



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.
- This work was funded primarily by the Superfund Research Program of the National Institute of Environmental Health Sciences and by the CDC.

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



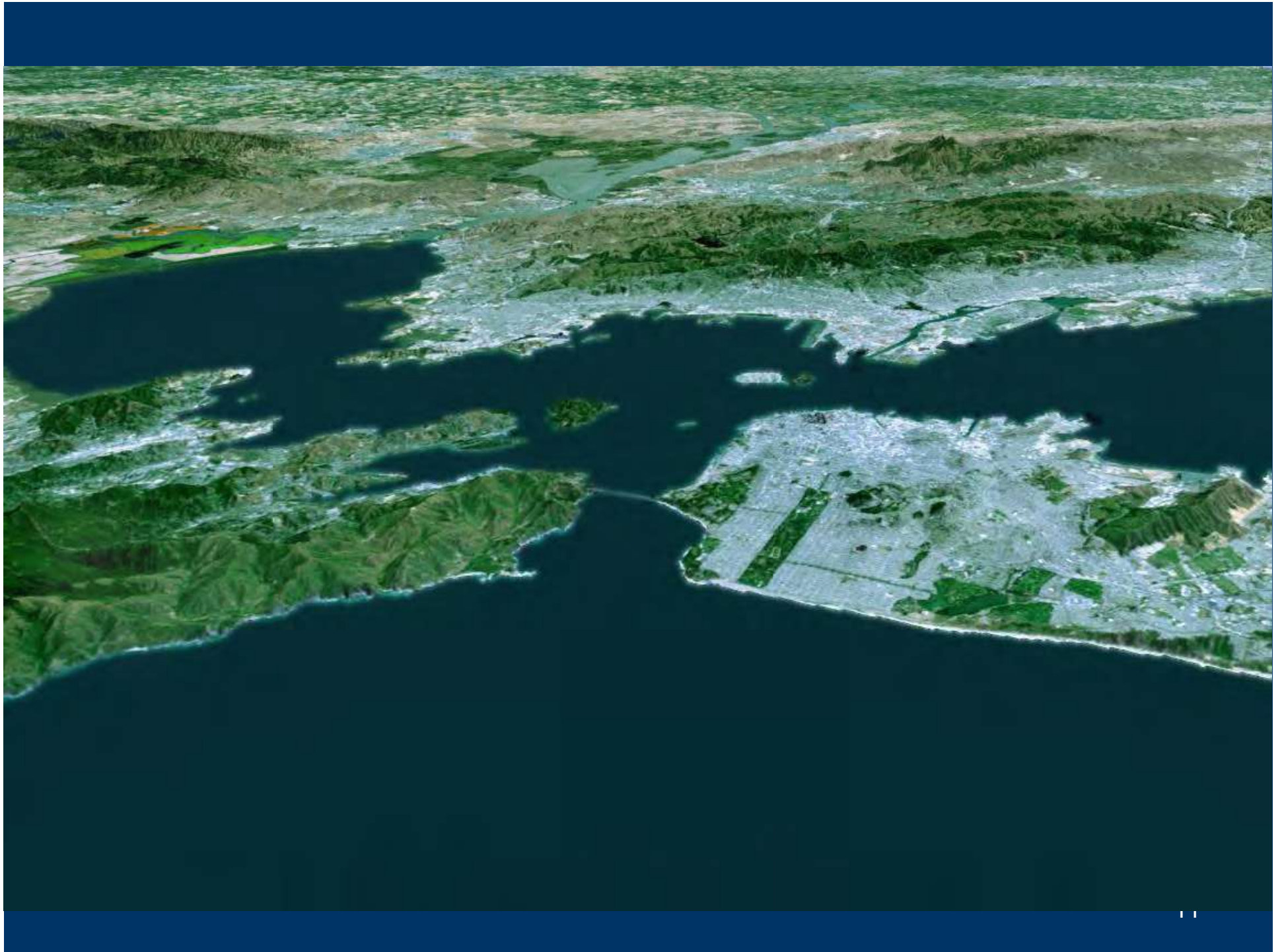
Packaging



Personal care products







GOODS MOVEMENT LAND USE STUDY

Regional View: Key Goods Movement Corridors

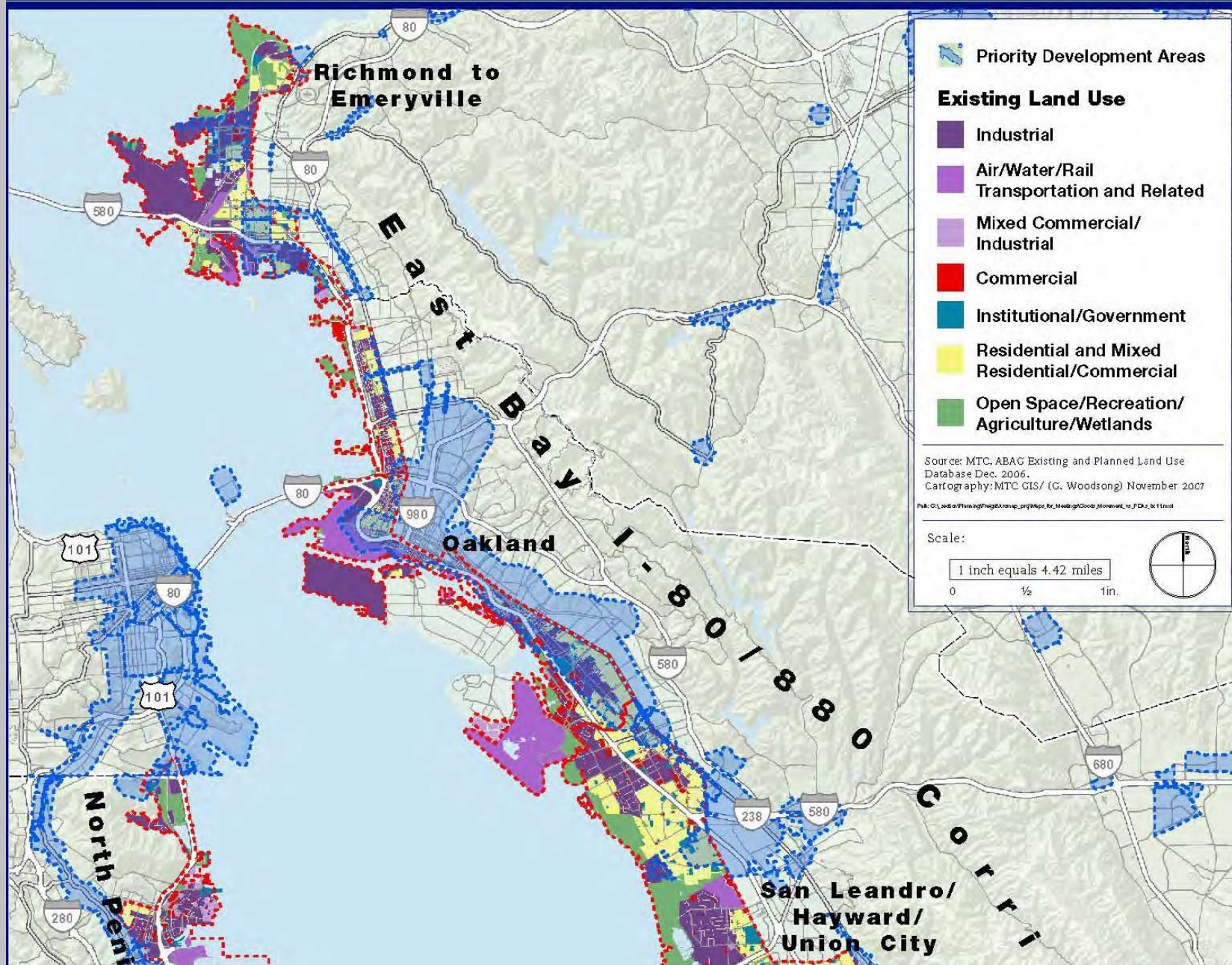
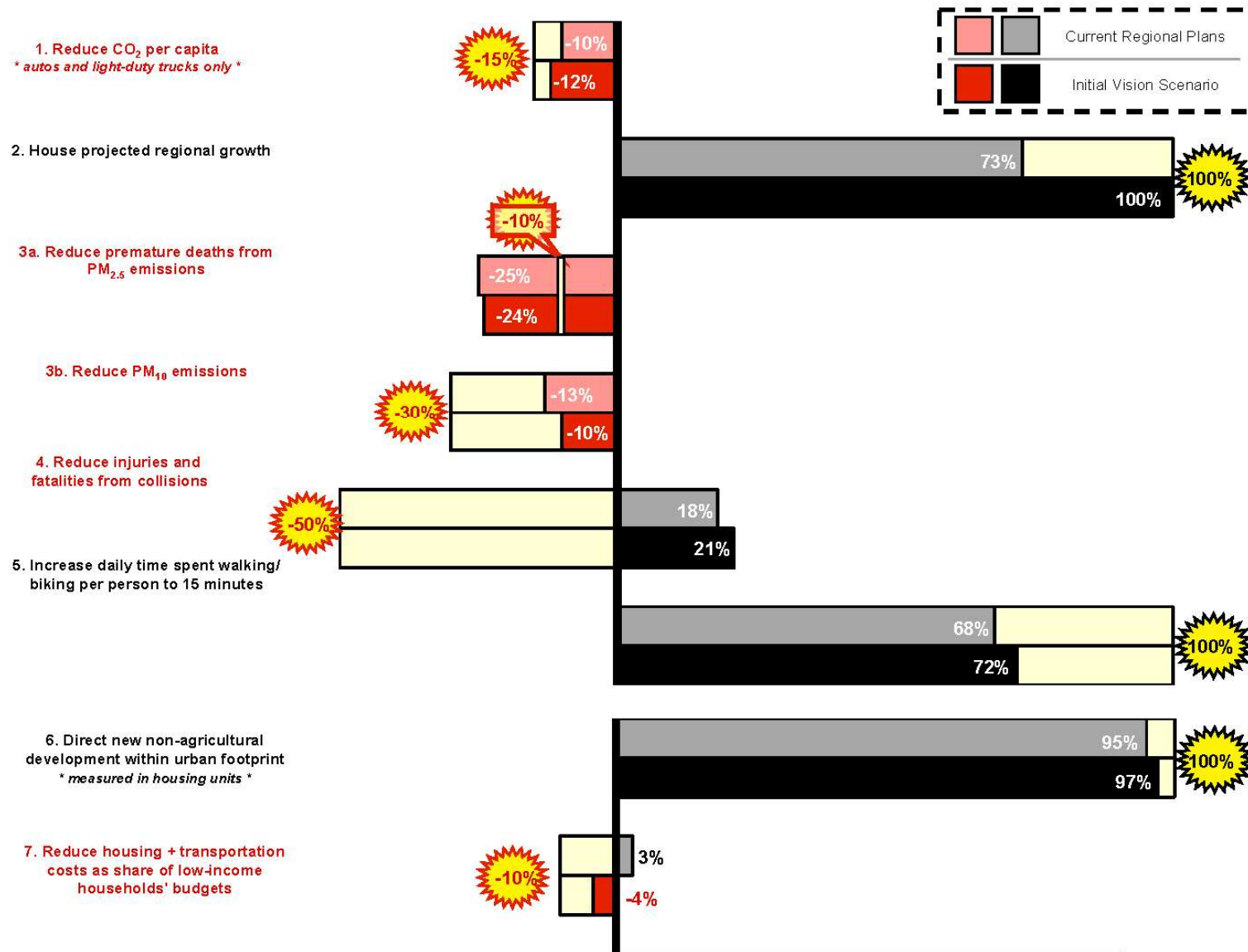


Figure 1

Target Results



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]

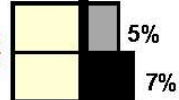
Targets results not yet available

Targets results not yet available

90%

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

-10%



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

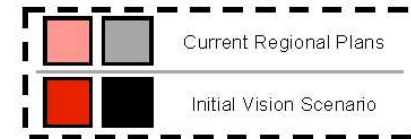
19%

20%

25%

9b. Reduce VMT per capita

-10%



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

84%

84%

100%

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

10%

35%

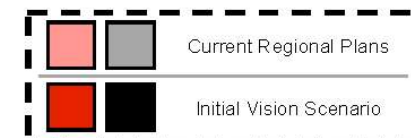
35%

50%

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

120%

120%



Environmental

COALITION

COMUNIDADES EN RIESGO



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.

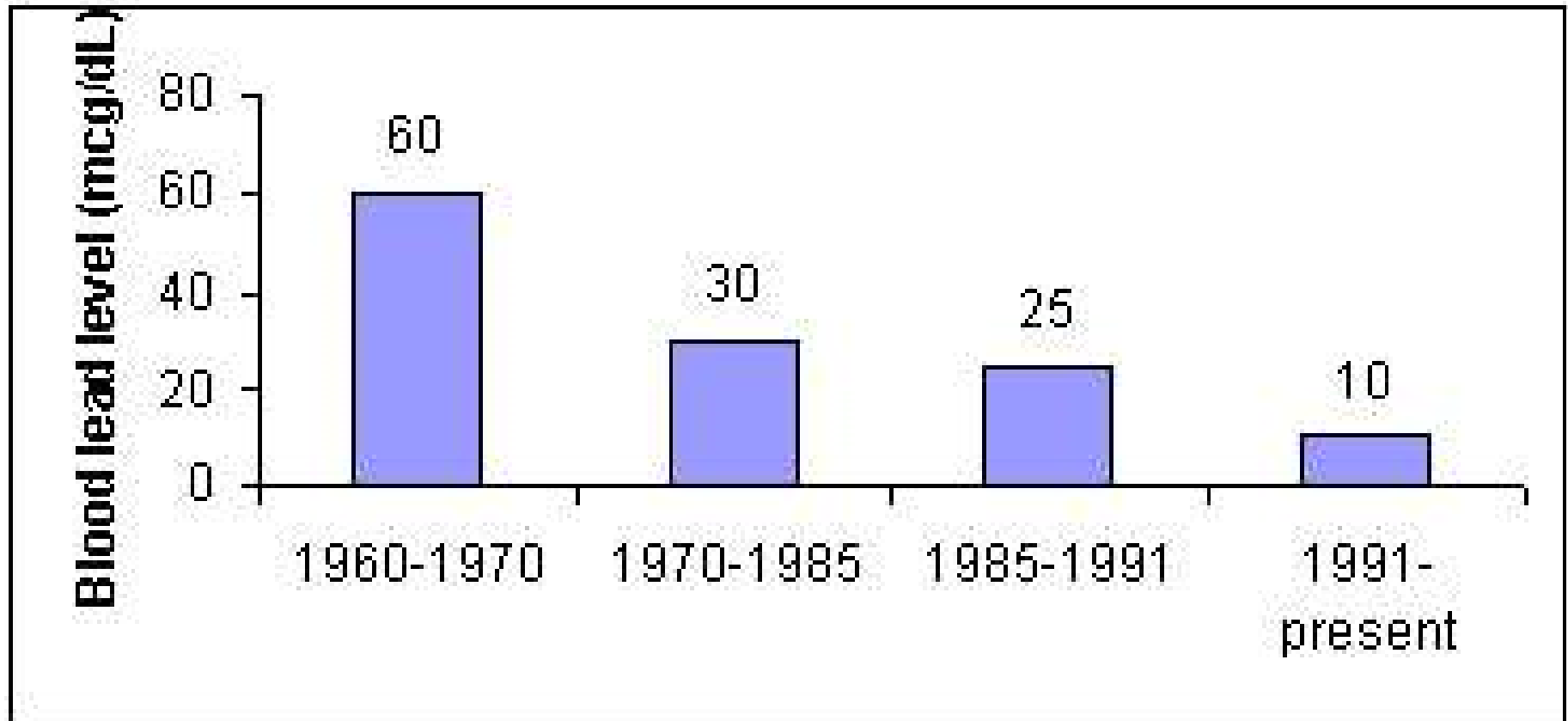
¡Justicia Ambiental Ya!



Predicting for individuals?

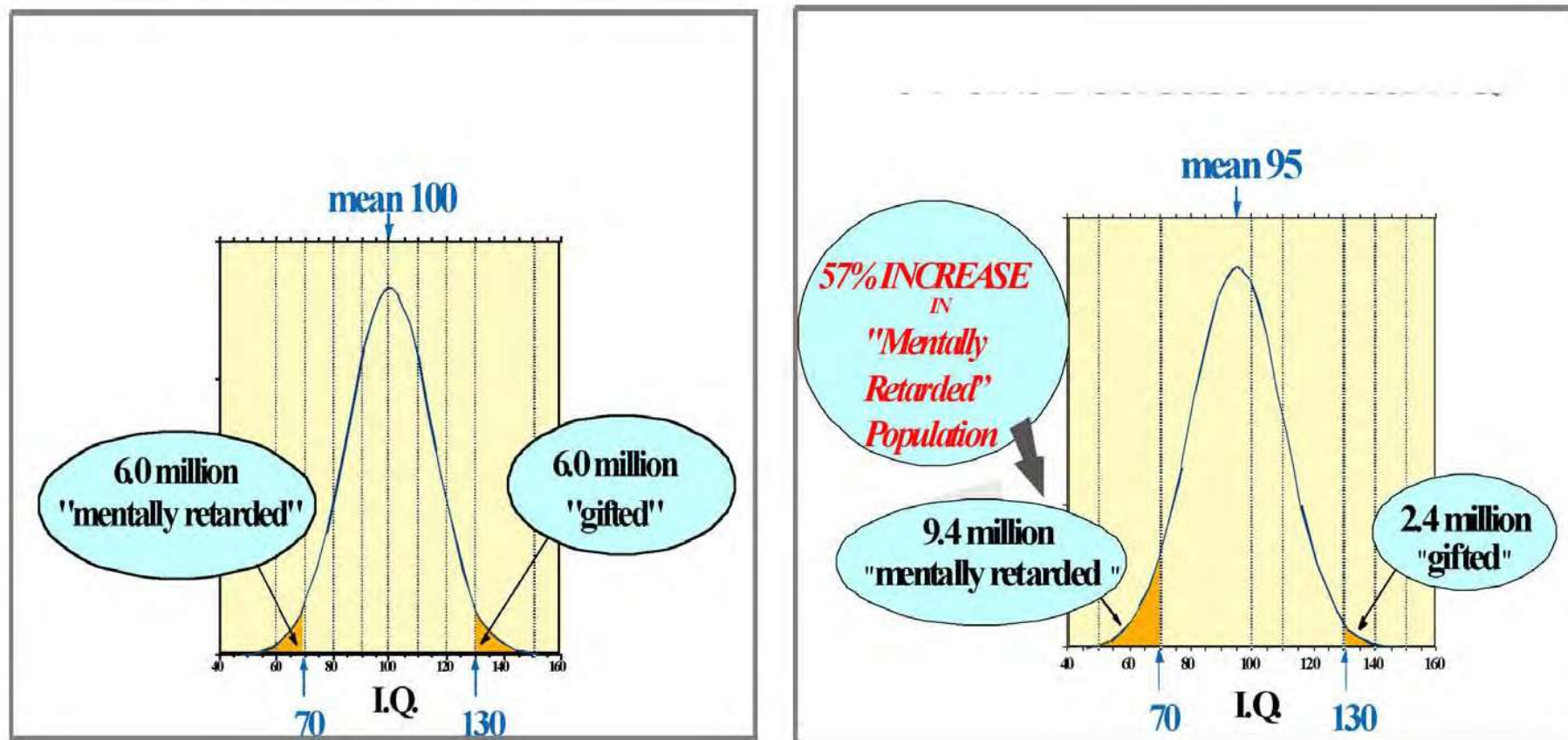
- Differences between population and specific, named individuals
- Locus for analysis and actions is in public spheres
- What can we manage?
- Limited capacity to provide any individual level advice
- Current knowledge always on a trajectory

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.

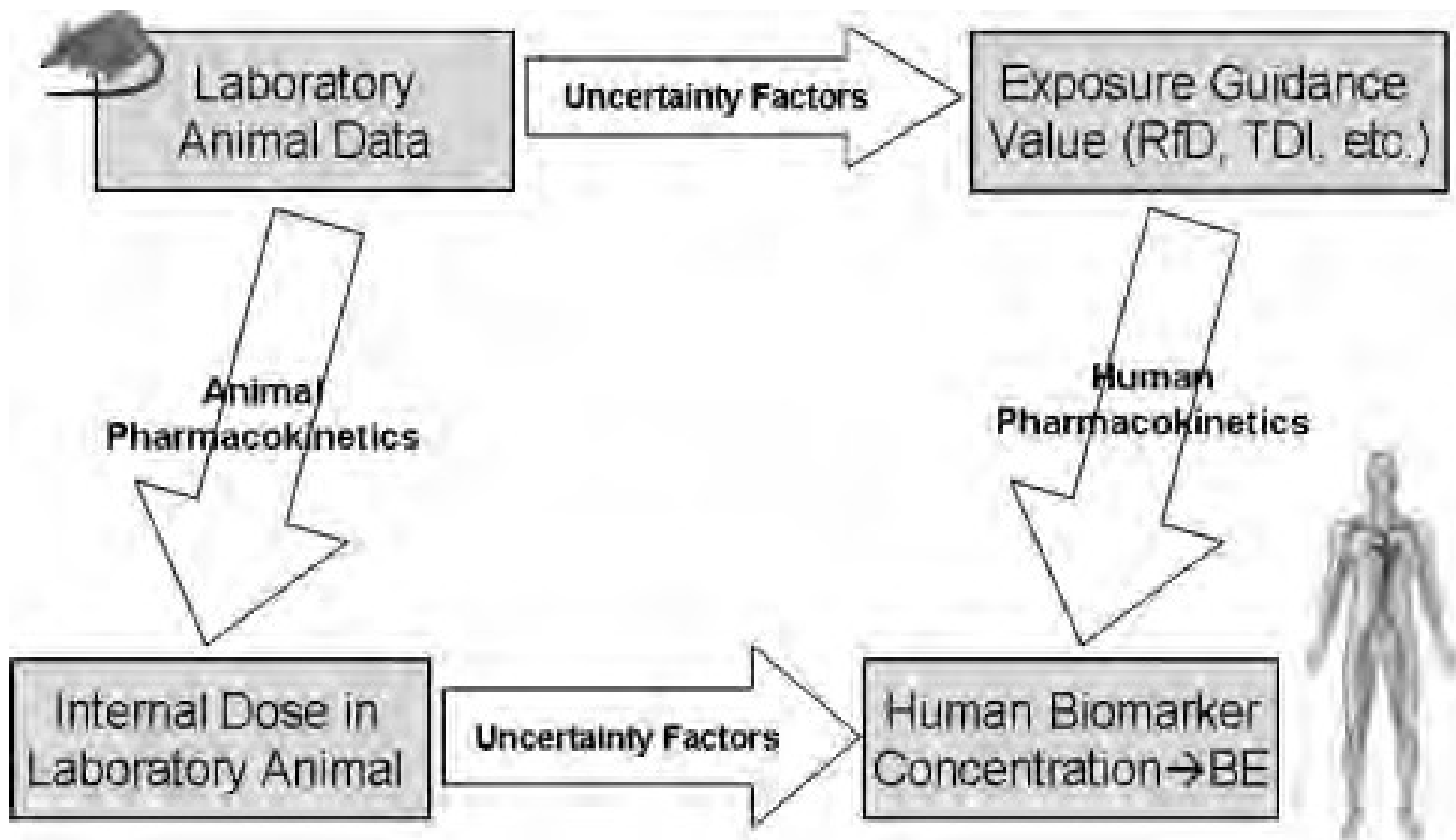


Fig. 1. Generic description of method for deriving the BE

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

**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 concentrations in
foods, action level for lead in
dust

**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)*

Human responses

diseases, disorders
loss of function or
potential
biological changes that
predict risk or disease
increased susceptibility

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

**Create barriers; reduce or
eliminate practices that result
in exposure**

*Bottled drinking water, in-home filters
Individual actions to reduce exposure to
particular sources*

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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Received April 6, 2009. Revised manuscript received August 21, 2009. Accepted August 27, 2009.

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

Cumulative Impacts: Building a Scientific Foundation

Public Review Draft

August 19, 2010

PUBLIC REVIEW DRAFT

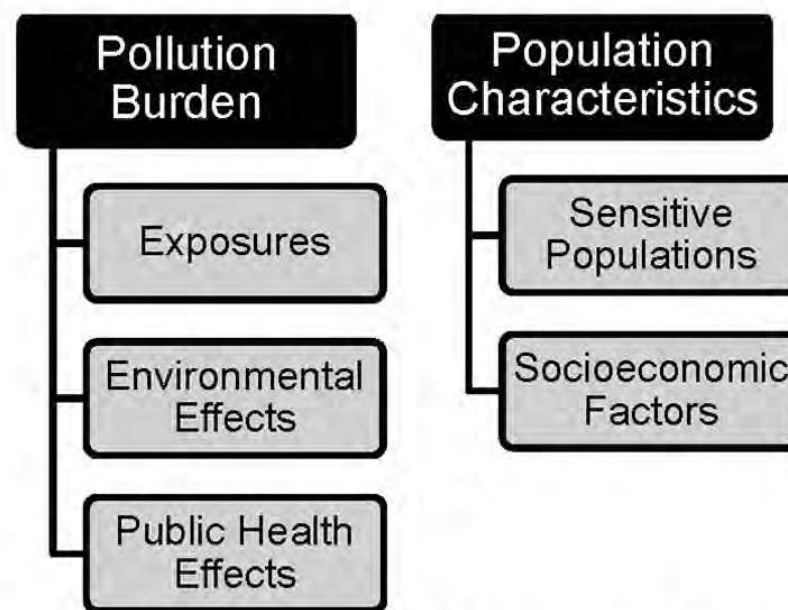


Figure 1. Components of cumulative impact.

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.

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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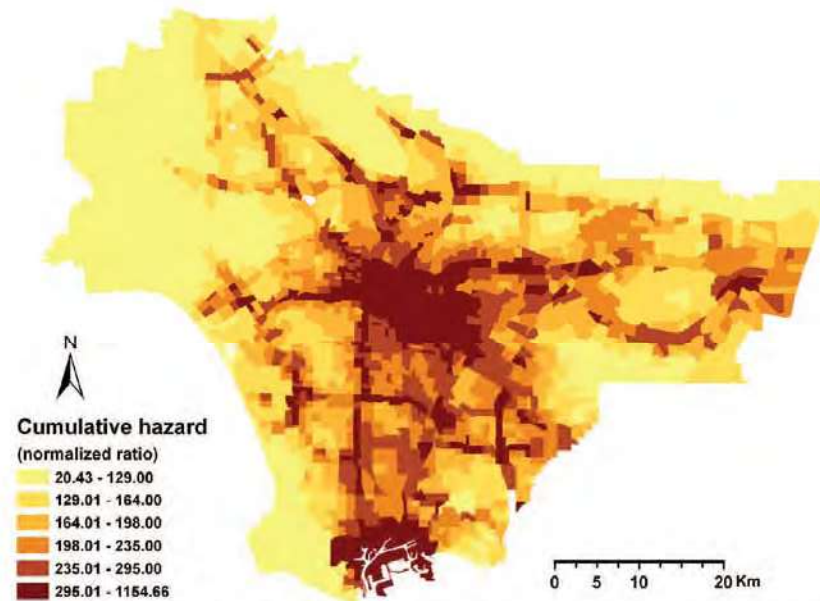


FIGURE 4. The cumulative environmental hazard using the multiplicative approach. Census tract level cumulative environmental hazard = $(NO_2)/(53) \times (PM_{2.5})/(15) \times (DPM)/(1)$.

