

Berkeley Center for Green Chemistry: A Novel Interdisciplinary Approach to Chemical Sustainability



Michael P. Wilson, PhD, MPH
Megan R. Schwarzman, MD, MPH

Dean Richard Mathies, PhD, College of Chemistry
Dean Stephen Shortell, PhD, MPH, School of Public Health



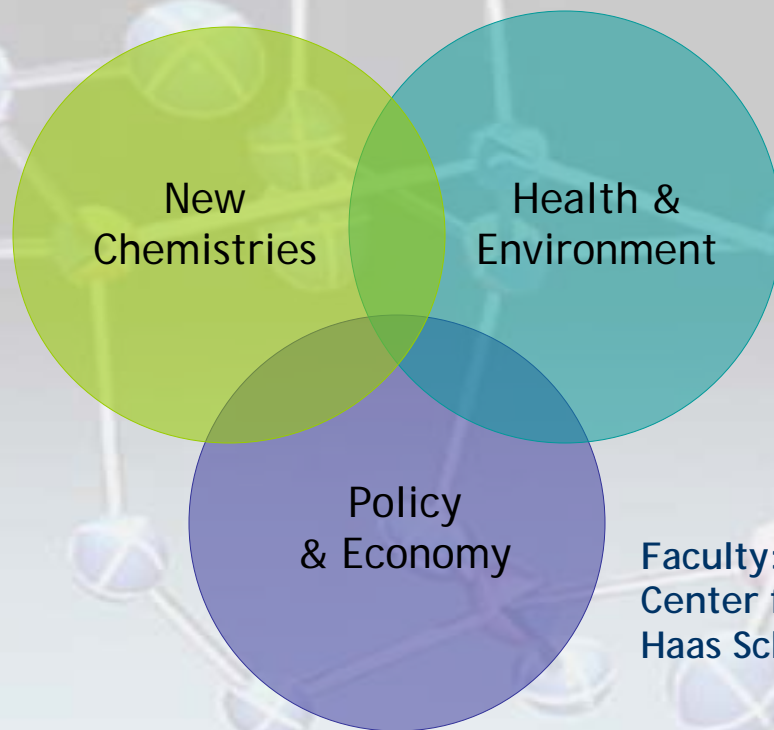
University of California, Berkeley
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Berkeley Institute of the Environment



**THE BERKELEY INSTITUTE
OF THE ENVIRONMENT**
UNIVERSITY OF CALIFORNIA, BERKELEY



Berkeley Center for Green Chemistry



Faculty:
College of Chemistry
College of Engineering

Faculty:
School of Public Health
College of Natural Resources

Faculty:
Center for Law, Energy and Environment
Haas School of Business

Education, Research, Engagement

European Union Affecting Global Change



Cosmetics Directive (2004)

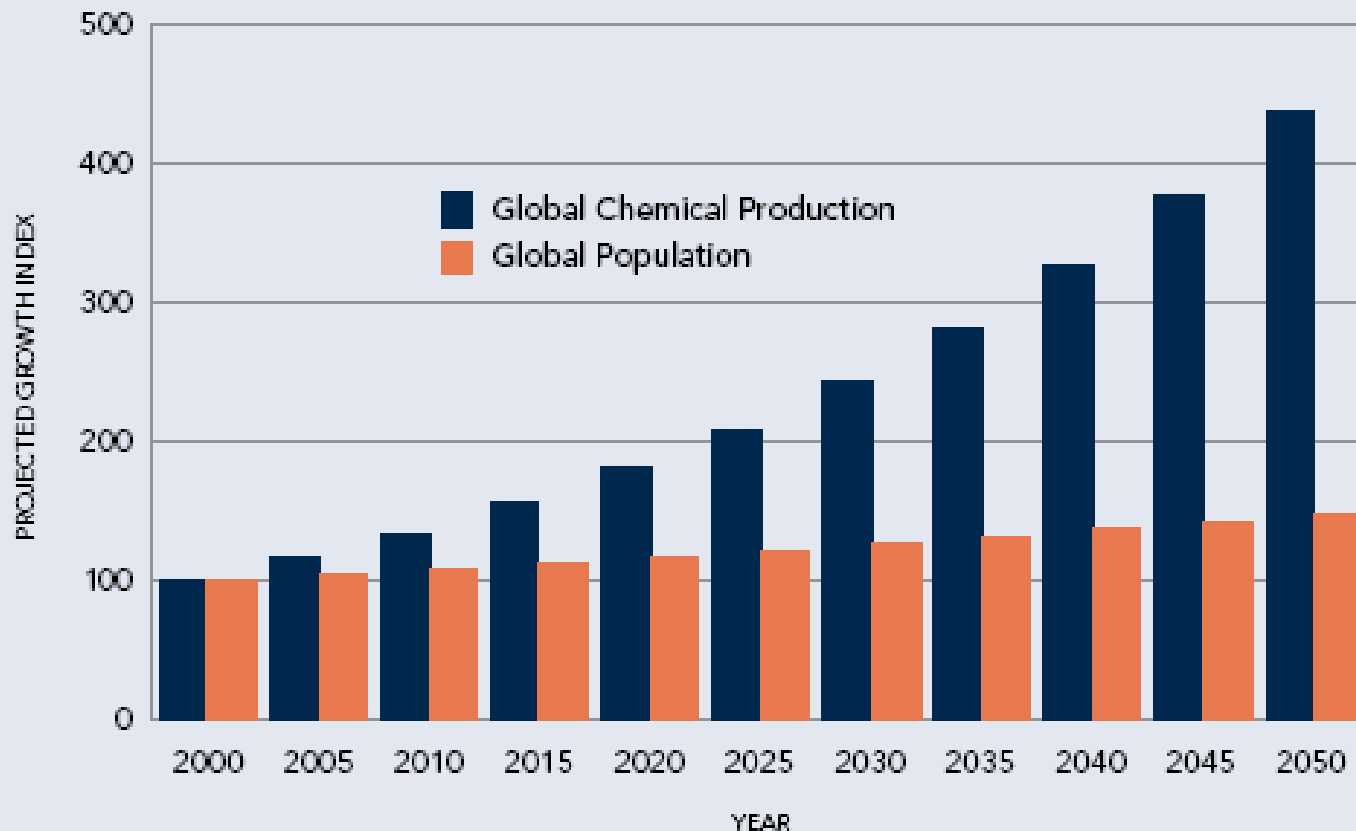
WEEE: Waste in Electrical and Electronic Equipment (2005)

RoHS: Restriction on Hazardous Substances (2006)

REACH: Registration, Evaluation, Authorization, and Restriction of Chemicals (2007)

Global Chemical Production

- Growing 3% per year
- Doubling every 25 years
- Four-fold growth by 2050, indexed to 2000



Green Chemistry Initiative

California EPA's Policy Recommendations

1. Expand Pollution Prevention
2. Develop Green Chemistry Capacity
3. Create an Online Product Ingredient Network
4. Create an Online Toxics Clearinghouse (SB 509)
5. Accelerate the Quest for Safer Products (AB 1879)
6. Move Toward a Cradle-to-Cradle Economy

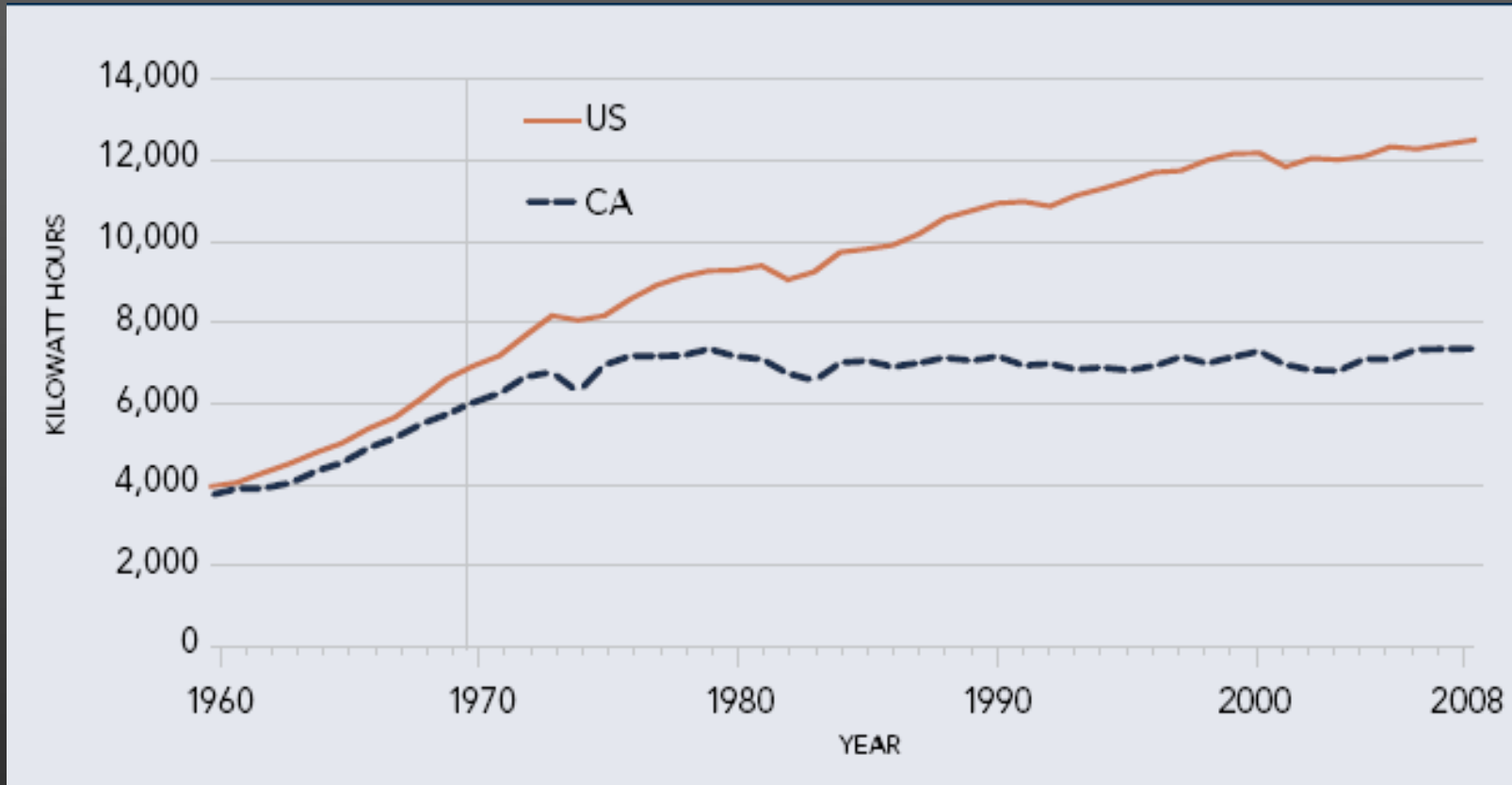


California Green Chemistry Initiative
Final Report



Policy with Environmental & Economic Aims

Per Capita Electricity Consumption, 1960-2007



Source: California Energy Commission, 2007



New Chemistries



Lead Unit - College of Chemistry

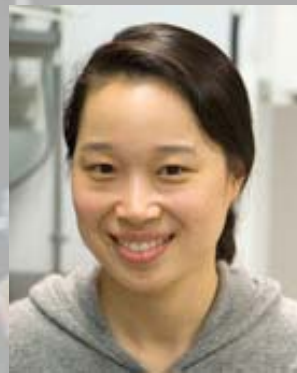
Education

- Insure that the principles and practices of green chemistry are second nature to the next generation of chemists and chemical engineers
- Redesign and rebuild undergraduate teaching labs to incorporate principles of green chemistry

Innovation

- Design new chemistries to address the challenges of limited natural resources, environmental toxicity, and climate change
- Develop sustainable processes for energy production, chemical manufacture, bioremediation and CO₂ fixation

New Chemistries: Faculty & Researchers (selected)



Lisa Alvarez-Cohen, PhD (Civil-Env Engineering): Bioremediation of environ. contaminants

John Arnold, PhD (Chem): Green oxidation processes

Bob Bergman, PhD (Chem): Efficient, non-halogenated catalyst development

Michelle Chang, (Chem): Biosynthesis of pharmaceuticals and biofuels

Douglas Clark, PhD (ChemE): Biocatalysis, cell culture "Data Chip"

David Dornfeld, PhD (Mech Engineering): Sustainable manufacturing



Health & Environment



Lead Unit - School of Public Health

Inform the design of safer substances

- Identify highest-priority substances and toxicity pathways that demand the new solutions offered by green chemistry
- Develop new toxicity testing methods for chemical screening

Create safe jobs and healthy communities

- Improve understanding of the relationship between exposure and disease
- Develop new prevention and remediation strategies
- Ensure that “clean technologies” are safe for workers and reduce environmental contamination

Health & Environment: Faculty & Researchers (selected)



John Harte, PhD (Energy Resources Group): Global change ecology

Dale Johnson, PhD, PharmD (Natural Resources): Predictive toxicology

Rachel Morello-Frosch, PhD (Natural Resources): Toxicant exposure, environmental justice

Steve Rappaport, PhD (Public Health): Exposure biology

Megan Schwarzman, MD, MPH (Public Health): Health and ecosystem effects

Chris Vulpe, MD, MPH (Natural Resources): Ecotoxicology, genomics



Policy & Economy



Lead Unit - Haas School of Business

Public Policy Context:

- European laws: REACH
- California laws: AB 1879

Business context:

- Need improved supply chain management
- Need predictability/lead time
- Challenge of sustainability

Design business strategies

- Improve the safety of chemical and product supply chains
- Speed adoption of new technologies

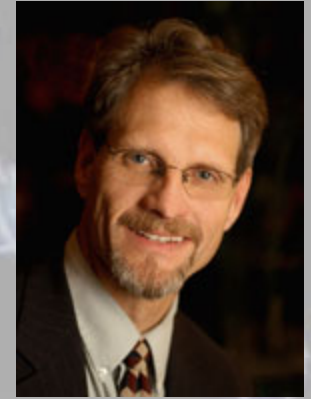
Develop decision-making tools

- Address health and environmental risks of chemicals in light of scientific uncertainties

Inform public policies

- Improve information transparency and accountability in the chemicals market
- Increase viability of safer alternatives

Policy & Economy: Faculty & Researchers (selected)



Eric Bieber, JD (Law): Natural resources law

Alastair Iles, PhD (Natural Resources): Sustainable production

Dara O'Rourke, PhD (Natural Resources): Global supply chains

Christine Rosen, PhD (Business): Socially responsible business

Michael Wilson, PhD, MPH (Public Health): Science and policy



Berkeley Center for Green Chemistry: Initial Projects

<http://bie.berkeley.edu/cgc/home>

Curriculum development

- Green undergraduate chemistry lab modules and web lectures
- Interdisciplinary doctoral program (IGERT-NSF) in Green Chemistry
- BCGC Graduate group formation

Seminars

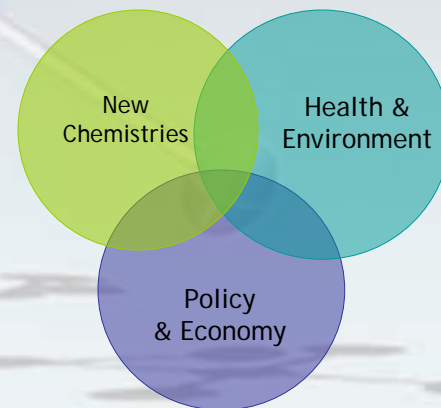
- Lectures and discussions on sustainable chemical design

BCGC Roundtable

- Convene faculty to develop collaborative projects

International Collaborations

- Europe, Africa, Asia



Berkeley Center for Green Chemistry: Multidisciplinary Vision for the Future

"It is essential that we initiate a generational change in our production and use of chemical products. The BCGC's interdisciplinary approach can accomplish that by bringing together scholars in chemistry, the environmental health sciences, public policy, economics, and the law.

Only in this way can we truly advance the necessary research and education in sustainable chemical practices."

-- Richard Mathies, PhD
Dean, College of Chemistry

"The BCGC illustrates the breadth of Public Health. It has the power to address issues which affect all of us nearly every day of our lives."

-- Stephen Shortell, PhD, MPH
Dean, School of Public Health

