

# Today, and the Challenges of Tomorrow!



Karl Palmer, Manager  
Pollution Prevention Branch  
Department of Toxic Substances Control  
Used Oil and HHW Conference  
March 8, 2011

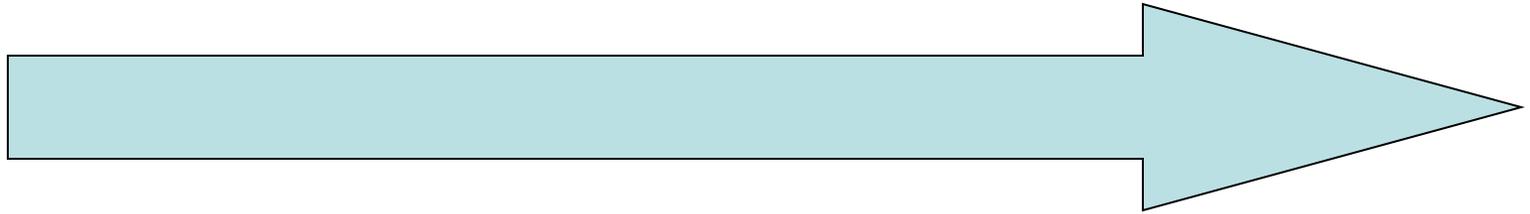
# ***Changing Gears: Staying on Track for the Future!***



# Historic Approach: Cradle to Grave



Risk Assessment

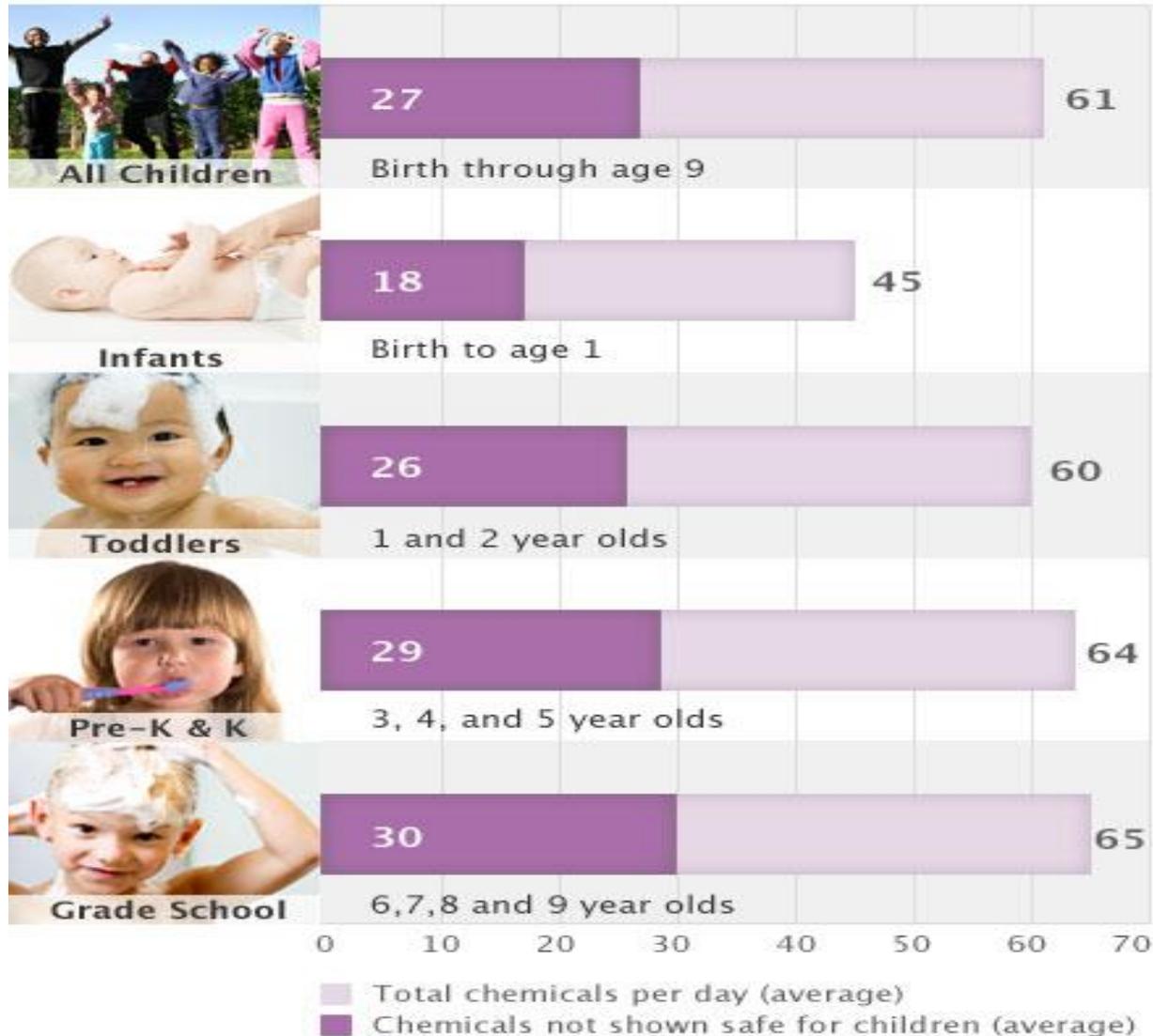


Chemicals (TSCA)

Haz Waste (RCRA)

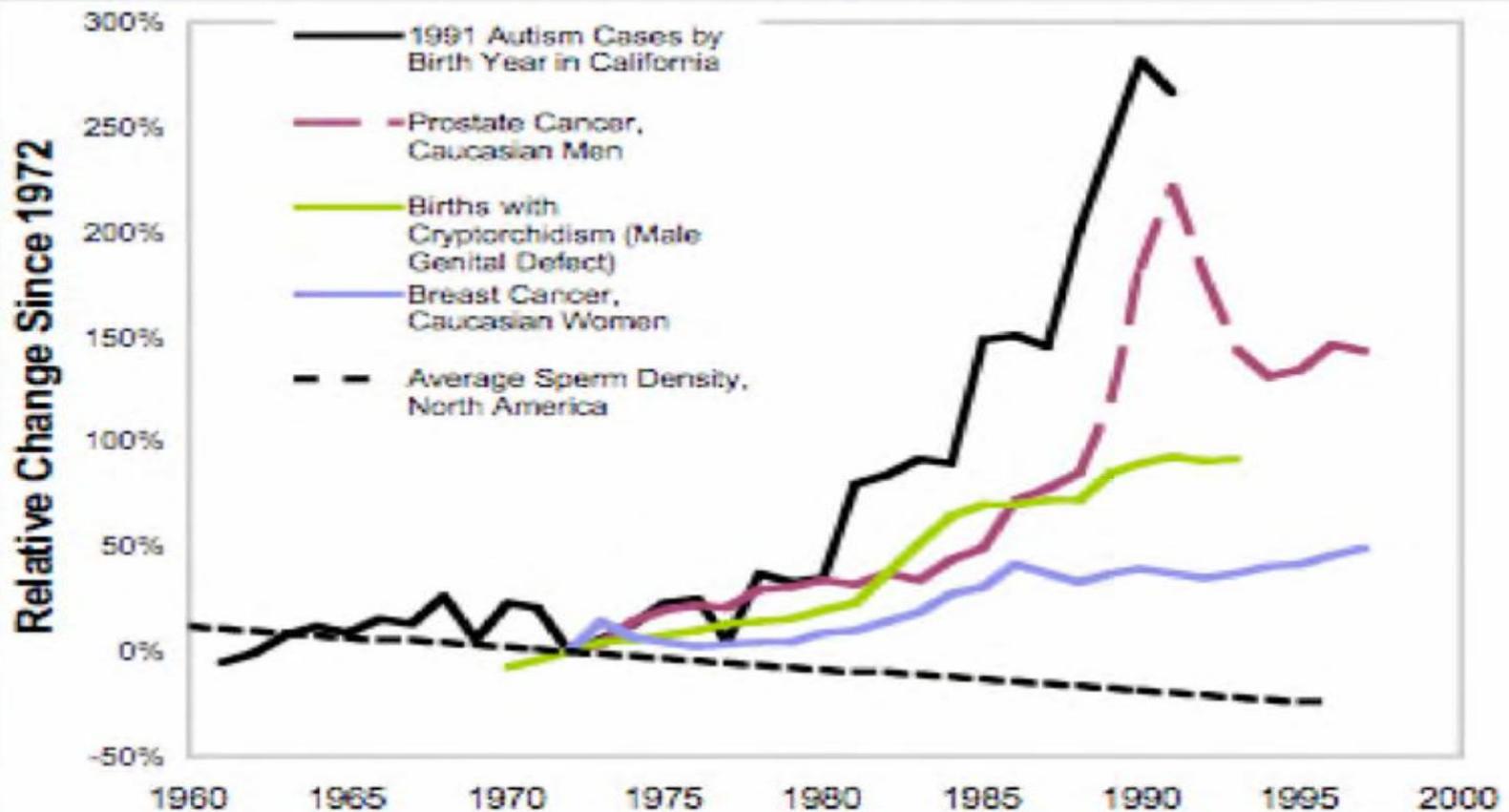
Superfund (CERCLA)

# Childhood Toxics Exposure from Products



# Is Regulating Toxic Waste Good Enough?

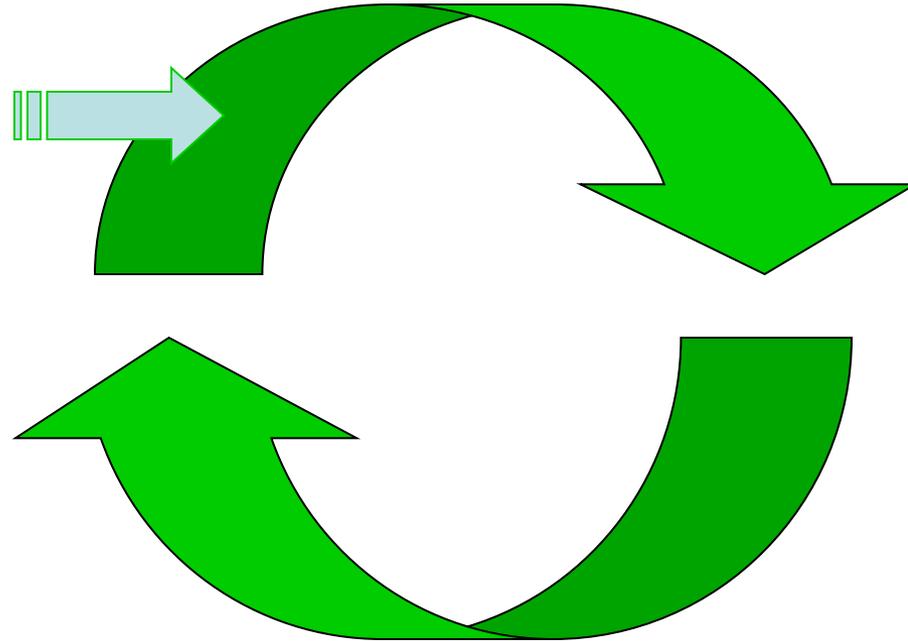
Figure 2: Relative Increase in Disease Incidence Rates Over the Last 40 Years



# What Track Should We Take?



# The Future: Cradle to Cradle Zero Waste, Sustainability



# *The Three Spheres of Sustainability*



*Adopted from the 2002  
University of Michigan  
Sustainability Assessment*

# Heading Upstream...



- **2001: BAN CRTs from landfills**
- **2006: Households no longer can legally dispose batteries, fluorescent lamps and hg thermostats in landfills (“Ban without a plan...”)**



# Since 2001, a Series of California Laws on Toxics in Products...

- Mercury vehicle switches
- Mercury fever thermometers
- Mercury-added novelties
- Mercury thermostats
- Mercury-containing devices and materials for use in K-12 Schools
- Mercury-containing motor vehicle light switches
- Mercury relays

# Since 2001, a Series of California Laws on Toxics in Products...

- Mercury “psychometers”
- Mercury manometers
- Mercury pyrometers
- Mercury sphygmomanometers
- Mercury thermometers
- PentaDBE in products
- OctaBDE in products
- Toxic metals in electronics
- Cell phones

# And New Laws in 2010...

- Cadmium in Children's Jewelry SB 929: limits cadmium to <300 ppm
- Brake Pads: SB 346: Phased-in limits on metals, asbestos fibers
- Glass Beads: AB 1930: Restricts lead and arsenic in glass beads used for sand blasting



# A Variety of Approaches for Regulating Toxics in Products...

- Restrict the chemical
- Phase out the chemical
- Ban use of the chemical outright
- Impose “extended producer responsibility (EPR)



# Challenges of Implementing Legislative Bans and Restrictions

- Understanding the law
- Informing stakeholders
- Monitoring compliance/detecting violations
- Enforcement

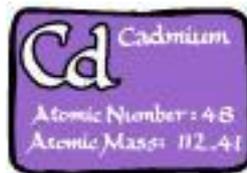


# Challenges: RoHS

- California's legislation has made *parts of* European Union legislation, *Directive 2002/95/EC of "on the restriction of the use of certain hazardous substances in electrical and electronic equipment"* applicable to certain products sold in our State
- "As amended"
  - The EU law has been regularly amended, requiring California to track a moving target

# RoHS in Electronics

- Four of the EU's six substances restricted
  - Mercury, Lead, Cadmium, Hexavalent Chromium
  - In “homogeneous materials” (one device = hundreds or thousands of homogeneous materials)
- Only certain devices are subject to RoHS in California: video display devices tested/listed
- Challenges:
  - Complex, slow, expensive lab testing
  - Huge number of constantly changing products



Is the lamp a high-intensity discharge light (e.g., metal halide, mercury vapor, or a low- or high-pressure sodium lamp)?

No  
↓

Does the lamp (or light) contain mercury?

No  
↓

Is lead used in high-melting-temperature type solders?

No  
↓

Is lead used in steel, aluminum, or copper alloy?

No  
↓

Yes  
←

Is the lamp (or light) a very compact energy-saving lamp?

**RoHS Application 22.** No restrictions on lead with PbBiSn-Hg and PbInSn-Hg in specific compositions as main amalgam and with PbSn-Hg as auxiliary amalgam in very compact Energy Saving Lamps (ESL).

RoHS exemption for Lead (Application 22).

Your lamp may contain no more than a maximum concentration in homogenous materials of:

- 0.1% by weight (1,000 ppm) of lead,
- 0.1% by weight (1,000 ppm) of hexavalent chromium, PBBs, or PBDEs, and
- 0.01% by weight (100 ppm) of cadmium.

# Successes: a Few Examples

- Lead in Jewelry Law
- Toxics in Packaging Prevention Act
- Lead Wheel Weigh Ban

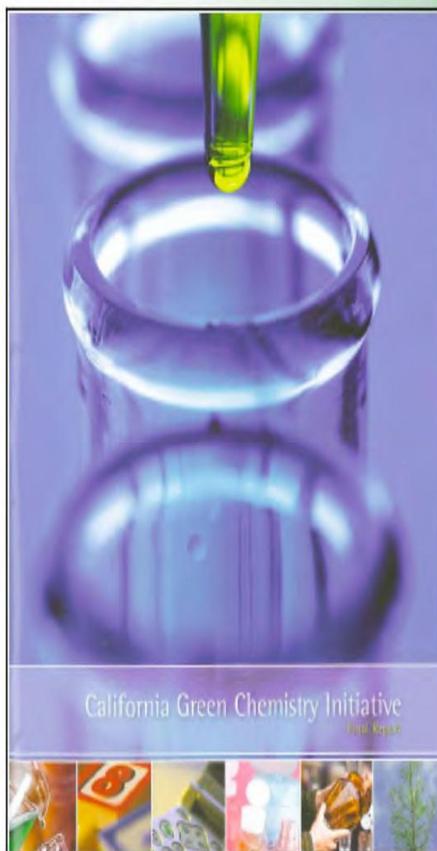


# Success: Ban on Lead Wheel Weights

- Simple product, single chemical, finite universe of sellers
- Readily available, less toxic substitutes
  - DTSC discusses alternatives on its web site—and concerns about aquatic toxicity of zinc—without endorsing or condemning any product
- Survey of manufacturers and distributors:
  - Were prepared for the ban
  - Provided easy exchange of Pb inventory for Zn or steel.
  - Car manufacturers were already using the alternatives, so compliance is believed to be high



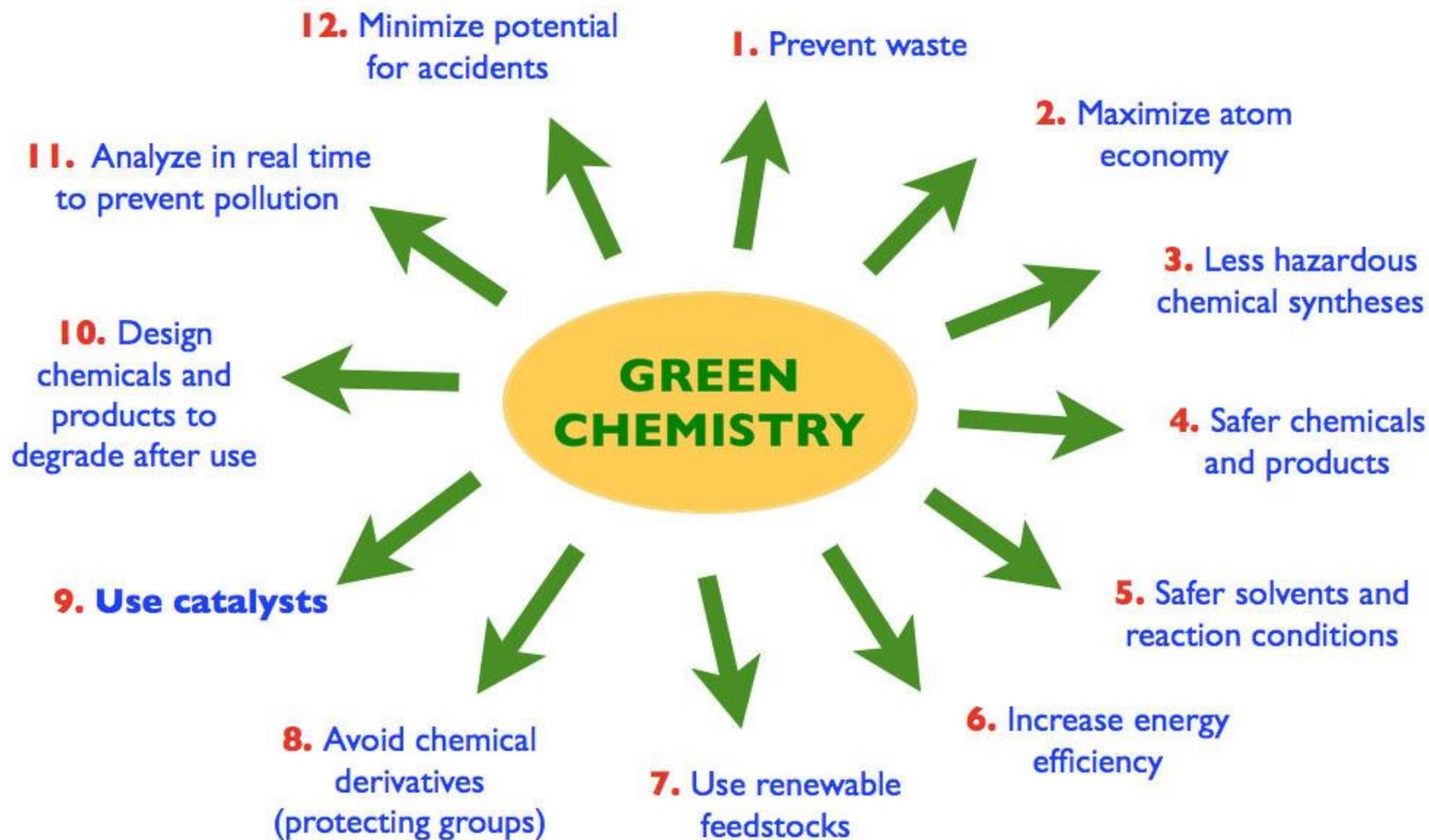
# Green Chemistry Initiative



## *California Green Chemistry Initiative Final Report*

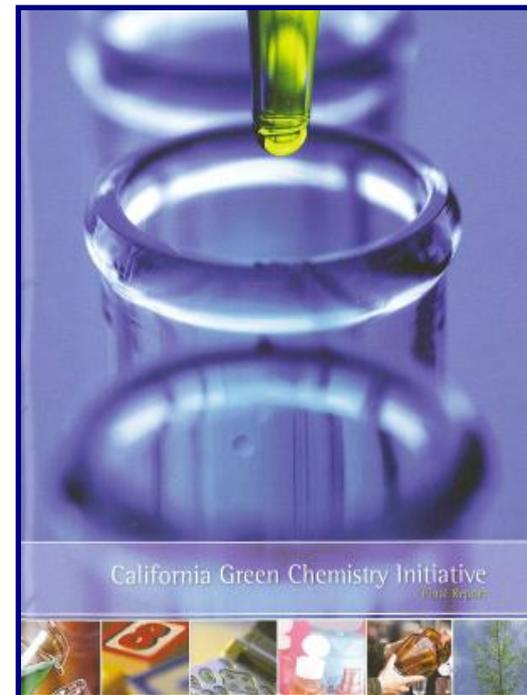
On DTSC website: <http://www.dtsc.ca.gov/GreenChemistry>

# 12 Principles Of Green Chemistry



# ***State Policy Framework Six Recommendations:***

- 1. Expand Pollution Prevention**
- 2. Develop Green Chemistry Education, Workforce, Research, and Tech Transfer Infrastructure**
- 3. Create Online Product Ingredient Network**
- 4. Create Online Toxics Clearinghouse**
- 5. Accelerate Quest for Safer Alternatives**
- 6. Move Toward Cradle-to-cradle Economy**



***Final Report***  
***[www.dtsc.ca.gov](http://www.dtsc.ca.gov)***

# *Expand Pollution Prevention*

Assist California facilities to shift their focus from end-of-pipe waste management to greener design and production.

## **Actions**

- Spread technology and information resources to more businesses, support a statewide Green Business program
- Expand voluntary program to include tools to reduce chemical use



# *Accelerate Quest for Safer Products*

- Assess chemicals in products
- Identify safer alternatives
- Allow for regulatory responses

## **Actions**

- Develop regulations / prioritize chemicals of concern
- Develop science-based alternatives assessment decision-making tool
- Coordinate with existing consumer protection & product safety efforts

# *Green Chemistry: Two Laws*

- AB 1879 (Feuer): Framework to respond to chemicals of concern and to assess alternatives
- SB 509 (Simitian): Increase information about toxicity for chemicals via an online portal

# *What is the On-line Toxics Clearinghouse?*

Established by SB 509:

- “Decentralized Web-based system for the collection, maintenance, and distribution of specific chemical hazard trait and environmental and toxicological end-point data”
- “Accessible to the public through a single Internet Web portal”
- DTSC shall “operate the clearinghouse at the least possible cost to the state”

# AB 1879

- DTSC shall establish a process to identify and prioritize chemicals of concern in consumer products, which will include:
  - Volume in commerce
  - Exposure potential
  - Potential effects on sensitive subpopulations
- As part of the process, DTSC shall develop criteria for evaluating chemicals and alternatives, which will include:
  - “The traits, characteristics and endpoints that are included in the clearinghouse data”

# Applicability

- All consumer products put into the stream of commerce in CA
- Except:
  - Prescription drugs and devices and their packaging
  - Dental restorative materials
  - Medical devices
  - Food
  - Pesticides
  - Hg containing lights exempt through 2011
  - Unintentionally added chemicals

# Guiding Principles

- Use of green chemistry principles and life cycle thinking
- Reduce or eliminate adverse public health and environmental effects resulting from production, use or EOL management of consumer products
- Encourage redesign of consumer products and manufacturing processes
- Priority should be given to chemicals and consumer products which pose the greatest threats

# Alternative Assessments

- Identify the selected alternative and provide rationale
- Demonstrate that chosen alternative will not have greater significant adverse impact on public health or environment – not a regrettable substitution
- Regulatory response?

# Regulatory Response Options

- EOL Management Requirements
- Sales ban
- Product Labeling
- Engineered safety measures
- Restrictions on use
- R&D projects and GC challenge grant
- Any other regulatory response necessary to reduce public health or environmental hazards posed by product



# Regulation for Safer Consumer Products

ARTICLE 14, CHAPTER 6.5, DIVISION 20 OF THE HEALTH & SAFETY CODE  
CHAPTER 53, DIVISION 4.5, TITLE 22, CALIFORNIA CODE OF REGULATIONS  
DRAFT REGULATORY FLOW CHART





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## Prioritization



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Prioritization

Alternatives  
Assessment



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Prioritization

Alternatives  
Assessment

Regulatory Response

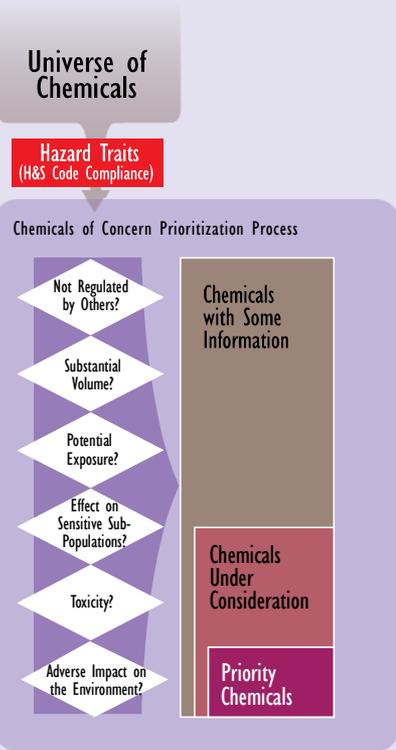


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## Prioritization



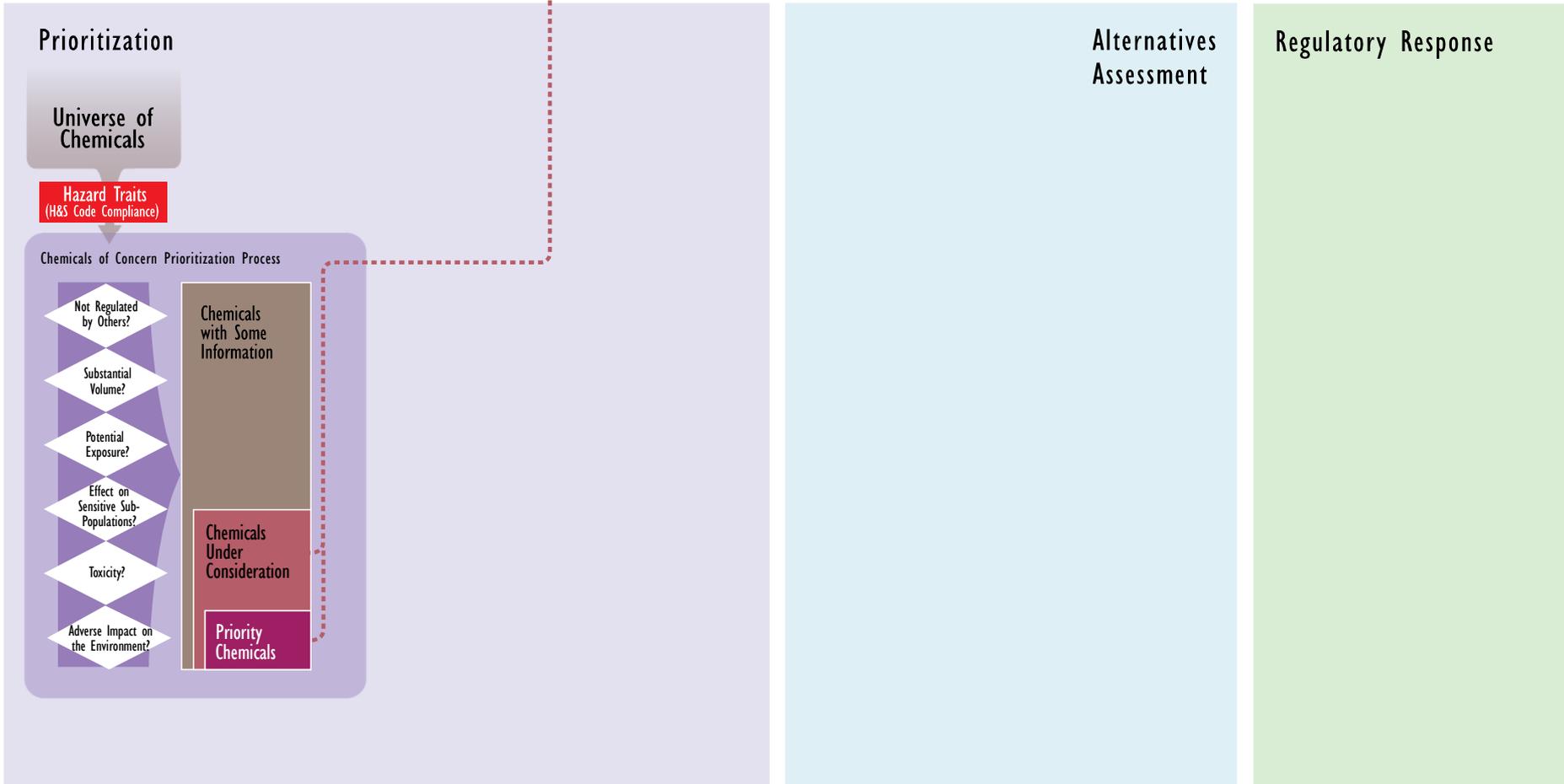
## Alternatives Assessment

## Regulatory Response



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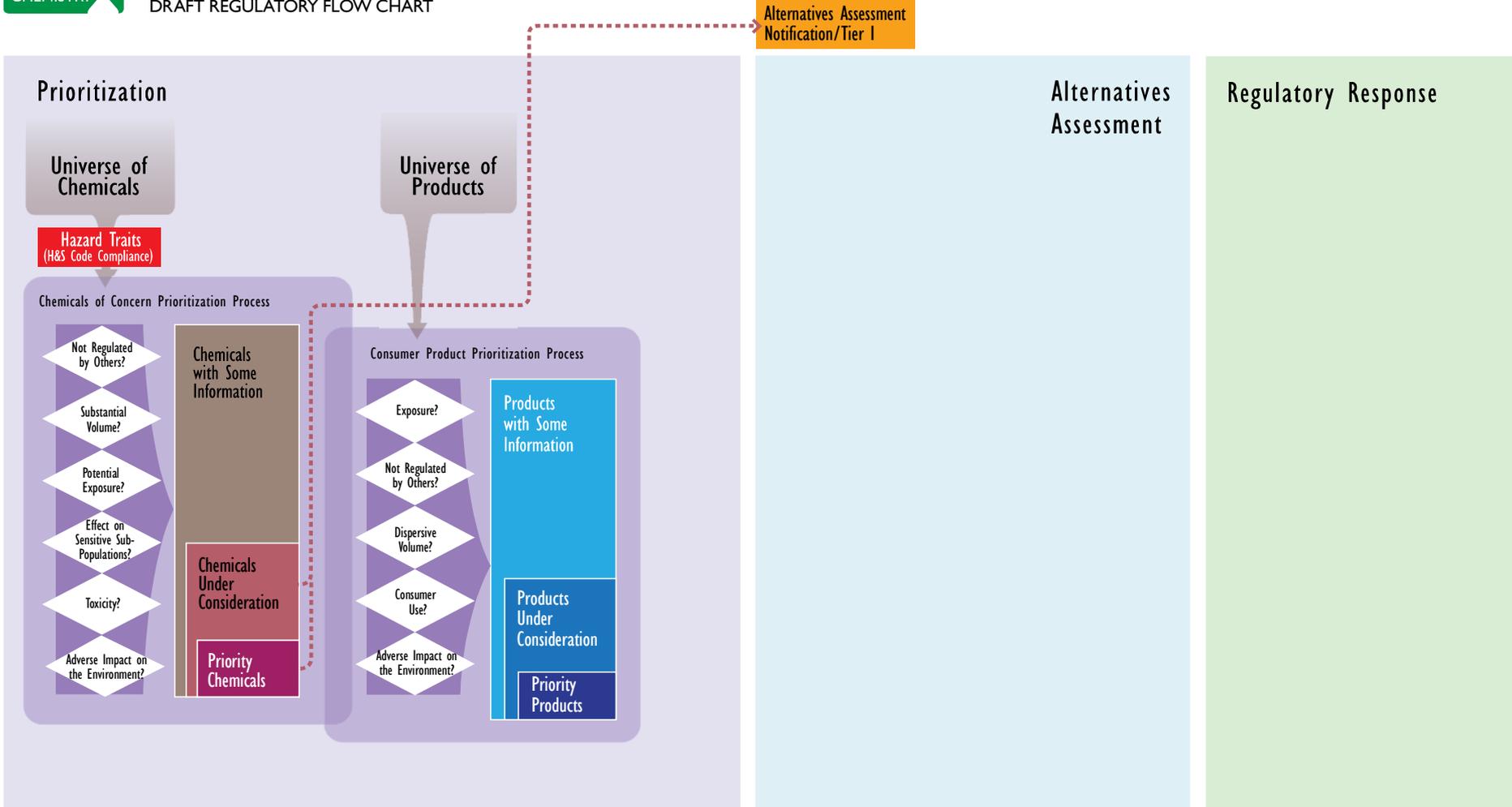
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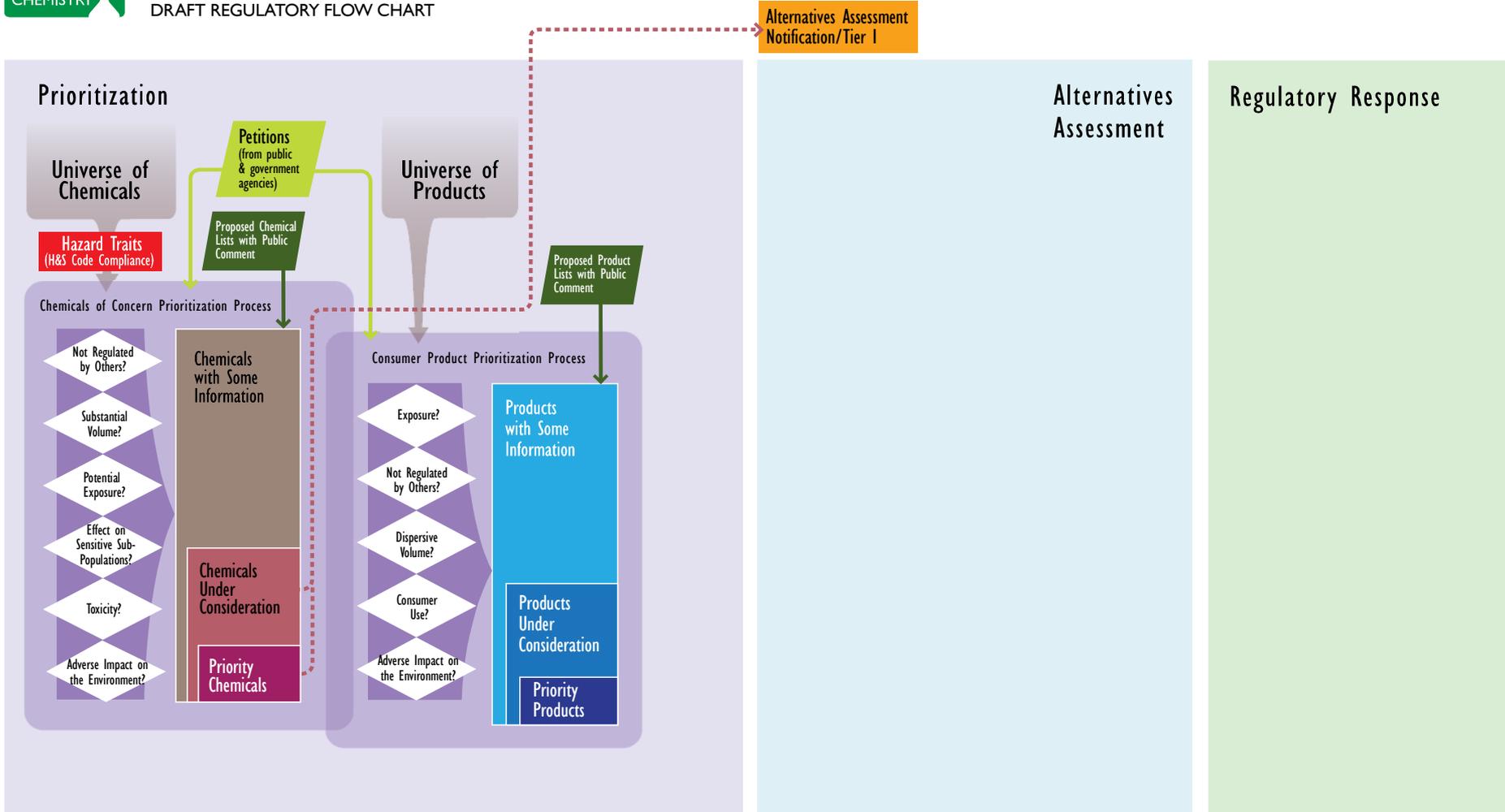
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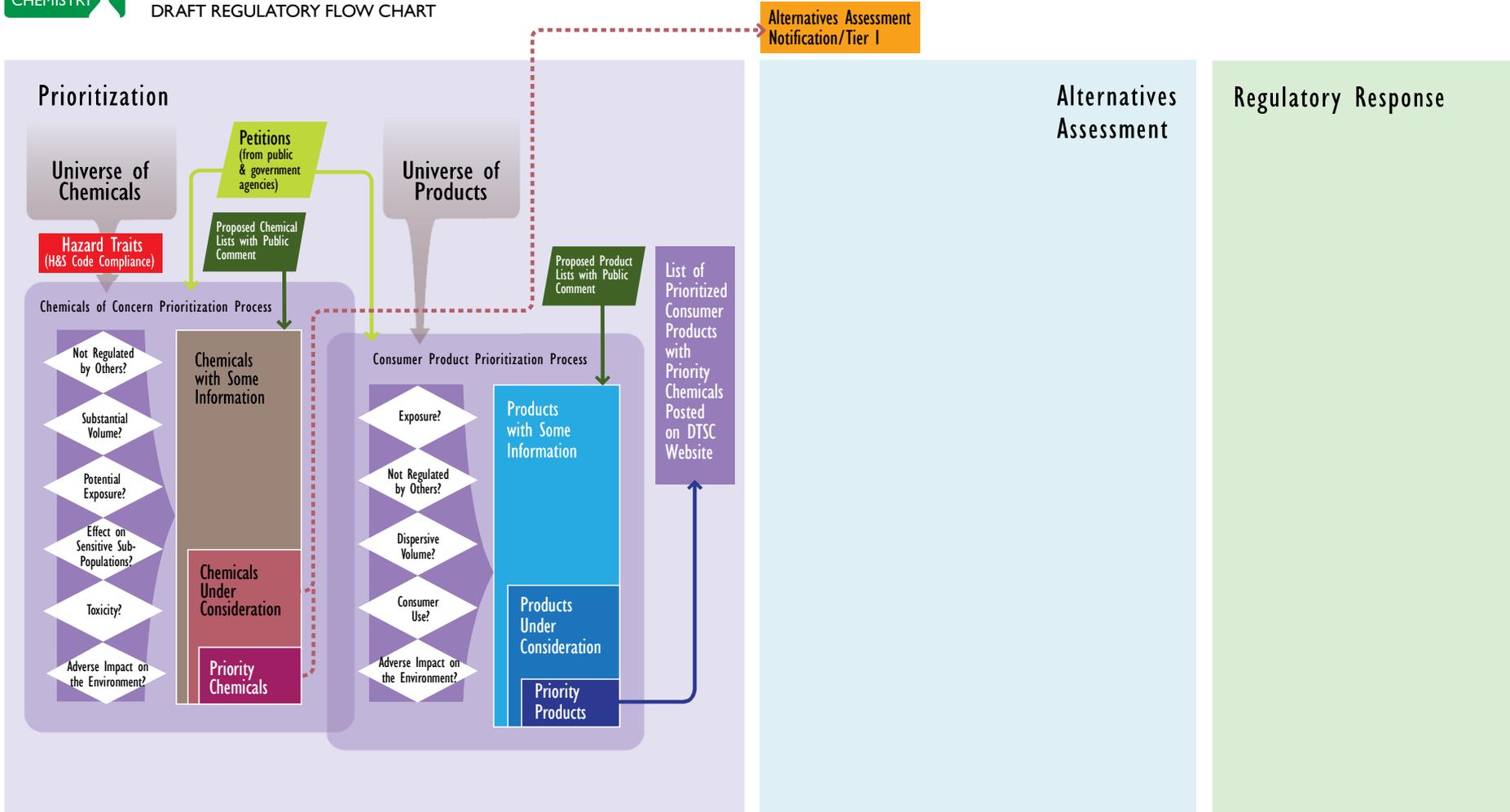
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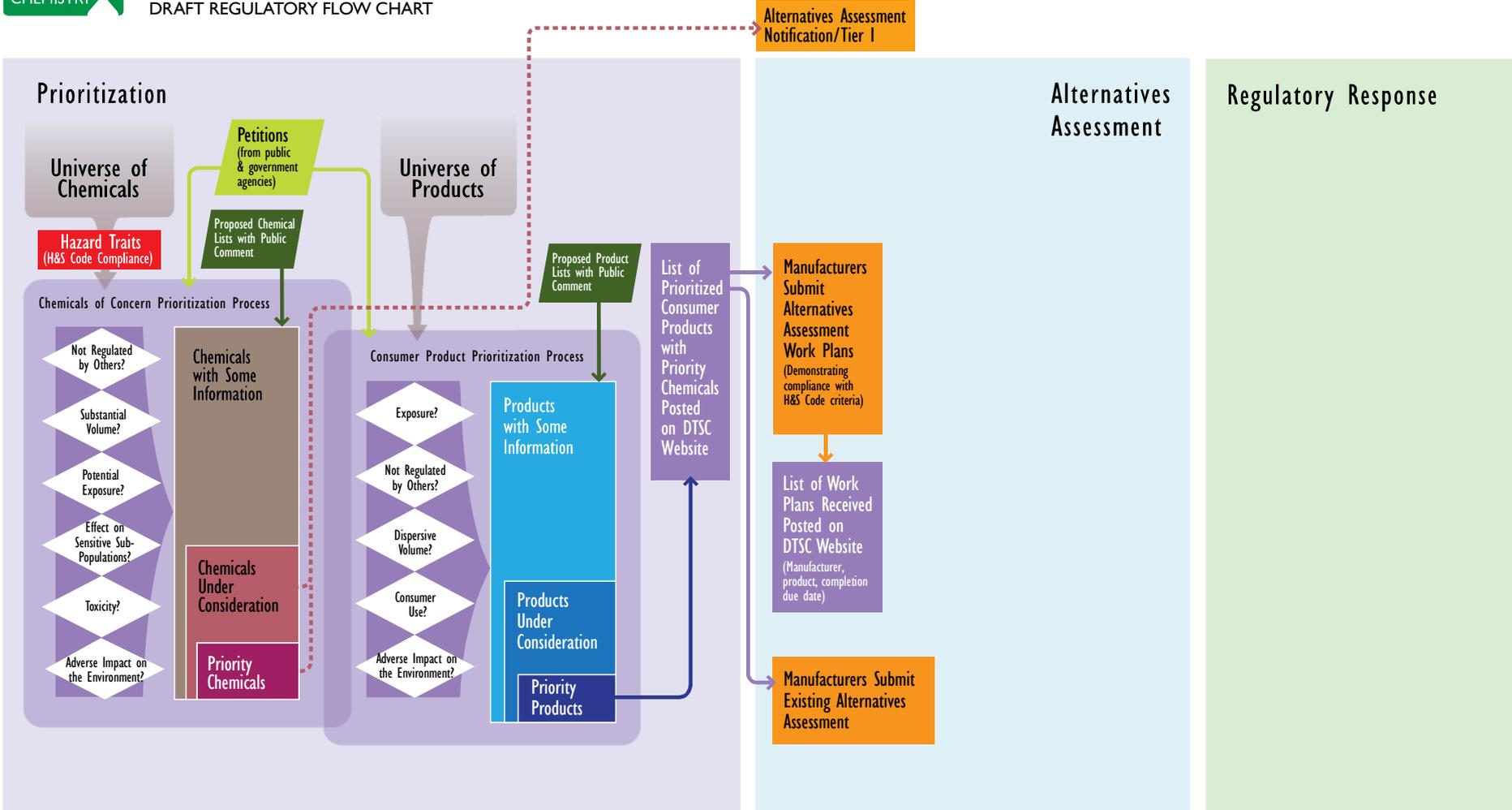
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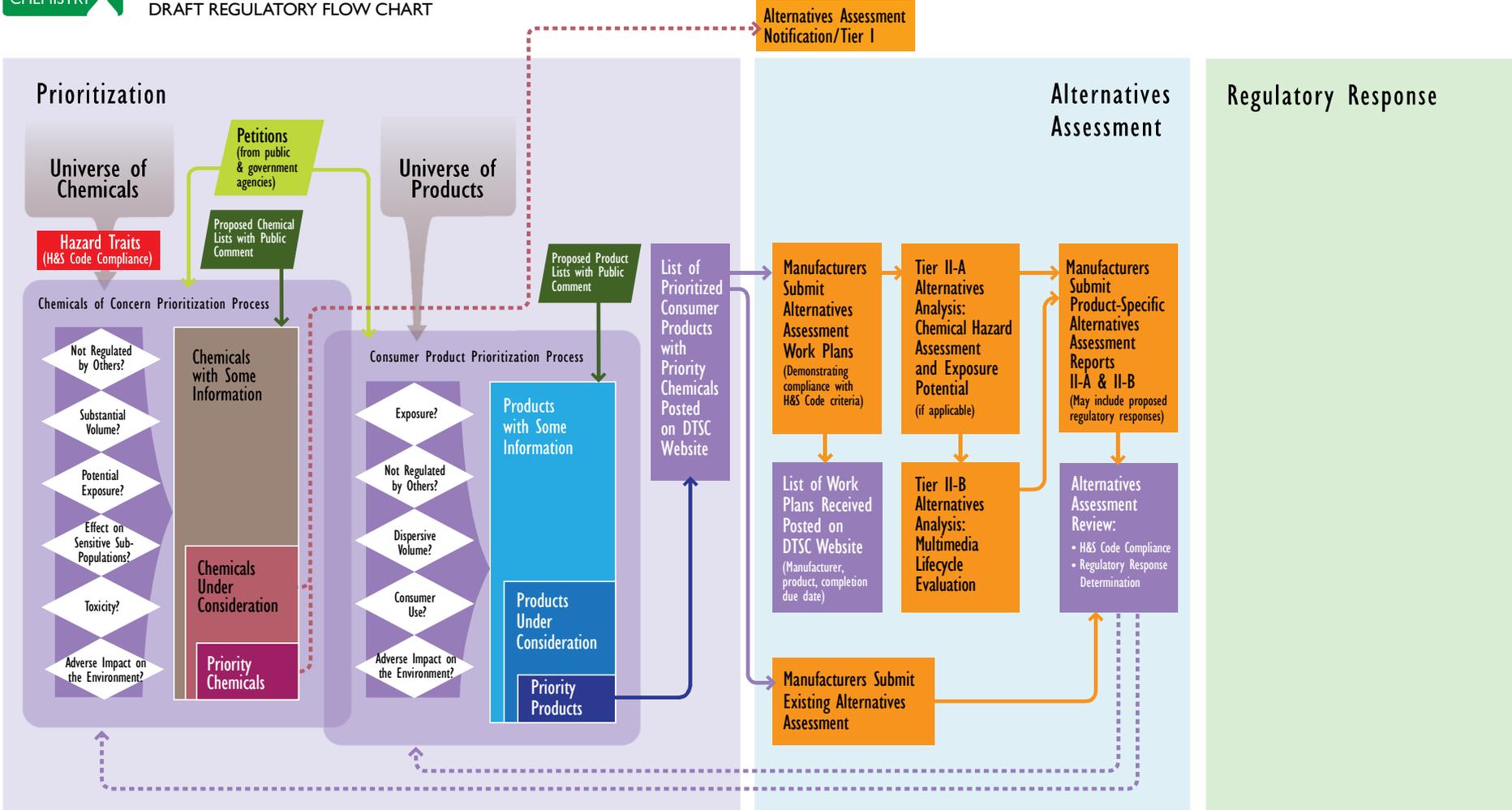
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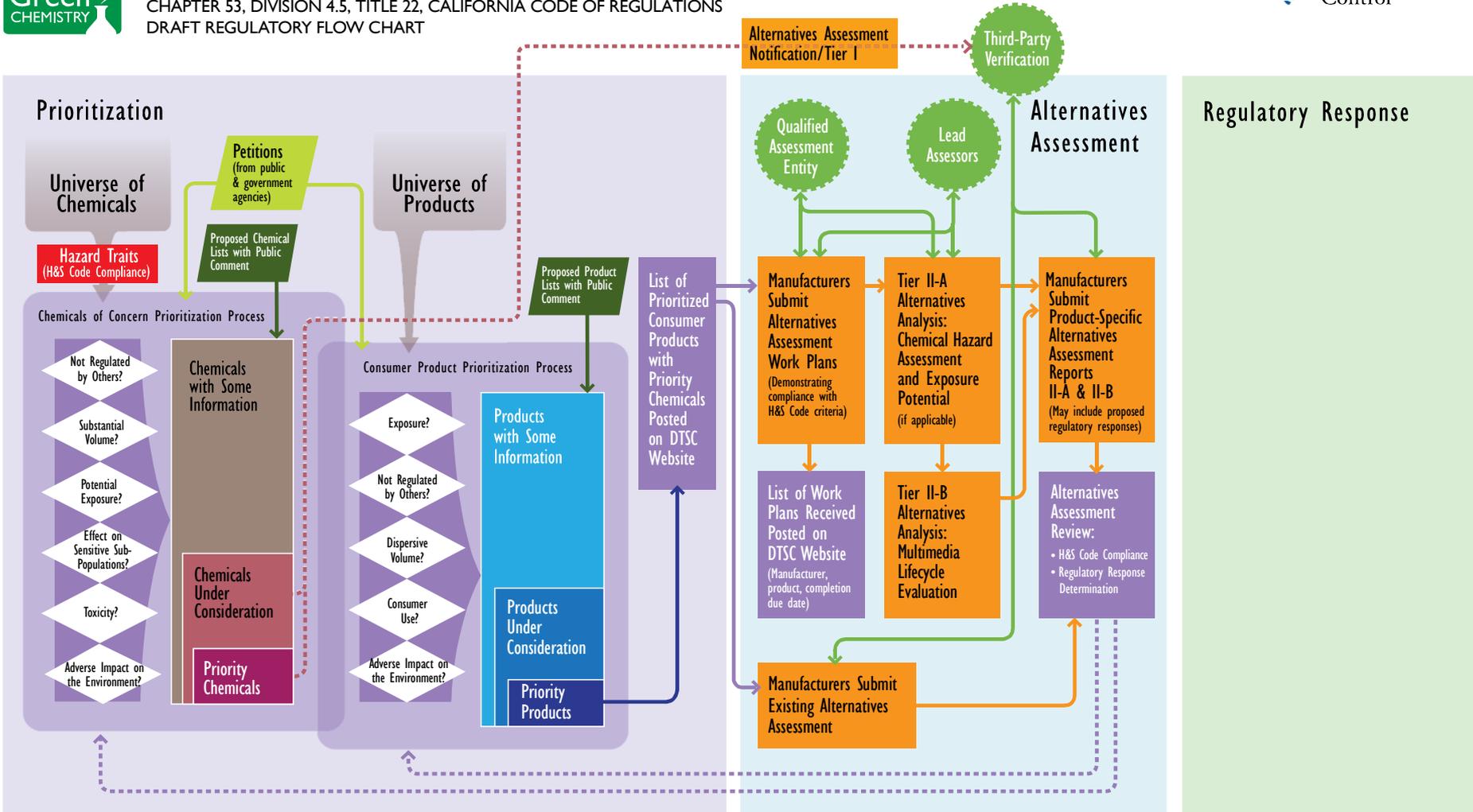
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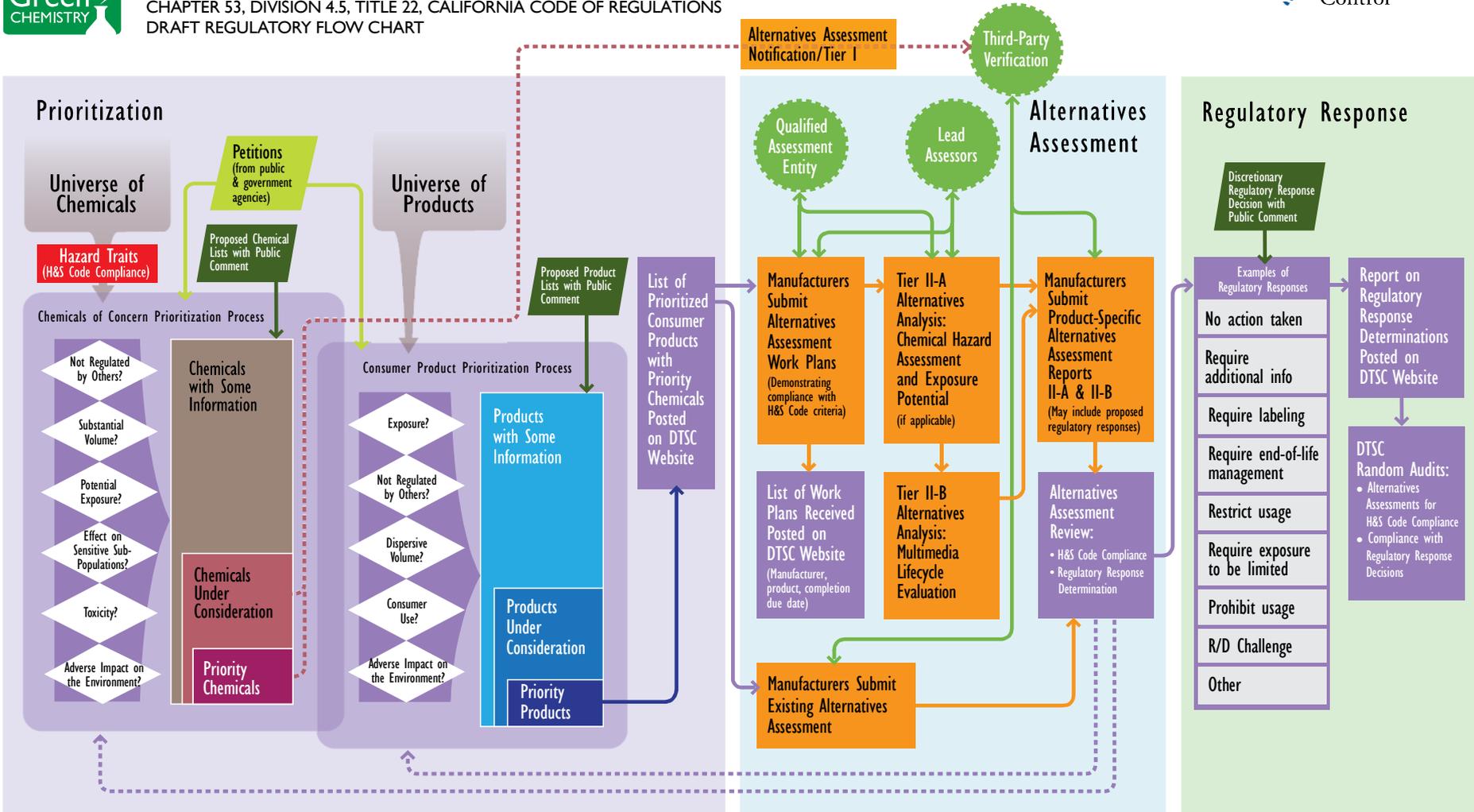
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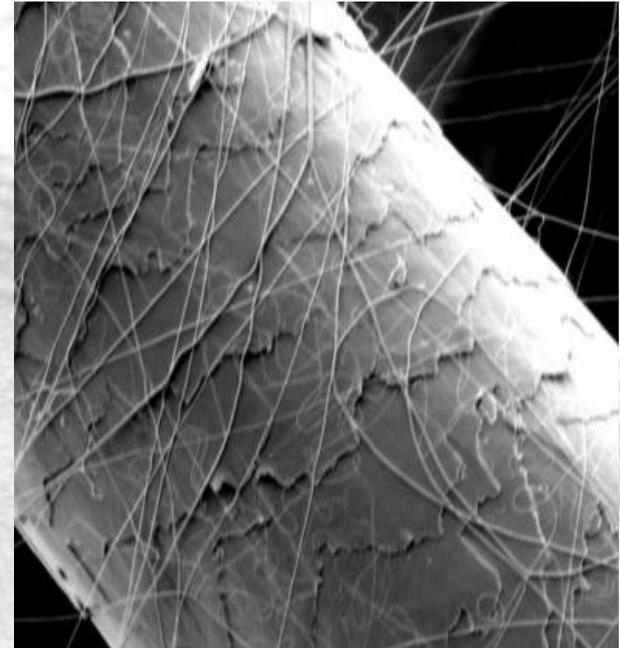
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# What about Nanotechnology?

- Nanoscale: 1 ~999 nm in the metric system.  $1\text{nm}=10^{-9}\text{m}$
- 1 ~ 100 nm or 500nm
- Different properties from same bulk materials
  - mechanical, electrical, and thermal, etc.
  - Small size and large surface area
- Types
  - Carbon based:
    - carbon nanotubes (CNTs)
    - fullerenes ( $n\text{C}_{60}$ )
    - graphene, etc.
  - Metals: Au, Ag, Al, Fe, Pt, etc.
  - Metal oxides:  $\text{TiO}_2$ ,  $\text{SiO}_2$ , ZnO,  $\text{CeO}_2$ , etc.
  - Others: Quantum dots, dendrimers, etc.

human hair vs. CNTs



Source: unknown

# Applications of Nano

Automobile



Self cleaning



Sports



Fuel additives



Display



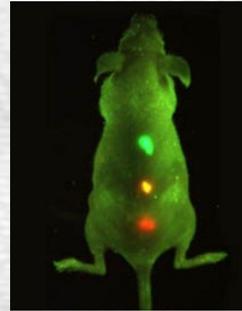
Energy



Textiles



Bio-Health



A.C.



Anti-bacteria



EMI shielding



Cosmetics

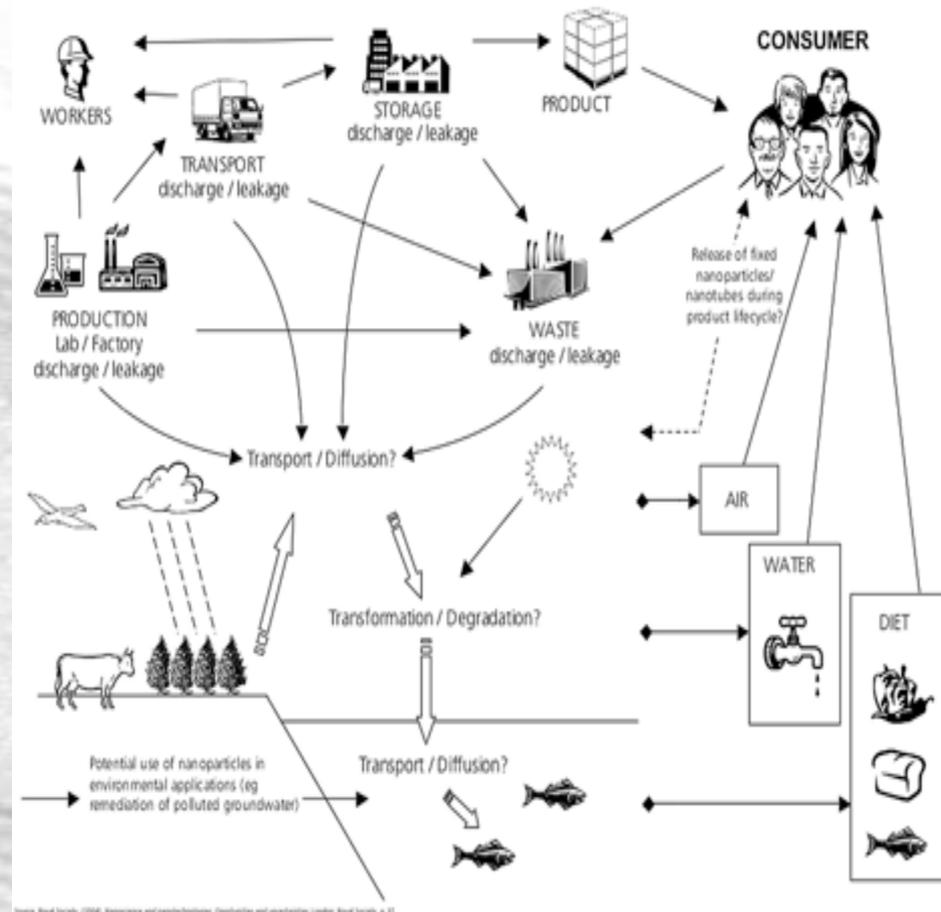


Paints



# Concerns

- **Uncertain** about **hazards** that maybe associated with size, shape, chemical/physical properties, etc.
- **Unknown** exposures
- **Lack** of standardized **analytical and hazard evaluation** methodologies...
- Need solutions **up front**, i.e. Pollution Prevention (P2) and Green Chemistry



# Information Call-in from manufacturers

- **Background: Assembly Bill 289**  
**California's Health & Safety Code Chapter 699,**  
**Section 57019-20**

*This bill authorizes a state agency to request a manufacturer to provide with specified information regarding the chemical.*

- **Manufacturers Responsible**
- **Mandatory program**

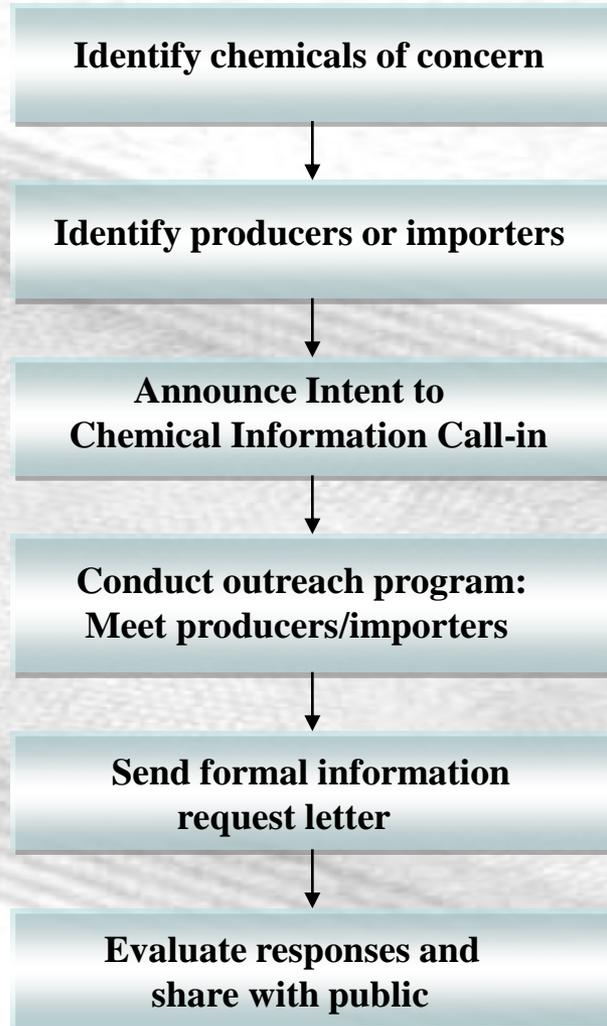
**First material: Carbon Nanotubes in 2009**

# WHAT MAY BE REQUESTED

The information requests may include, ***but is NOT limited to:***

- **An analytical test method for that chemical**
- **Information on the fate and transport of chemical**
- **Information on environmental health and safety of chemical**
- **Information on workers safety**

# Call-in Process steps



# Progress in Data Call-in

- Identified and contacting manufacturers in California
- Coordinate with manufacturers to develop and approach to filling information gaps
- Completed 1st phase call-in on CNT
- Partnered with US EPA on scientific symposiums and academia on nanomaterial safety in the workplace
- Developing partnerships with the nanotechnology sector
- Information requesting letter
  - Next call-in will be nanometals and nanometal oxides
  - After receiving the letter, manufacturers have to reply within 365 days

# Expectations and benefits

- In-depth understanding the nature of nanomaterials
- Develop data base and help to fill out existing data base
- Encourage protection for nano-specific safety and health
- Sustainable development of Nanoindustry in California
- Get more information into the marketplace
- Develop safe nanomaterials

# It is a process...

## STEPS TO SUSTAINABILITY



Clean Production Action



# Questions?

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