BIOMONITORING CALIFORNIA

Use and Interpretation of Biomonitoring Data for Sustainable Communities

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Acknowledgements

- This file has been adapted slightly from the version prepared for the workshop to remove slides that were skipped, address copyright limitations, and clarify certain points addressed verbally.

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Biomonitoring -> sustainability

- What is biomonitoring about?
- Population numbers for individuals?
- Environmental health system
  - System and group scale metrics
  - Actions in public space
  - Characterizing unknowns
- Moving towards sustainability

Household chemicals

- [Images omitted]
  - Glue
  - Bug spray

Combustion sources

- [images omitted]
  - Urban wildfire
  - Gas stove
  - Candle
  - Home fireplace

Dust, furniture, carpets

Packaging

Personal care products


PUBLIC SERVICE ELECTRIC AND GA

GOODS MOVEMENT LAND USE STUDY

Regional View: Key Goods Movement Corridors

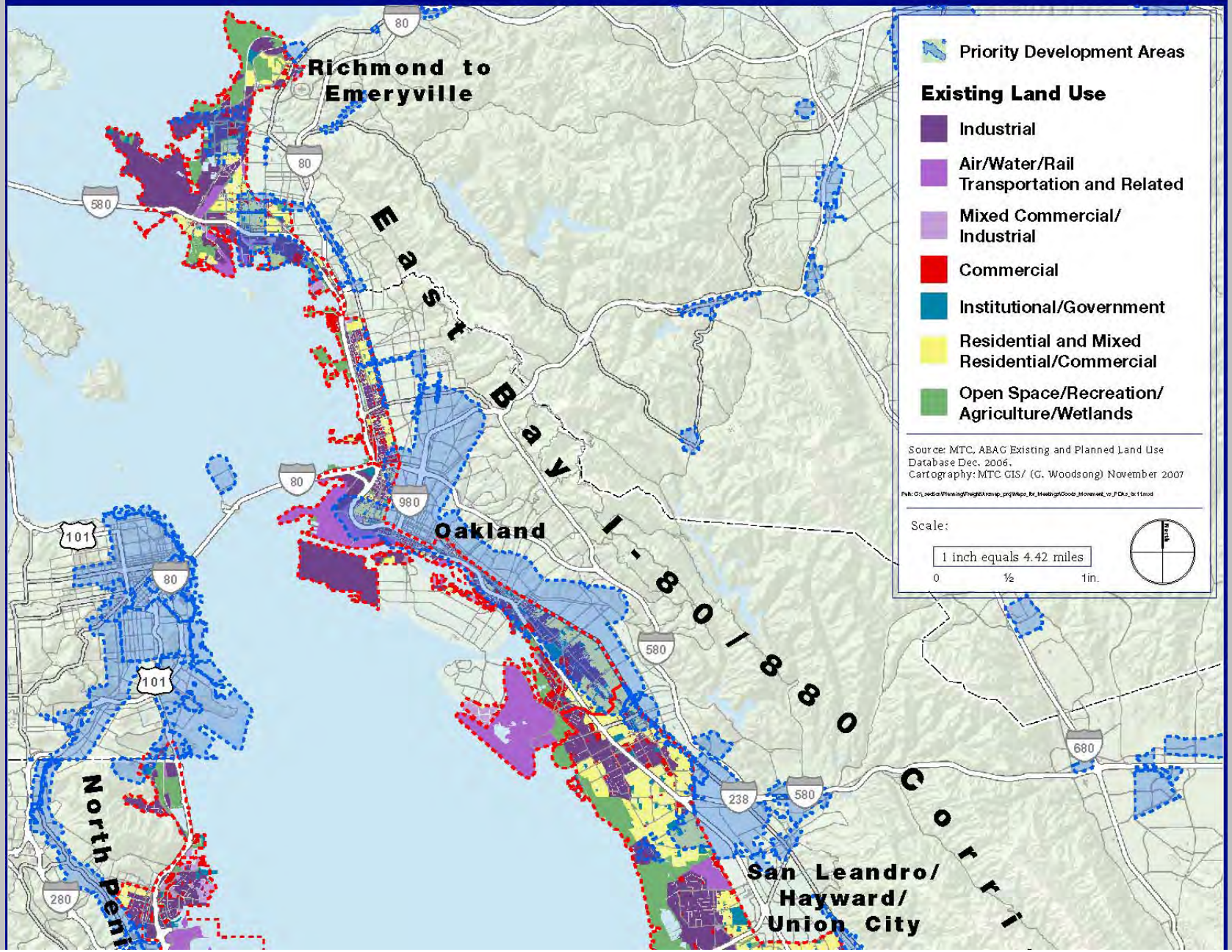
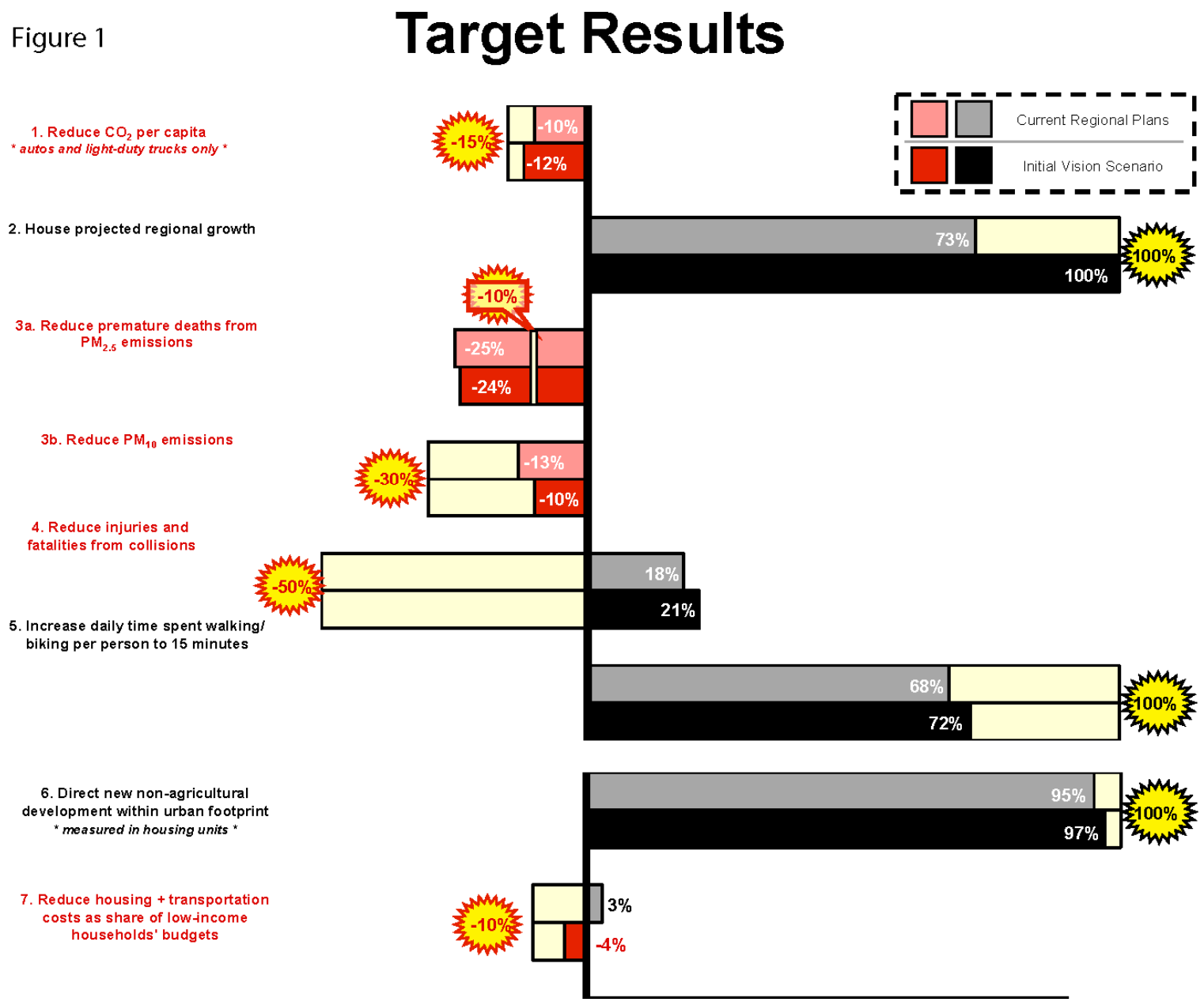


Figure 1



From the draft Bay Area Sustainable Communities Strategy 2011. Example of setting multi factorial targets on a regional basis.

8. Increase gross regional product [GRP]

9a. Reduce per-trip travel time for non-auto trips

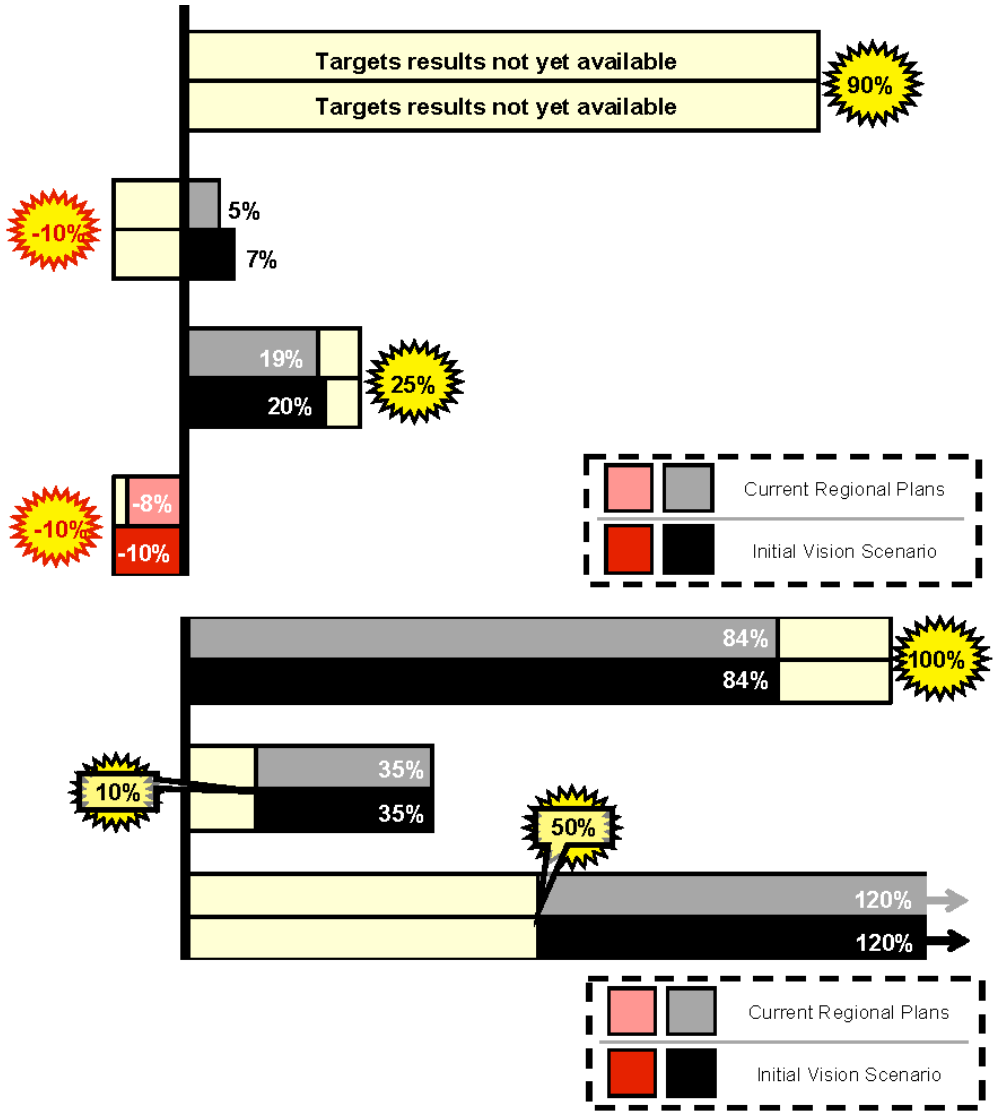
9a. Increase non-auto mode share (alternative target)

9b. Reduce VMT per capita

10a. Increase local road pavement condition index [PCI] to 75

10b. Reduce share of distressed state highway lane-miles to no more than 10% of total lane-miles

10c. Reduce average transit asset age to 50% of useful life



mental
COALITION
OMUNIDADES EN RIESGO

TOXIC-FREE NEIGHBORHOODS

Should a neighborhood park be next door to huge fuel tanks?
Should a metal plating shop be located in a residential neighborhood?
Should toxic emissions from industries pollute the air our children breathe?

¿Debe estar un parque comunitario situado a un lado de tanques con combustibles?
¿Debe estar una industria cromadora situada dentro de una comunidad residencial?
¿Deben las industrias contaminar con emisiones tóxicas el aire que respiran nuestros hijos?

Environmental Health Coalition says NO!

EHC's Toxic Free Neighborhoods Campaign has worked since 1980 in the urban neighborhoods south of Interstate 8 to reduce toxic pollution and protect public health. These neighborhoods, such as Barrio Logan, Sherman Heights, Logan Heights, and National City, contain the largest concentration of polluting industries in all of San Diego County.

Environmental Justice Now!

Environmental Health Coalition opina que ¡no!

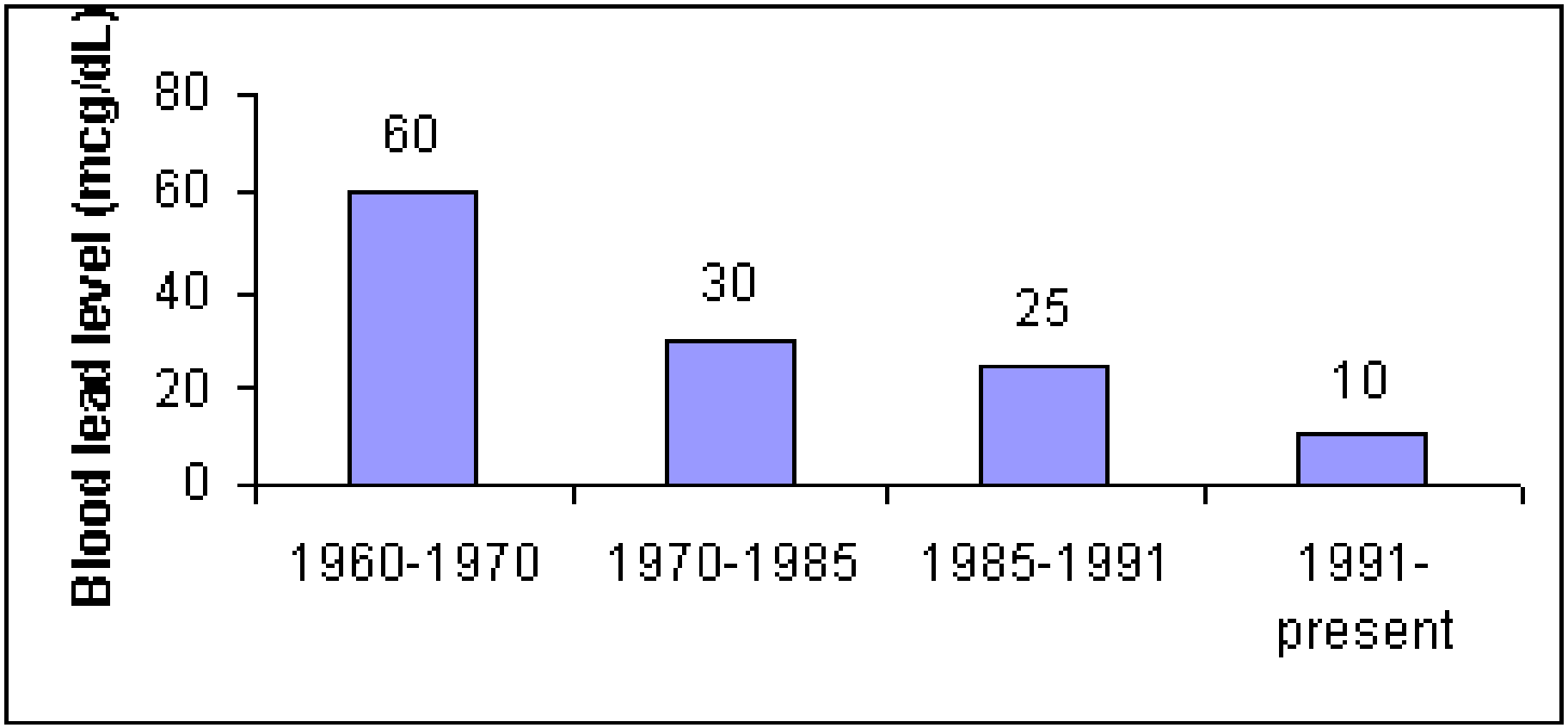
La Campaña para Barrios Libres de Tóxicos de EHC ha trabajado desde 1980 dentro de las comunidades urbanas al sur de la carretera 8, para reducir la contaminación tóxica y proteger la salud pública. Vecindades como Barrio Logan, Sherman Heights, Logan Heights, y National City, contienen la más grande concentración de industrias contaminantes en el condado de San Diego.

¡Justicia Ambiental Ya!

Predicting for individuals?

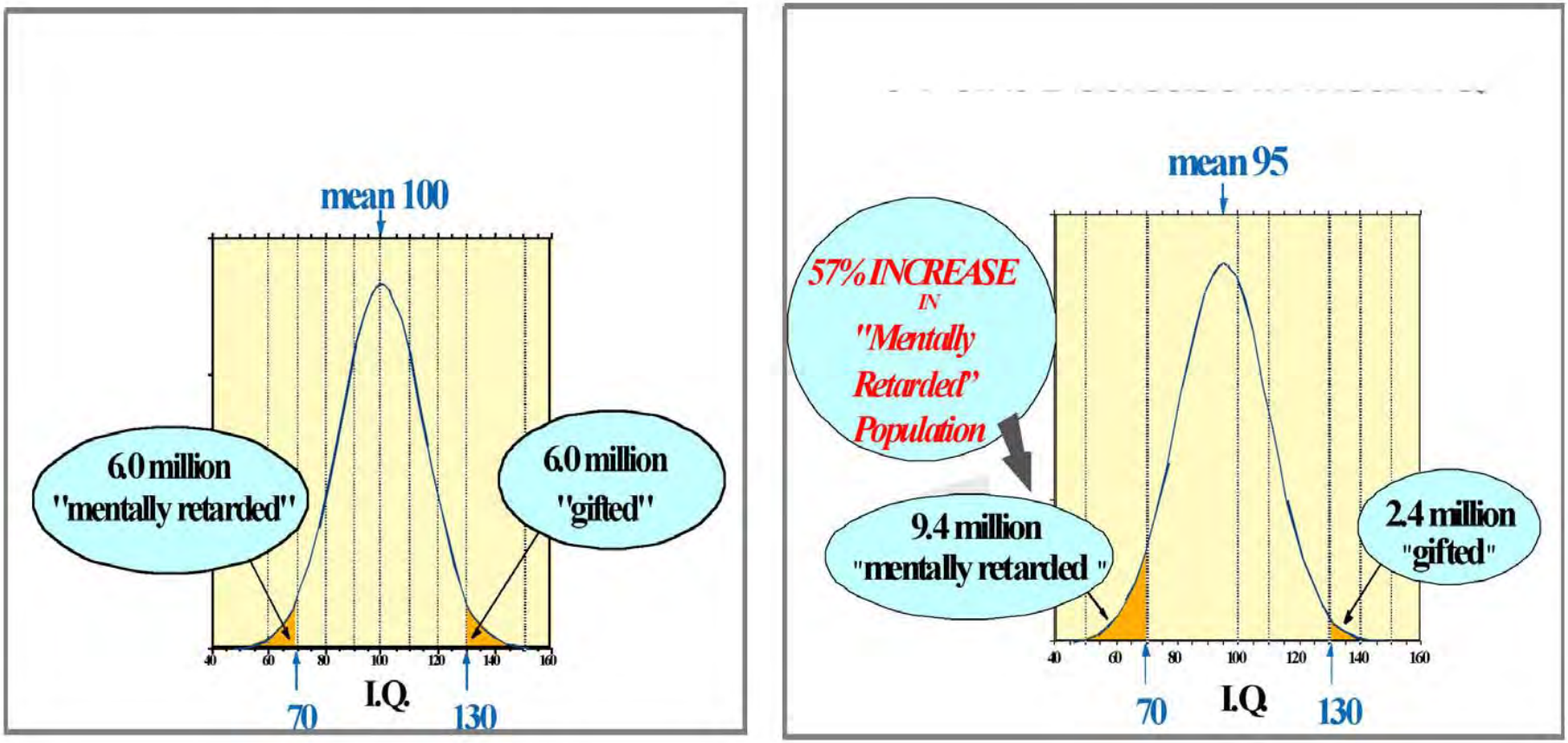
- Differences between population and specific, named individuals
- Locus for analysis and actions is in public spheres
- What can we manage?
- Limited capacity to provide any individual level advice
- Current knowledge always on a trajectory

Even for lead, advice has been wrong



Lowering of CDC-recommended action level for blood lead in children over time. ATSDR. **Case Studies in Environmental Medicine (CSEM)**

Fig. 4. Losses associated with a five-point drop in IQ in 100 million people



WHO. Childhood Lead Poisoning. 2010.

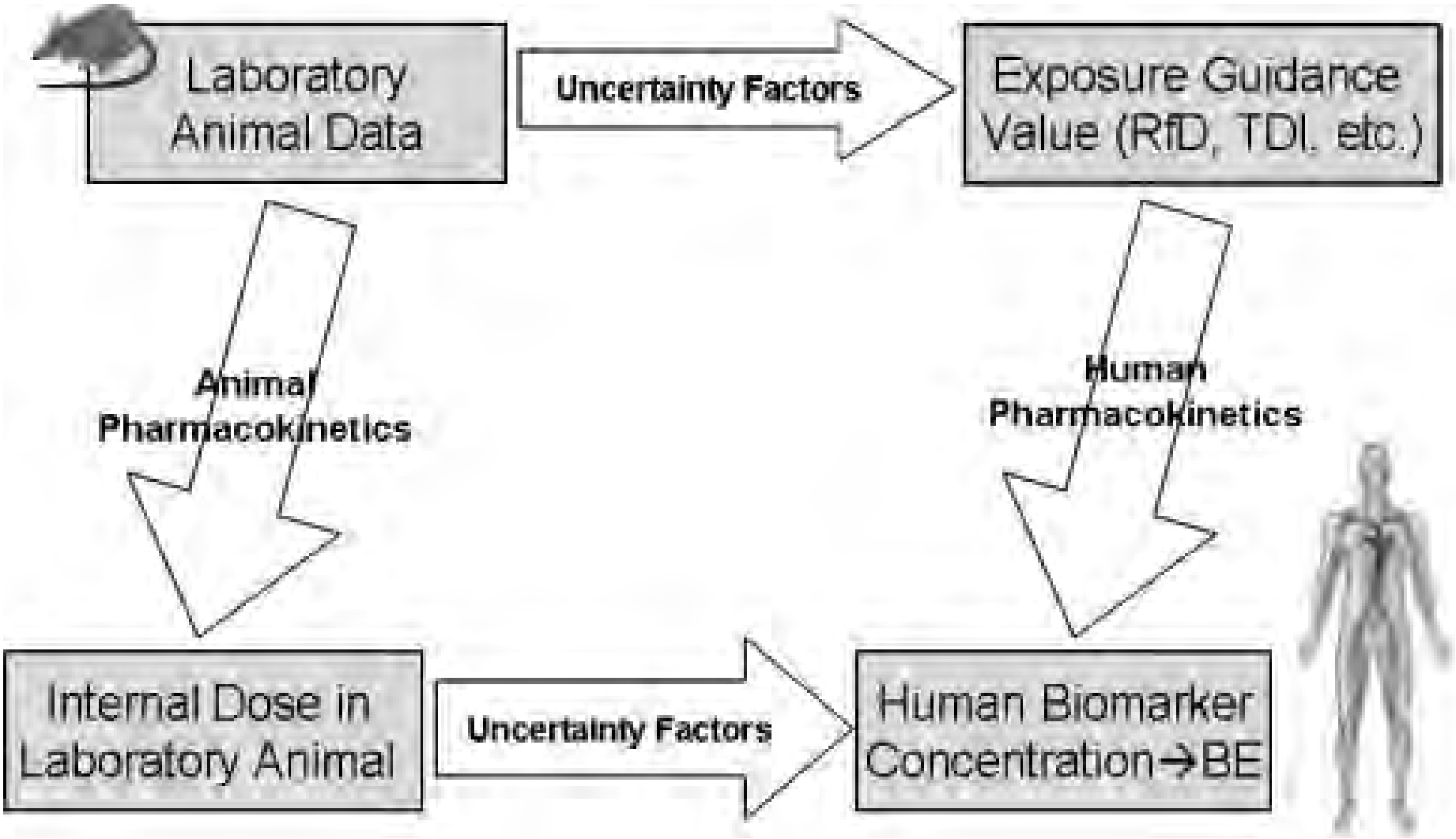


Fig. 1. Generic description of method for deriving the BE

From Hayes et al, 2008. *Regul. Toxicol. Pharmacol.* **51** (2008), pp. S4–S15

Overcoming past dynamics

- Strong political opposition to health based reference levels
  - Do results represent political or scientific process?
  - IRIS viewed as "failing" system
- Ethical concerns in using these for individual results
- Can we propose solutions?

Purview of environmental health

U.S. ARMY PHOTO

FIGURE 13.—Shipside inspection of foods of animal origin in Zone of Interior ports was one of the many inspections conducted by the Army Veterinary Service along the food supply route to troops overseas.

Bringing in new factors and places

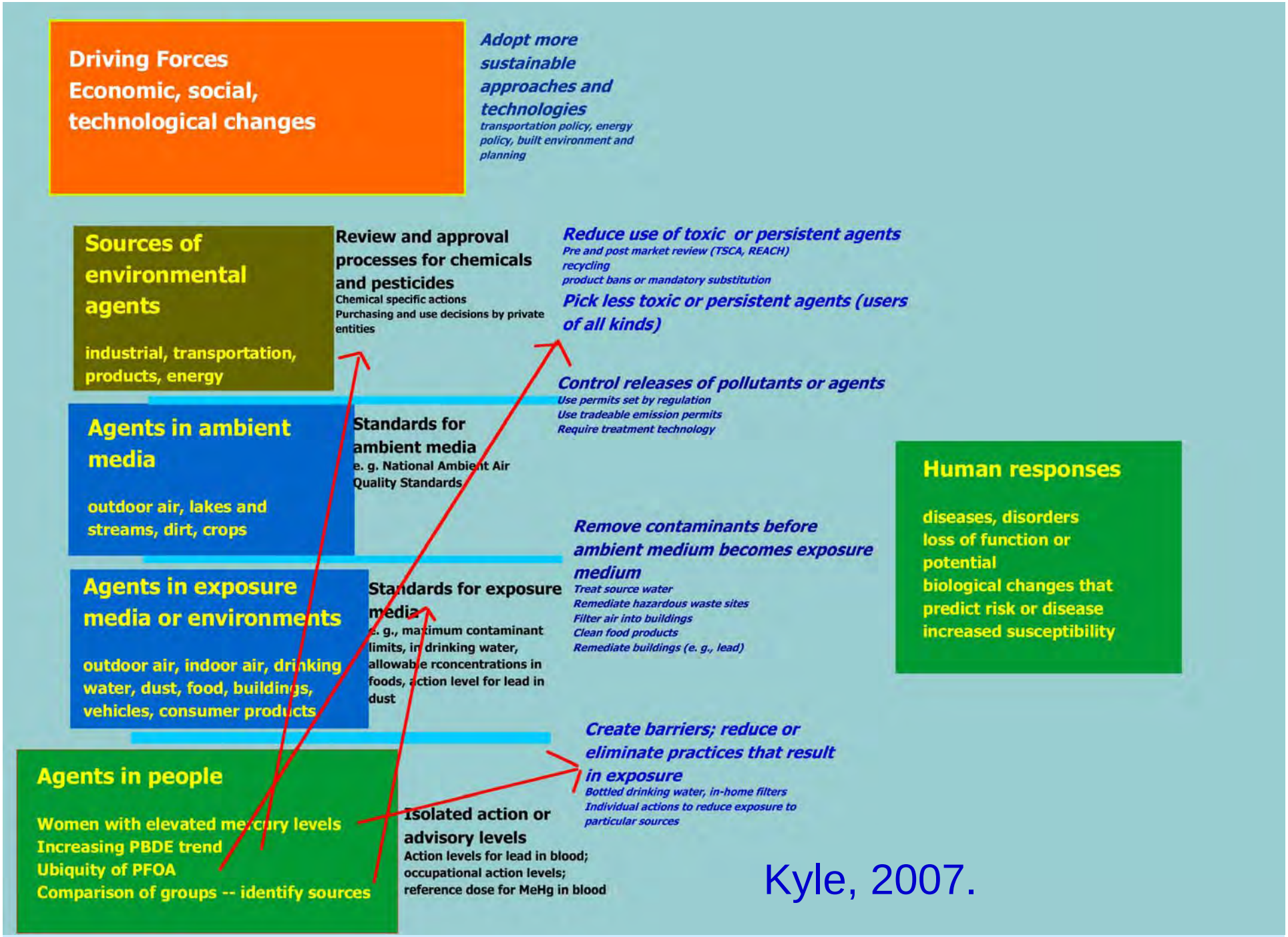
Broader picture of significance

- Cumulative impacts of multiple environmental factors and other stressors
  - Social determinants
- Sensitive windows for exposure
- Background
- Variability in sensitivity and response

105451. (a) As appropriate, the program shall utilize the principles of the agency's Environmental Justice Strategy and Environmental Justice Action Plan developed pursuant to Sections 71110 to 71113, inclusive, of the Public Resources Code, so that the activities of the panel and the implementation of the program provide opportunities for public participation and community capacity building with meaningful stakeholder input. This strategy and plan shall accord the highest respect and value to every individual and community by developing and conducting public health and environmental protection programs, policies, and activities in a manner that promotes equity and affords fair treatment, accessibility, and protection for all Californians, regardless of race, age, culture, income, or geographic location.

Think of a system

- Functions rather than static topics
  - Obtaining data and information
  - Analyzing and reaching conclusions
  - Providing information to audiences
  - Taking effective actions
  - Evaluating to improve and correct
- Network rather than any institution


Driving Forces
Economic, social, technological changes
Adopt more sustainable approaches and technologies
transportation policy, energy policy, built environment and planning
Sources of environmental agents
industrial, transportation, products, energy
Review and approval processes for chemicals and pesticides
Chemical specific actions
Purchasing and use decisions by private entities
Reduce use of toxic or persistent agents
Pre and post market review (TSCA, REACH)
recycling
product bans or mandatory substitution
Pick less toxic or persistent agents (users of all kinds)
Control releases of pollutants or agents
Use permits set by regulation
Use tradeable emission permits
Require treatment technology
Agents in ambient media
outdoor air, lakes and streams, dirt, crops
Standards for ambient media
e. g. National Ambient Air Quality Standards
Human responses
diseases, disorders
loss of function or potential
biological changes that predict risk or disease
increased susceptibility
Remove contaminants before ambient medium becomes exposure medium
Treat source water
Remediate hazardous waste sites
Filter air into buildings
Clean food products
Remediate buildings (e. g., lead)
Agents in exposure media or environments
outdoor air, indoor air, drinking water, dust, food, buildings, vehicles, consumer products
Standards for exposure media
e. g., maximum contaminant limits, in drinking water, allowable rconcentrations in foods, action level for lead in dust
Create barriers; reduce or eliminate practices that result in exposure
Bottled drinking water, in-home filters
Individual actions to reduce exposure to particular sources
Agents in people
Women with elevated mercury levels
Increasing PBDE trend
Ubiquity of PFOA
Comparison of groups -- identify sources
Isolated action or advisory levels
Action levels for lead in blood; occupational action levels; reference dose for MeHg in blood

Kyle, 2007.

Group scale metrics

- Occurrence metrics
  - What is present and where?
- Time trend metrics
  - Better or worse?
- Burden metrics
  - Variability in overall burden
  - Combine with other stressors?
- Geographic metrics

System scale metrics

- Percent of phenomena represented
  - What percent of chemicals in use are represented?
  - How much of exposure do we understand?
- Percent of investigation completed
  - Where we are on trajectory of research
  - Likelihood that we are close to true estimate

The Unknowns

- There is probably more that we don't know than we do know
- Can we devise metrics?
- Work on this systematically
  - What percent of exogenous compounds did we measure?
  - What percent of air releases do we monitor or account for?

Inequality metrics

Environ. Sci. Technol. **2009**, *43*, 7626–7634

An Index for Assessing Demographic Inequalities in Cumulative Environmental Hazards with Application to Los Angeles, California

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Introduction

Objectives. Researchers and policy-makers concerned about environmental justice argue that low-income communities and communities of color face a higher frequency and magnitude of impact from environmental hazards as well as psychosocial stressors (*1*–*3*). These disparities are increasingly recognized as potential determinants of health inequalities (*4*, *5*) and additional research is needed to assess the cumulative impact of multiple environmental hazards and their toxic effects on these vulnerable communities (*6*). The potential interaction of elevated environmental hazards and socioeconomic stressors have been described as a form of "double jeopardy" (*2*, *7*). As a result, environmental justice advocates have urged the regulatory and scientific communities to integrate cumulative impacts in their decision-making and enforcement activities. Regulatory agencies are beginning to grapple with the methodological challenge of developing transparent, yet scientifically valid, indicators of cumulative impacts and to examine and address environmental health inequities (*7*, *8*). Recent reports from the National Research Council have also advocated "cumulative risk frameworks" (*9*).

This paper proposes an index to assess the cumulative environmental hazard inequalities in socially disadvantaged groups and neighborhoods. There are two principal objectives: (1) to develop an index capable of summarizing inequalities of impact from cumulative environmental

California Environmental Protection Agency

Cumulative Impacts: Building a Scientific Foundation

Public Review Draft

August 19, 2010

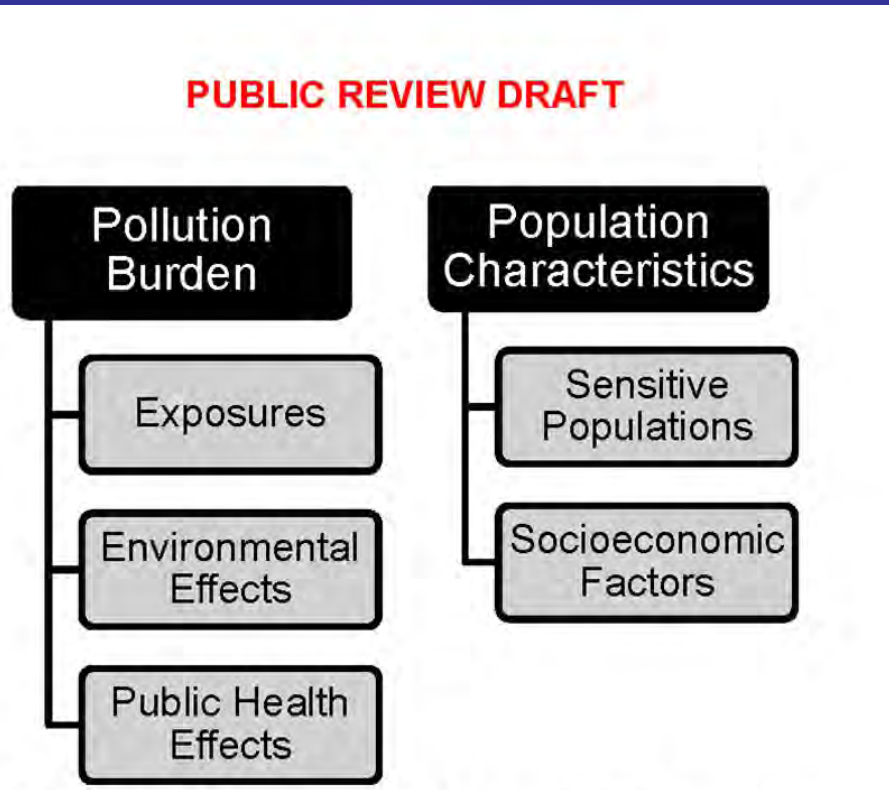

Figure 1. Components of cumulative impact.

Sustainability

- In the context of climate change
- Contemporary biomedical and epidemiological research has evolved to explore details of relations, and their variants, within an essentially normally functioning, constant, external world. Climate change, however . . .
- shifts our focus far beyond the familiar and specific conceptualisation of disease as a result of individual behaviours, local environmental toxins, occasional heat waves, and genetics. . . .

- consider risks at the whole-population level, informed by an understanding of ecological relations and the imperatives of environmental sustainability.

AJ McMichael, M Neira, et al. Lancet. 374 (9707, 19 Dec 2009-1 Jan 2010): 2123-25

Biomonitoring for sustainable communities

- Public health actions
  - Focus on public venues not individuals
- Participate as part of system
- Connect to larger movement
- Human scale; resilience
  - communities and regions
- Allow for aspirations for improvement
  - reduced exposure and toxicity

Your comments?

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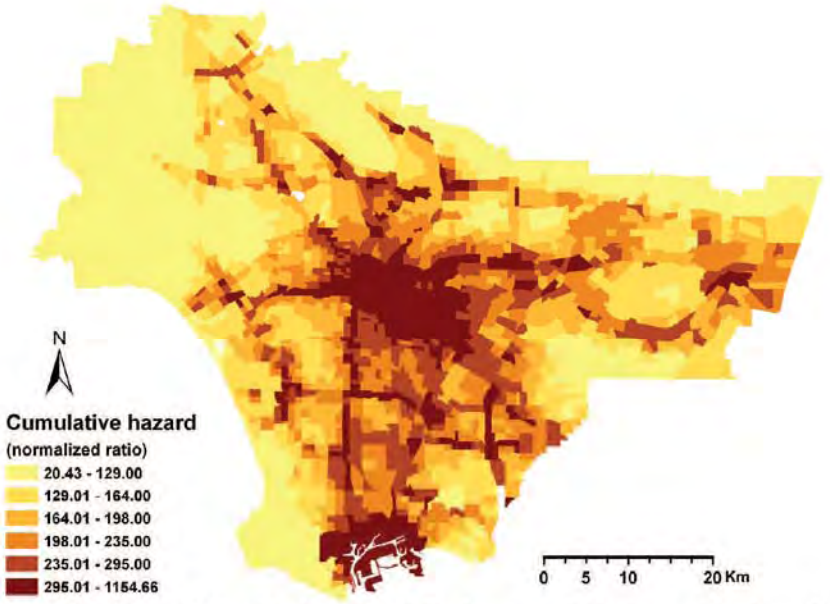

FIGURE 4. The cumulative environmental hazard using the multiplicative approach. Census tract level cumulative environmental hazard = $(NO_2)/(53) \times (PM_{2.5})/(15) \times (DPM)/(1)$.