
Framework for Understanding & Improving Urban Environmental Sustainability

Daniel M. Kammen

Co-Director of the

Berkeley

Institute

of the

Environment



**Presentation for the National Academies'
Workshop on Urban Environmental Sustainability**

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Dan Kammen

Co-Director

Class of 1935 Distinguished Professor

Energy and Resources Group

Goldman School of Public Policy

Director, Renewable & Appropriate Energy Laboratory (RAEL)



Inez Fung

Co-Director

Professor

Department of Earth & Planetary Science

Environmental Science and Policy Management

Director, Berkeley Atmospheric Sciences Center



Dr. Sharima Rasanayagam

Academic Coordinator

Formerly US West Coast Consul for Science, Technology, Energy and Environment for the UK Government

• **Chris Jones, Specialist**

• **Malini Ranganathan, Graduate Student Researcher**

• **Jessica Huang, Intern**

The BIE works with

• **43 undergraduate programs**

• **55 graduate programs**

with foci and/or faculty in the environment

Issue Areas

- Air Quality
- Water
- Land Use
- Biological & natural sciences
- Energy & Climate
- Public Health
- Engineering
- Planning & Design
- Policy, Law & Business
- Environmental History

Cross cutting themes

- Water & Society
- Climate Change & Society
- Population & Environment
- Genomics
- Environmental Monitoring
- Green Business
- Governance
- Media
- Emerging Technologies

Berkeley Institute of the Environment



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Featured Links

[UC Berkeley's Campus Sustainability Assessment](#)
[U.S. News & World Report ranks UC Berkeley's Ph.D programs in the top five in all 15 academic categories](#)
[Calculate your Climate Footprint](#)

Welcome to UC Berkeley's Environmental Portal

The Berkeley Institute of the Environment strives to establish the University of California at Berkeley as the premier teaching and research institution for environmental science, technology, management and policy. UC Berkeley has some 100 individual [undergraduate](#) and [graduate](#) programs with foci in the environment, making it a top environmental research center. Please check back regularly for the latest in environmental news and activities at Cal.

Breaking Environmental News at Berkeley



BIE Co-Director, Inez Fung, honored as one of the "Scientific American 50"

Berkeley Institute of the Environment Co-Director, Inez Fung, was named one of 50 American technological leaders in the December 2005 issue of Scientific American. According to the magazine's editor-in-chief, John Rennie, "The Scientific American 50 is our annual opportunity to salute the people and organizations worldwide whose research, policy or business leadership has played a major role in bringing about the science and technology innovations that are improving the way we live and offer the greatest hope for the future." Fung was honored as a leading climate expert whose computer modeling has shown recently that the Earth may lose its ability to absorb much of the greenhouse gas that is raising global temperatures.

[More \(UCB New Center, Nov. 15 2005\)](#)

Transportation researchers get DaimlerChrysler hydrogen car for the holidays



DaimlerChrysler officially handed the keys to the F-Cell, the company's limited production hydrogen fuel cell vehicle, to UC Berkeley transportation researchers on Dec. 20 as part of a two-year field test. The project is connected to the U.S. Department of Energy's effort to assess the viability of hydrogen vehicle and infrastructure technology in real world settings. [More \(December 20 2005\)](#)

Featured Video Lecture



[Energy pricing, green buildings, and putting technology in California homes](#)

[Bear in Mind
October 5, 2005
Full Video Library](#)

Photo Gallery



[California Flowers by Stephen Wanyoike \(Wams\) Wamiti, participant in the College of](#)

Motivation: From Science & Best Practices to Action and Evaluation

BIE

If cities continue to grow and industrialize using existing technology & practices, the Earth's fundamental life-support systems will be increasingly at risk and under stress.

Global scientific capacity is not being channeled to meet the unique challenges of mid-sized cities, where the pressures of growth are strongest and capacity is weakest.

**Action: target research on these issues
while partnering and building the
capacity to put these findings into
practice**



What Cities Critically Need

Improved:

1) Institutional Capacity

to capture benefits from existing technology, policies & management practices



2) Technology, Policy & Management Options

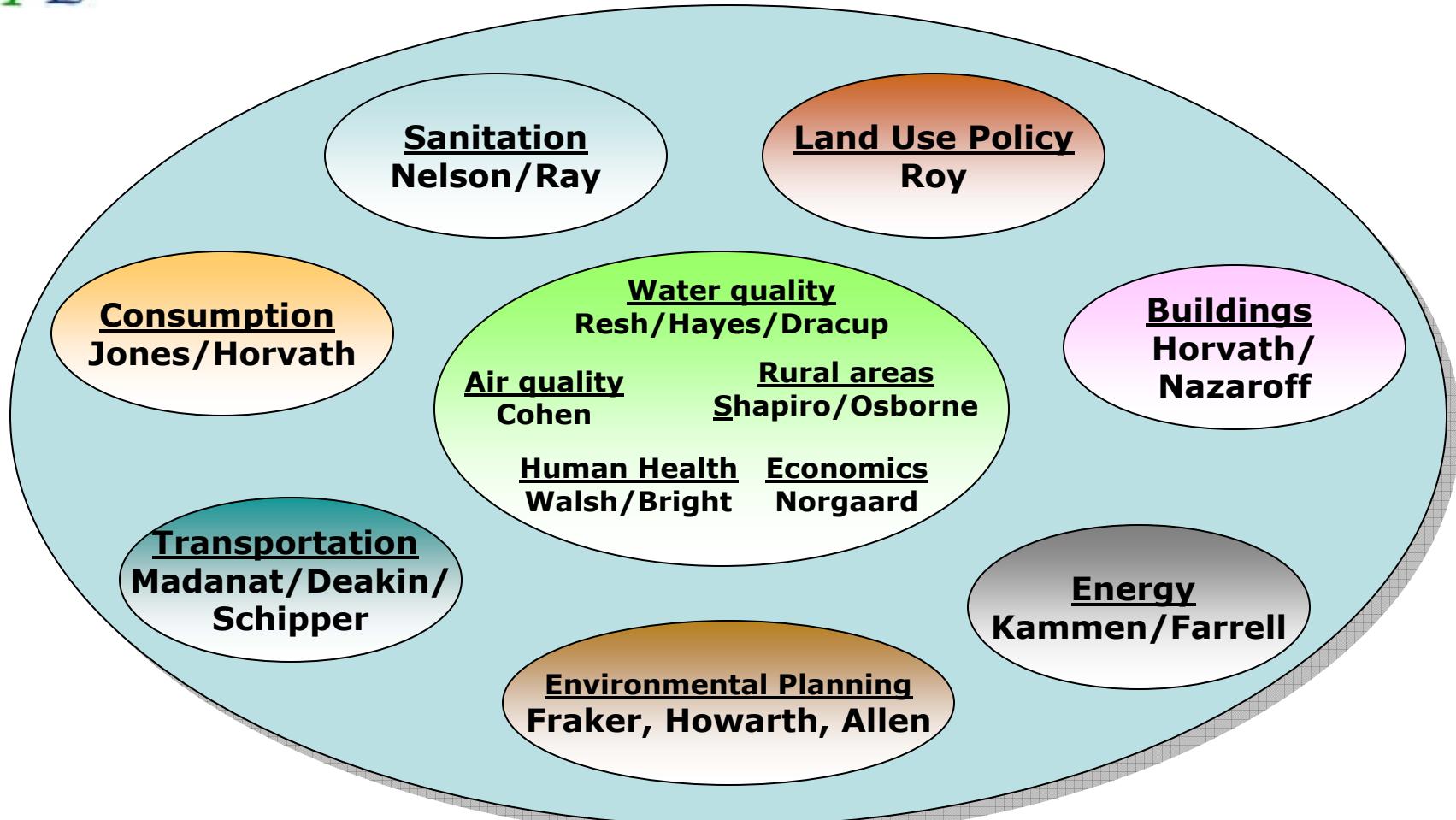
appropriate for their populations & natural environments



3) Financial Resources

which are frequently dependent upon points 1 & 2

Berkeley Interdisciplinarity & Project Teams



Professor Harrison Fraker, Dean, College of Environmental Design

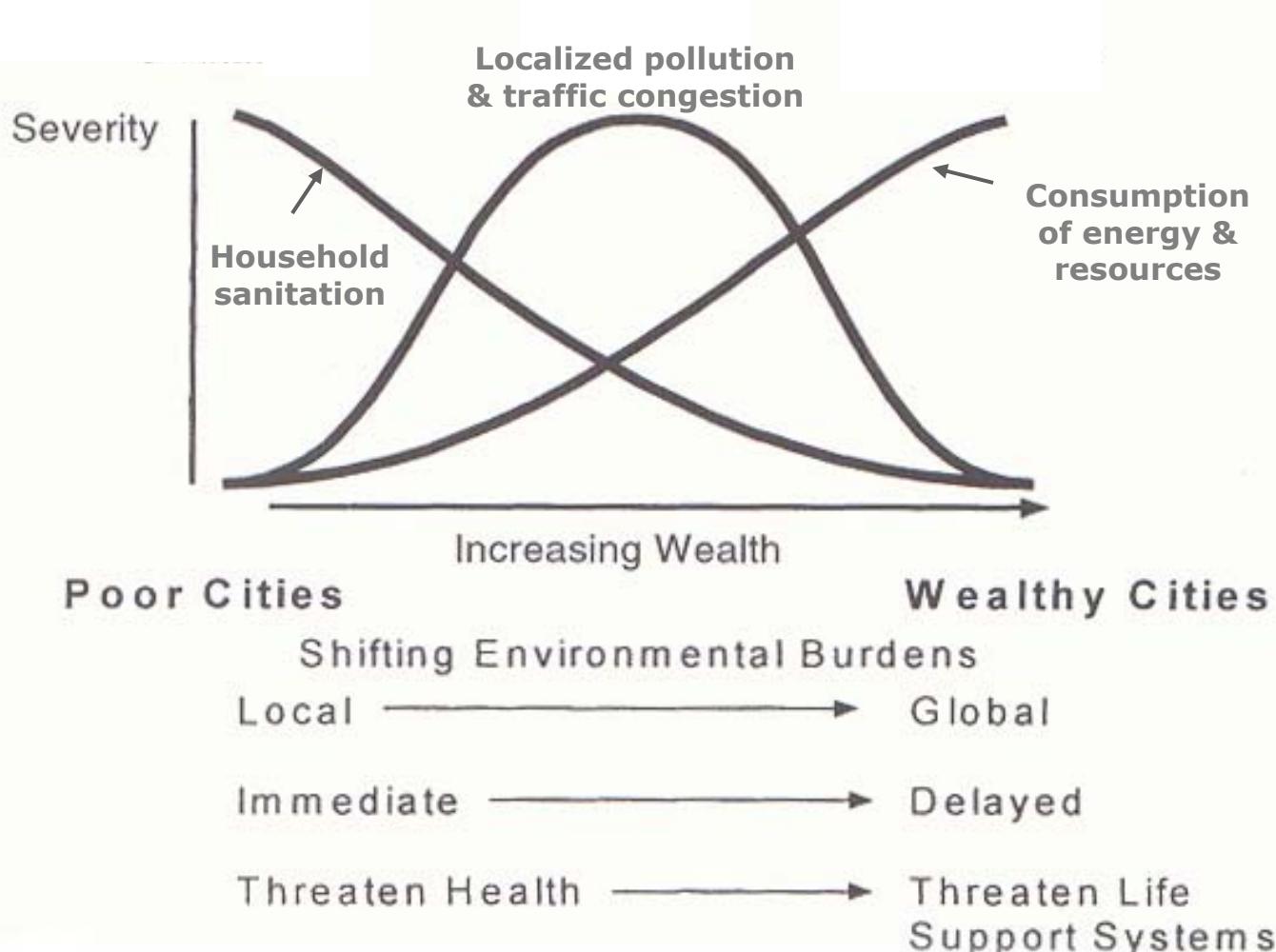
Professor Samer Mandat, Director, Institute of Transportation Studies

Professor Kara Nelson, Department of Civil Engineering

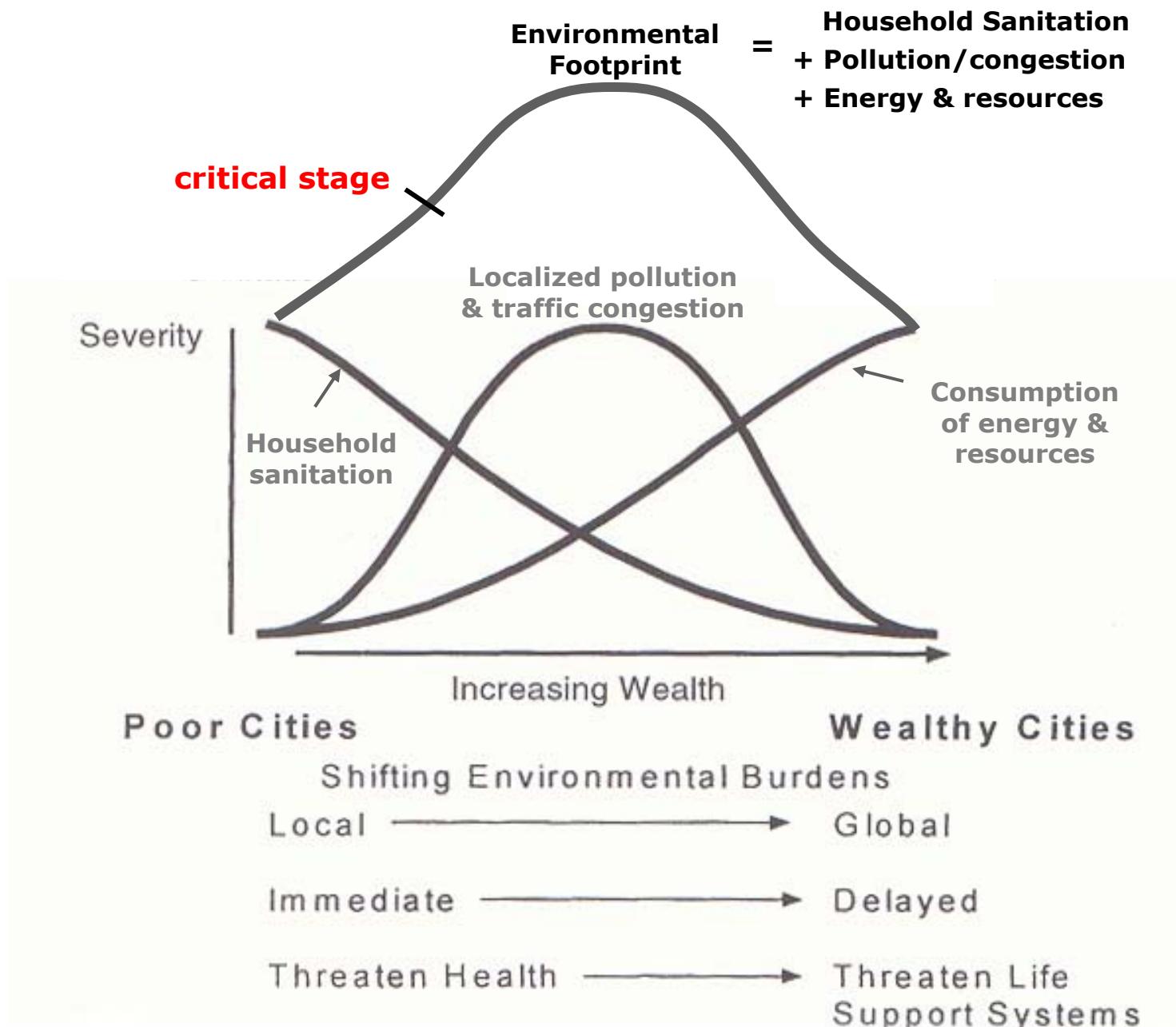
Professor Ron Cohen, Director, Center for Atmospheric Studies



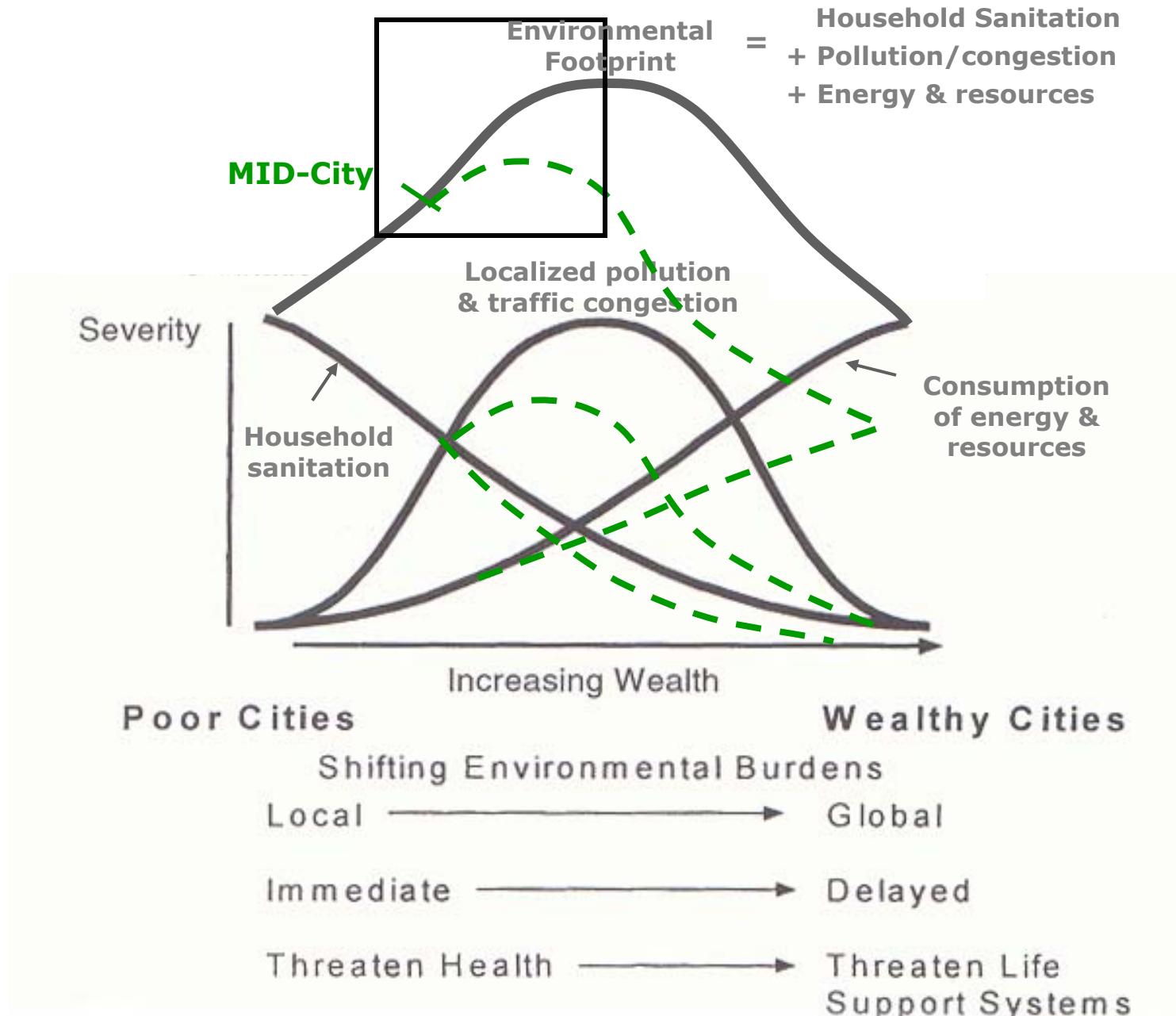
Generalized Model of “Sustainability” Priorities



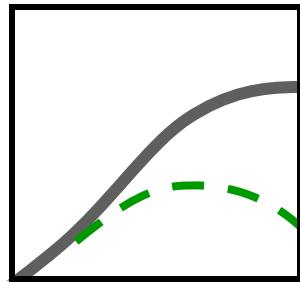
Adapted from McGranahan et al., 1999; Ezzati, Singer & Kammen, 2002



Adapted from McGranahan et al., 1999

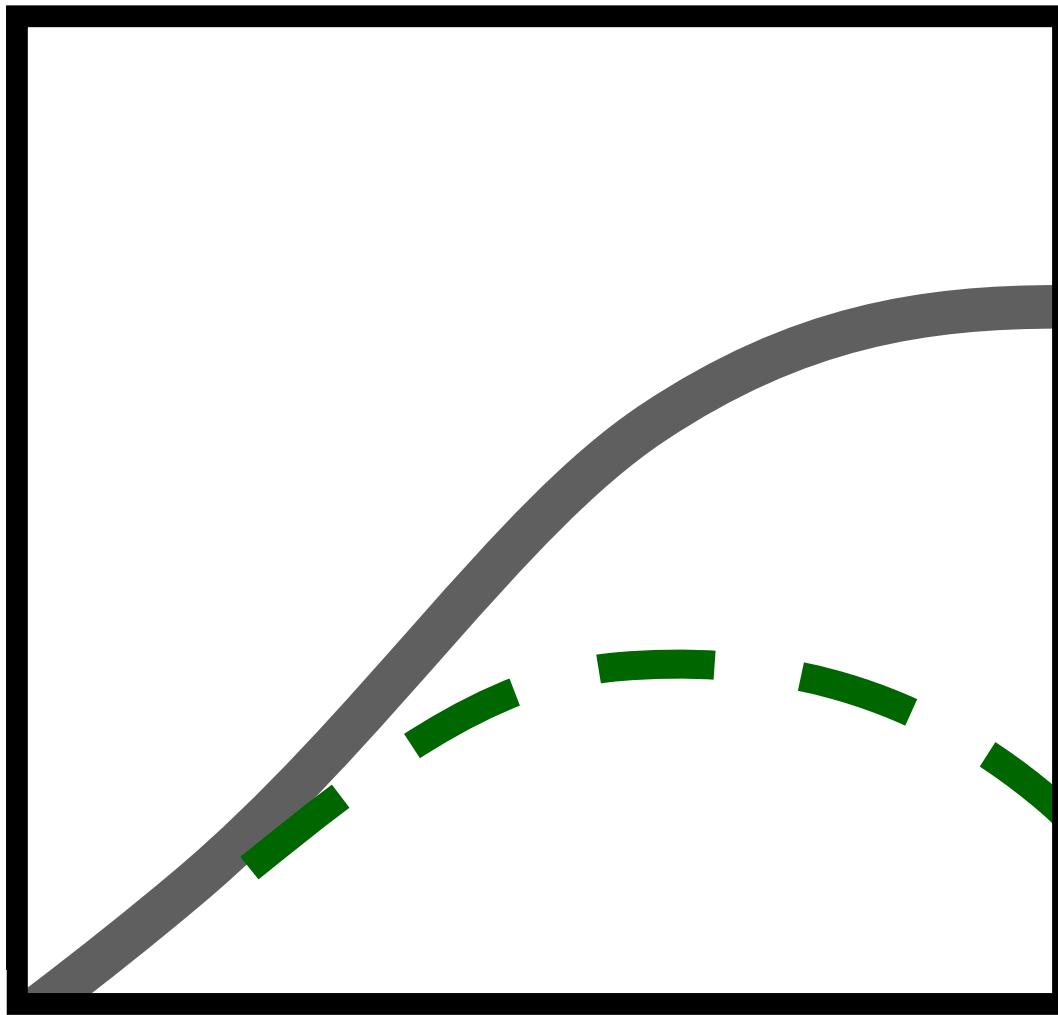


Adapted from McGranahan et al., 1999



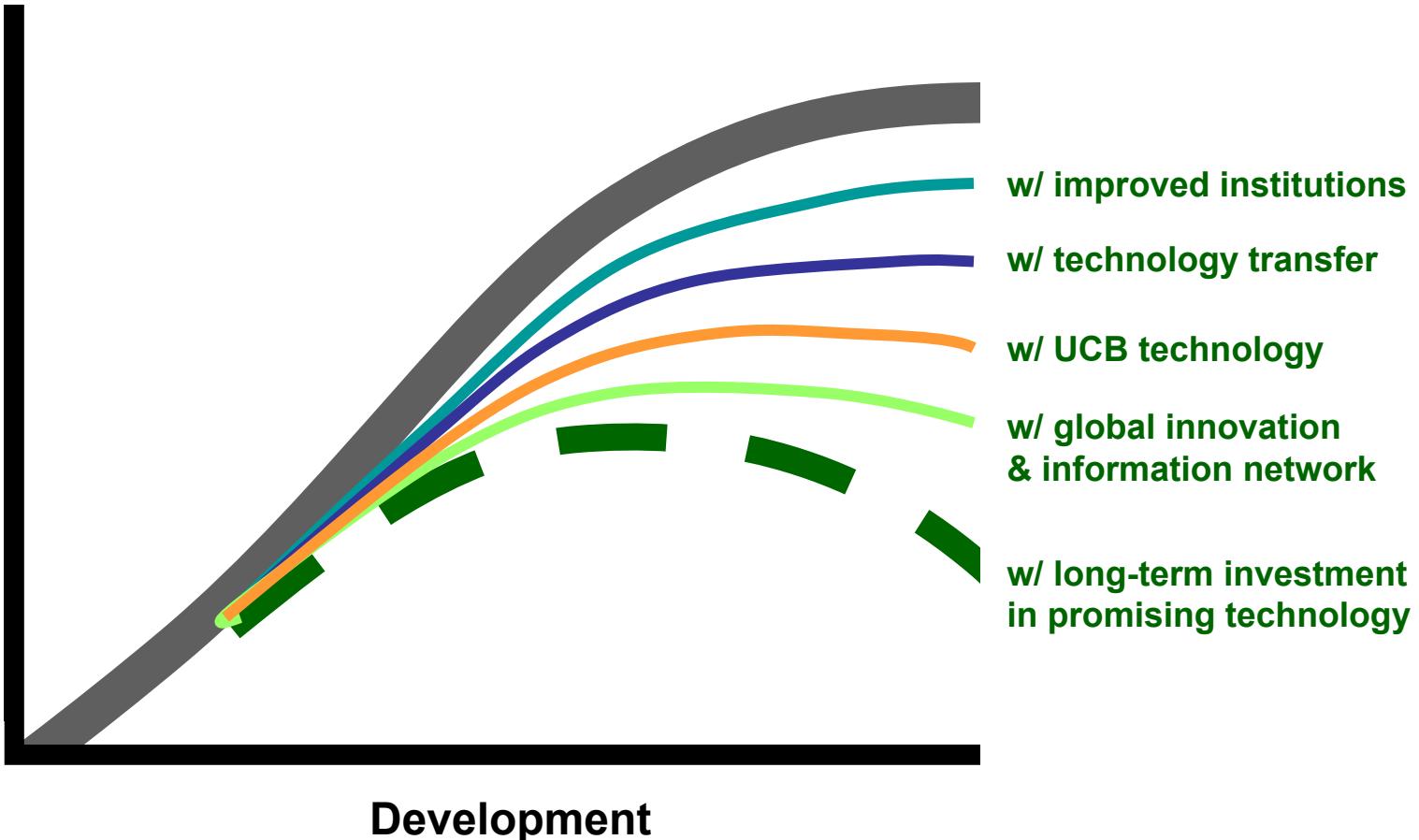
**Environmental
Footprint**

Development



Advancing Development & Environment Goals

Environmental Footprint





Berkeley Research Teams

Water Nelson

1. Drinking water/
Waste water/
Sanitation
(Nelson/Ray)
2. Watershed
processes/Ecological
health/biological
resources (Resh/
Hayes/Dracup/Harris)
3. Institutional capacity
(Harris/Kocher)

Transportation* Madanat & Deakin

1. Balancing mobility
& accessibility
2. Sustainability of
urban structures
3. Traffic safety
4. Green logistics
5. Congestion mitigation

* Partner: EMBARQ

Teams will begin a process of identifying other US-based resource teams to invite into the project

Infrastructure Fraker & Cohen

1. Green Buildings
(Horvath/Nazaroff)
2. Air quality monitoring
(Cohen)
3. Environmental Footprinting
(Jones/Horvath)
4. Human Health
(Walsh/Bright/Banerjee)
5. Renewable Energy
(Kammen)
6. Rural Linkages
(Shapiro/Osborne)
7. Natural Disasters & Risk
(Allen)
8. Urban Settlements
(Fraker, Roy)

Examples from UCB MID-Cities Toolkit

Training Tools

example

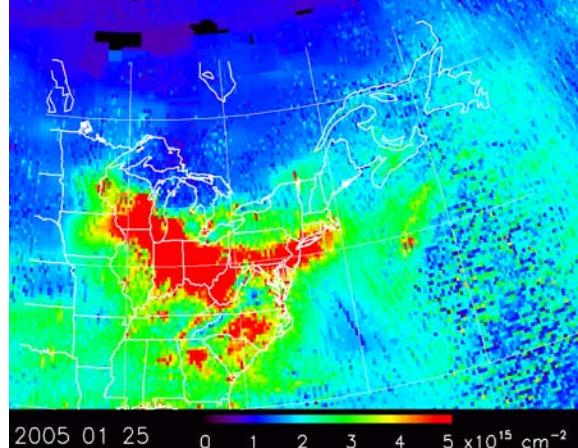


Best-practices
interactive
database and map



Assessment Tools

example



Remote sensing
software and real-time
measurements



Planning and Action Tools

example



Lifecycle assessment tool,
water, air, waste, and
economic planning tools



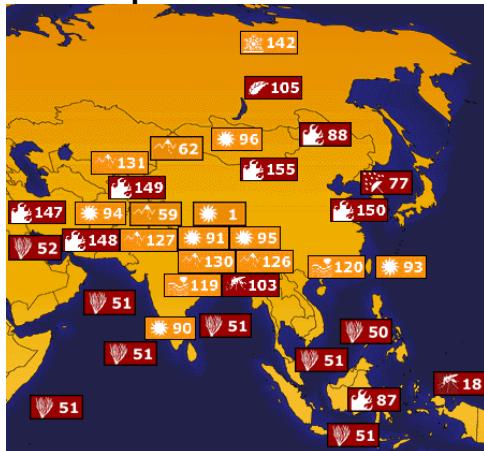


The Urban Sustainability Initiative

The Berkeley *Urban Sustainability Science Toolkit*

Training & Informational Tools

example



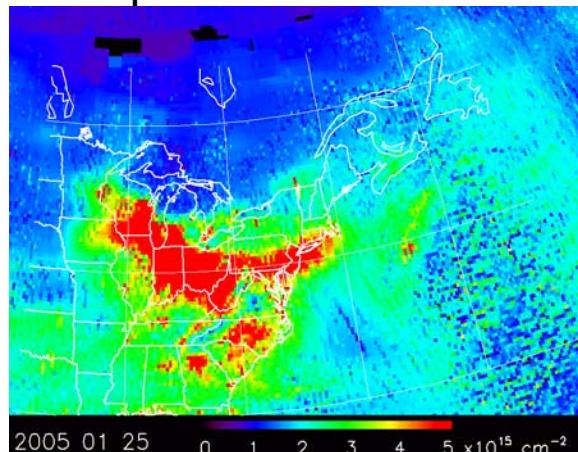
- Promising Practices Case Studies Website (pictured)
- Sustainability science books, reports
- Training manuals
- Instructional videos
- Web-based training tools

Best-practices map



Monitoring & Assessment Tools

example



Remote sensing software

1. Comprehensive set of sustainability indicators
2. Innovative water monitoring methods
 - cost-effective stream invertebrates sampling
3. Remote pollution sensing
4. Urban sustainability indicators software
 - air pollution inventory
 - societal cost of traffic accidents, congestion...
 - Lifecycle assessment software



The Berkeley *Urban Sustainability Science Toolkit*

example



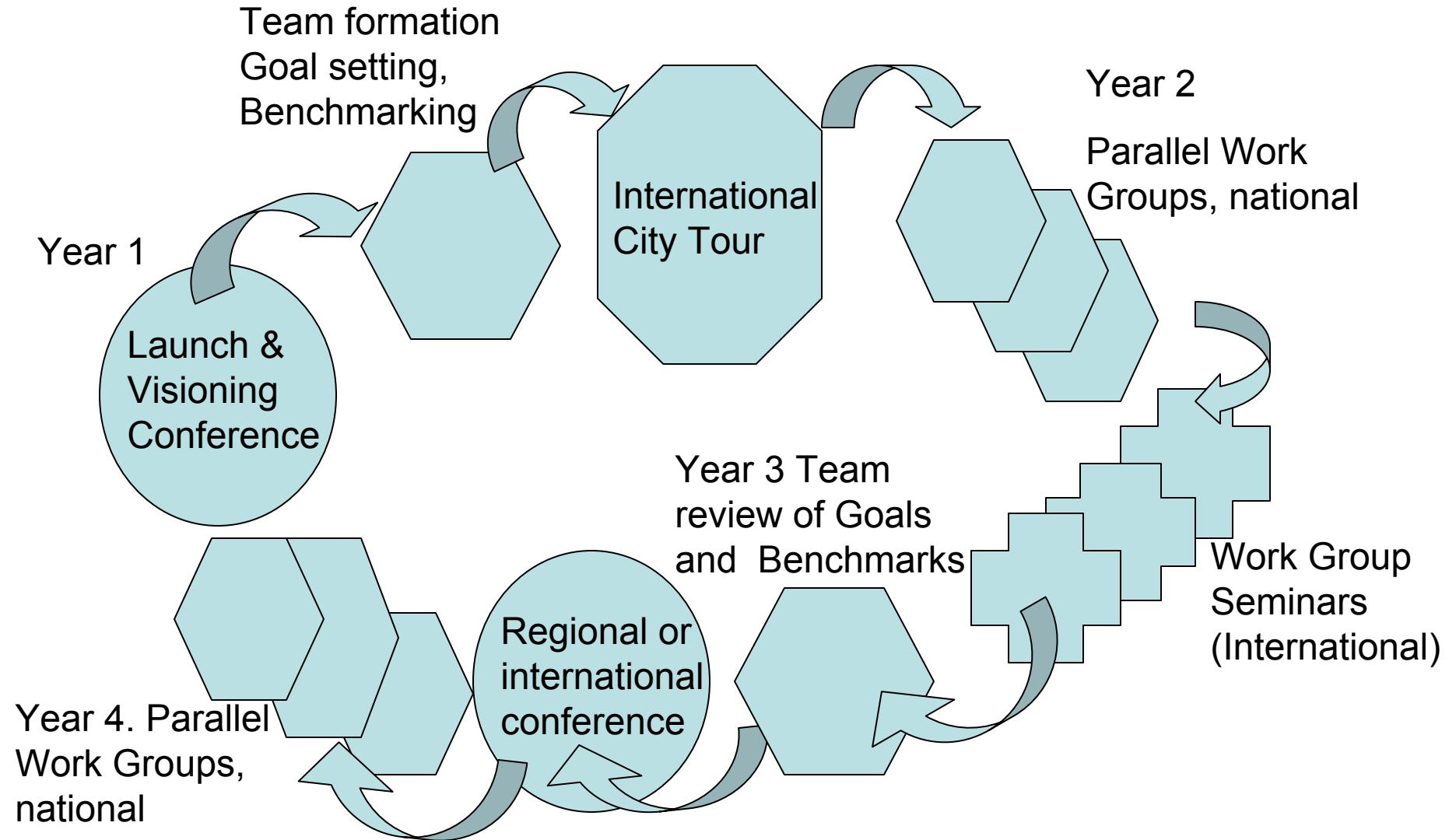
Lifecycle assessment tool

1. Allow users to test outcomes of planning scenarios
2. User-friendly, open-source models
3. A suite of tools for many applications
 - Neighborhood development, transportation systems, buildings, water systems, etc.
4. Allows cities to weigh tradeoffs in single platform
5. Links to detailed information
6. Useful in local as well as national-level policy-making (with major potential in China)



Urban Age Institute Capacity Building Programs

Hypothetical Sequence of Events. Learning and Exchange in MID-Cities





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► IN THE NEWS

National News

Mexico Signs Deal to Cut Fuel Emissions, Improve Air Quality

Assembly Studies Law to Promote Refineries

Trying to Improve Health Services

Semarnat-Yucatan Receives the National Prize for Saving Energy

Agricultural Day Laborers: Invisible Migrants

International News

Global Warming Causes the Earth to Lose Balance

Anxiety about Winter Favors Increase of Crude Oil

In Addition to Flooding, Global Warming Brings Epidemics



► Feature Story

Environment: Guatemala and Mexico Promote Agreement to Protect Resources

With the objective to create a center for the study of the mangrove forests, environmentalist organizations of Guatemala and Mexico look to fortify the bases for signing a binational agreement.... [Read the full story](#)

Most Read Stories

Global Warming Causes the Earth to Lose Balance

Agricultural Day Laborers: Invisible Migrants

Assembly Studies Law to Promote Refineries

ICLEI World Congress

[President of World Resources Institute to speak at World Congress](#)

[City of Cape Town](#)

► National Survey

What type of transportation do you use to commute to work?

- car
- walk
- bicycle
- bus

Vote [\[Results | Polls\]](#)

Votes: 12

► TOPIC CENTERS

[Art & Recreation](#)

[Economy](#)

[Education](#)



Resources

Urban Sustainability Project, Berkeley Institute of the Environment

<http://bie.berkeley.edu>

Urban Age Institute

<http://urbanage.com>

Healthy Communities Foundation

<http://www.hcf.org>

Towards a Project Process Model – “Living Laboratories”

Berkeley Group

Environmental Monitoring

1. Catalog existing data
2. Select *UCB Indicators*
4. Monitor sustainability

Technology (& practices)

1. Catalog existing tech.
2. Identify promising tech.
3. Develop emerging tech.
4. Invest in long-term tech.

Policy & Management

1. Identify barriers
2. Identify policy options
3. What works and why?

Other Initiatives

Private & public finance
 City Networks
 NGOs, CBOs
 Multi-lateral Institutions

UCB - HCN

Resources

1. Monitoring tools
2. Improved Tech.
3. Mgt. Tools

UCB – Urban Age

Training & Info

1. Manuals/reports
2. Workshops
3. Exchanges

National Academies

Capacity Building

1. Catalog existing science, technology & policy
2. Identify priority areas
3. Capacity Building Prog.



Pilot cities

Integrated & Participatory Management Planning

Project Partners

Evaluation of information, capacity and technologies

Global Network

1. Funding
2. Information
3. Networking



Information Network

Web-based tools
 City Exchanges
 Networking

Health Com. Network

Expansion to other cities