iterations
  - Focus on function not the particular chemical
  - Focus on “intrinsic impact reduction”
  - Considers the “necessariness” of a chemical
- Finding a safer alternative and getting industry to adopt the use of it are not the same thing.

The Process of Assessing Alternatives

www.theic2.org

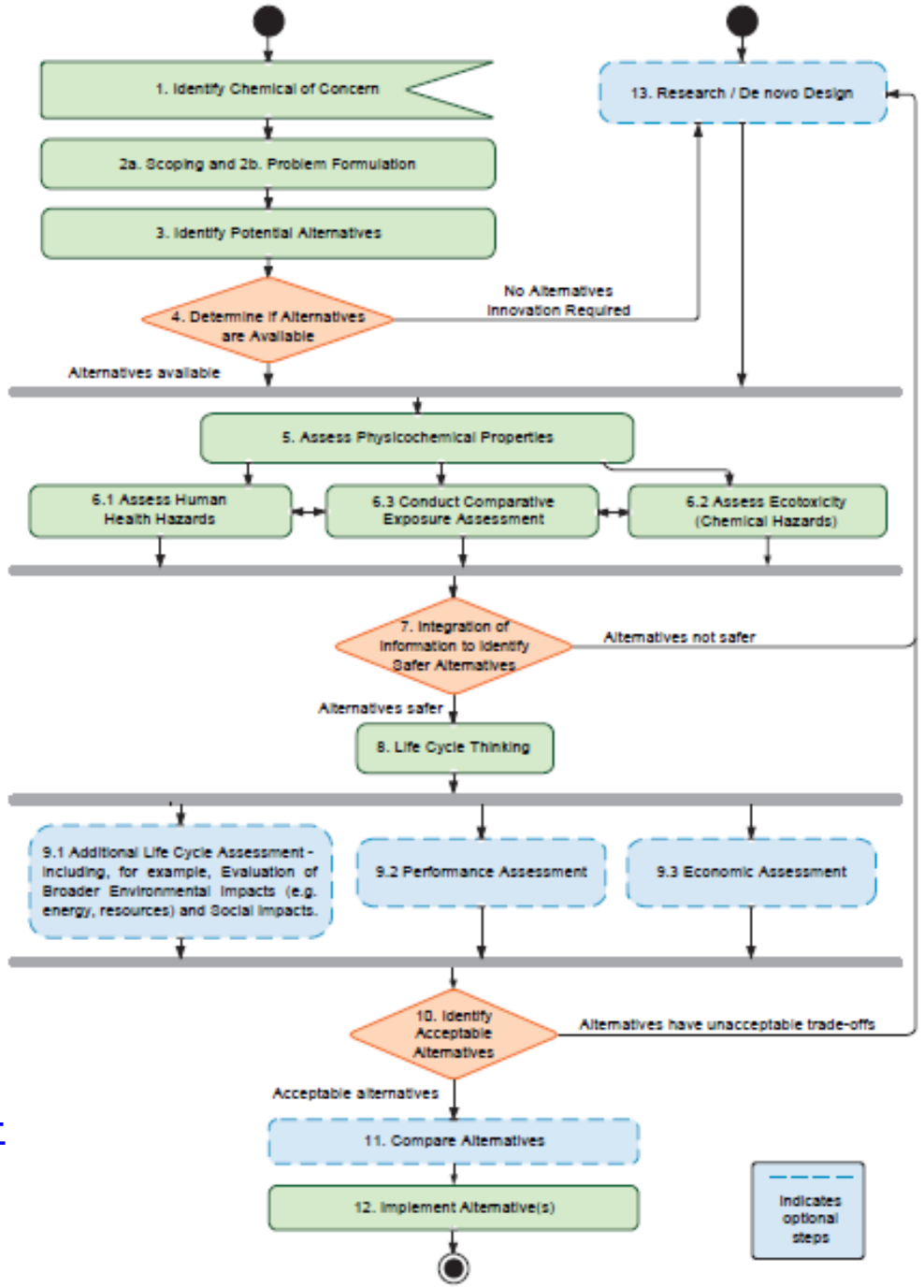
A Framework to Guide Selection of CHEMICAL ALTERNATIVES

NATIONAL RESEARCH COUNCIL
OF THE NATIONAL ACADEMIES

US National Research Council 13-Step Framework

Decision Points

Optional Steps



http://dels.nas.edu/Report/Framework-Guide-Selection/18872?bname=bcst

NAS 2014: Alternatives Assessment

is

- is a process for identifying, comparing and selecting safer alternatives to chemicals of concern.
- has a goal of facilitating an informed consideration of the advantages and disadvantages of alternatives to a chemical of concern.

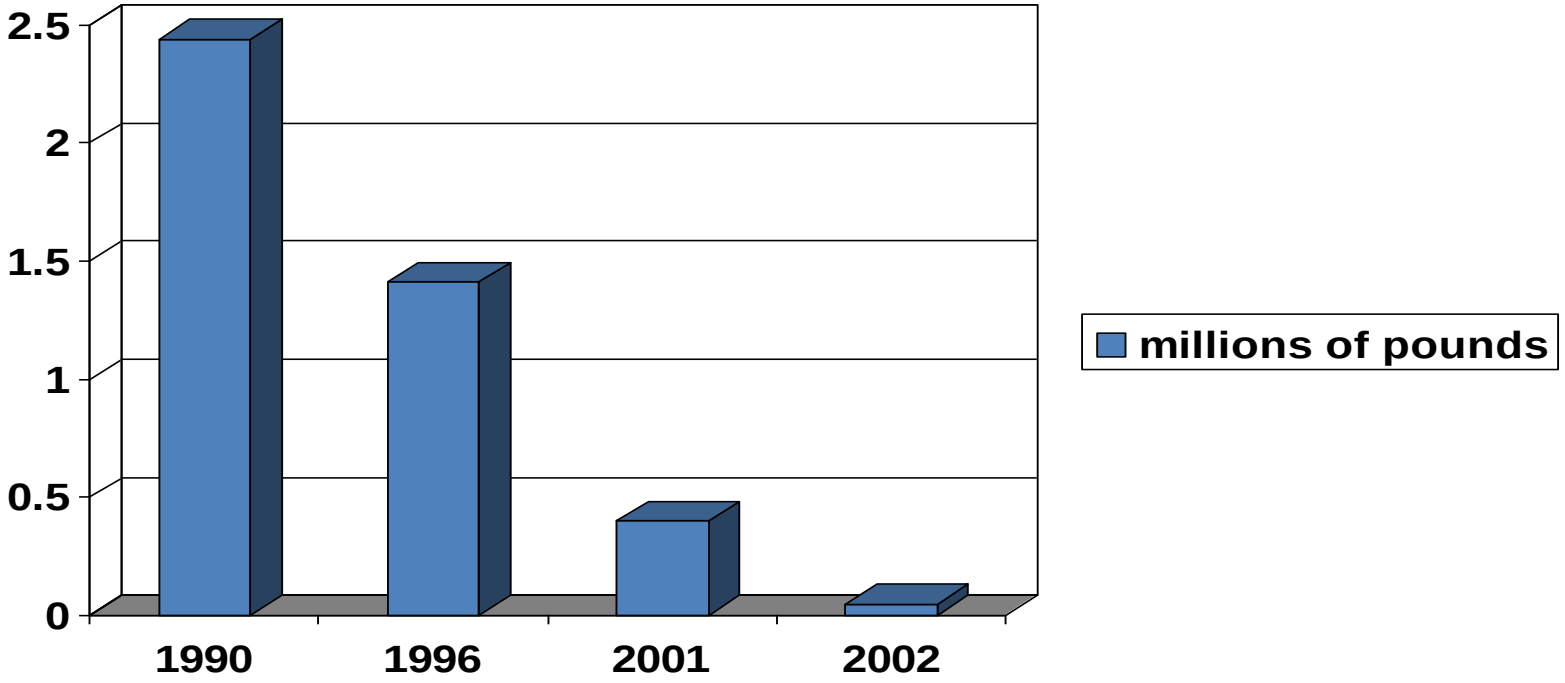
is not

- a *safety assessment*, where the primary goal is to ensure that exposure is below a prescribed standard,
- a *risk assessment* where risk associated with a given level of exposure is calculated
- a *sustainability assessment* that considers all aspects of a chemicals' life cycle, including energy and material use.

Massachusetts Toxics Use Reduction Program - Key elements of success in promoting safer alternatives

- Requirement to understand chemical use and undertake prevention planning
- Strong agency support to companies
  - On-site technical support
  - Research on alternatives
  - Technical evaluation of alternatives
  - Education and training
  - Demonstration sites, supply chains, etc

MA TCE Cleaning Use Data



The Result of the MA Toxics Use Reduction Planning and Technical Support Process

Review of Alternatives Assessment Frameworks, Jacobs, et al, 2015
http://ehp.niehs.nih.gov/1409581/#tab1

Framework	Publication Source			Purpose			
	Gov't	NGO	Academic	Regulatory	Guidance	Internal Protocol	Research
BIZNGO 2011		✓			✓		
DG Employment 2012	✓			✓	✓		
German Guide 2011	✓				✓		
Goldschmidt 1993			✓		✓		
IC2 2013	✓	✓			✓		
Lowell Center 2006			✓		✓		
MA TURI 2006/2011	✓					✓	✓
NAS 2014	✓				✓		
Ontario 2012	✓			✓	✓		
Quinn et al. 2006			✓				✓
REACh 2011	✓			✓			
Rosenberg et al. 2001			✓				✓
RSC 2007		✓	✓		✓		
TRGS 600 2008	✓			✓			
UCLA 2009/2013			✓		✓		✓
UNEP POPs 2009	✓			✓	✓	✓	
EPA CTSA 1996	✓				✓	✓	
EPA DFE 2011	✓				✓	✓	
EPA SNAP 2011	✓			✓			

General observations based on evolving frameworks, tools, and efforts

- Alternatives assessment is a robust, growing science policy discipline with evolving frameworks, methods and tools
- There are many commonalities in approaches but also some important differences. Greater consistency is needed in approaches
- There is a need for enhanced, readily available data to conduct alternatives assessments and actionable information for decision-making
- The field would benefit from greater cross-sectoral collaboration and sharing of data, knowledge, and practical case examples

Differences in approach

US

- Market driven
- Focus on process
- Focus on assessment and implementation
- Hazard focus (work on specific endpoints to consider)
- Increasing expansion to other properties – lifecycle, etc.
- Tendency towards prescriptive approach
- Done by government and sometimes industry

EU

- Policy driven (occupational health and environment)
- Focus on outcome
- Focus primarily on assessment
- Risk focus
- Focus primarily on risk, economics, and performance
- Tendency towards guidance
- Done primarily by industry

Research needs moving forward

- Development of core hazard endpoints and criteria
- Data type integration and data gap filling in hazard assessment
- Rapid exposure characterization (to identify potential trade-offs)
- Tools to integrate lifecycle thinking into alternatives assessments and compare chemical and non-chemical alternatives
- Consistent approaches to economic and performance assessment?
- Tools to more effectively integrate multiple attributes into decisions

Lessons learned on alternatives assessment

- Remember solutions-focus and action orientation
- Avoid Paralysis by Analysis – goal is “excellent action” not “excellent paper work”
- Keep it flexible and iterative and adaptable to decision-contexts and different users
- Develop tools for rapid evaluation
- Be comprehensive in choice of alternatives (focus on function) and scope, inclusive, and transparent
- Focus on both assessment and adoption
- Support innovation and new chemical/material design
- Opportunities for US-EU collaboration moving forward

Resources on alternatives assessment

- Massachusetts Toxics Use Reduction Institute – www.turi.org research, training, resources
- Lowell Center for Sustainable Production – www.sustainableproduction.org Alternatives Assessment Framework, alternatives assessments etc.
- US EPA Design for Environment Program – http://www2.epa.gov/saferchoice - research, methods, recognition program
- Interstate Clearing House on Chemicals - http://www.theic2.org/ - guide, completed alternatives assessments
- Clean Production Action – www.cleanproduction.org – GreenScreen, Plastics Scorecard and BizNGO working group for safer chemicals (biznGO.org)
- OECD Alternatives Assessment Tool Selector - http://www.oecdsaatoolbox.org/
- Subsport Project – www.subsport.eu – database of case studies, evaluations, resources, links

For more information

- Joel Tickner
  joel_tickner@uml.edu
- Toxics Use Reduction Institute
  www.turi.org
- Green Chemistry and Commerce Council
  www.greenchemistryandcommerce.org
- International Symposium on Alternatives Assessment
  www.saferalternatives.org