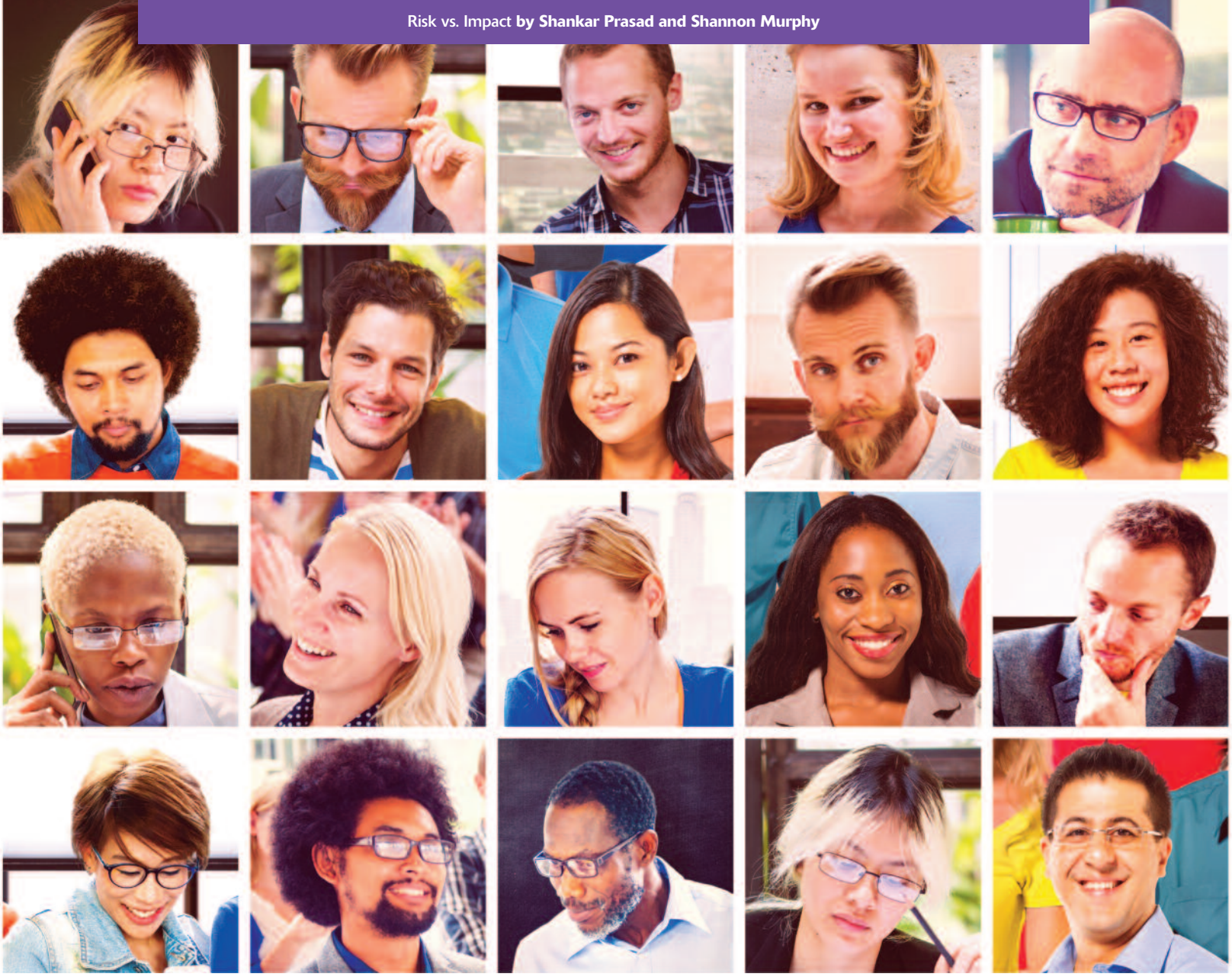

Moving from a ‘Risk’ to ‘Impact’ Paradigm is Critical to Achieve Environmental Justice

This article discusses a new approach to replace cumulative risk assessment.

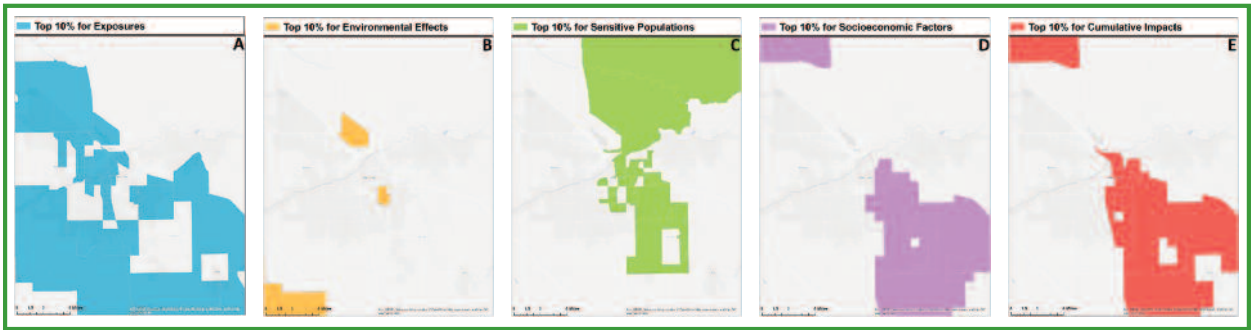

Figure 1: Bakersfield area maps showing the top 10 percent of impacted census tracts for individual components (A-D) and the cumulatively impacted tracts (E) across CA.

Traditional risk assessment (TRA) as currently practiced in environmental and other related regulatory programs at the federal, state, and local levels is designed primarily to evaluate health risks from a single contaminant or source at a time, often in one specific medium (e.g., air or water). In some cases, groups of related contaminants can be considered together, or aggregated as with cross-media or cross-source exposures.[1,2] Some community groups and scientists have criticized this approach as failing to adequately consider the totality of health risks facing an individual community.[3]

TRA is based on the concept of establishing risk thresholds that are considered either "safe" or —when there is no evidence of a safe threshold level—"acceptable".[4,5] The numeric risk levels established in this way are used as a foundation for most environmental health policy decisions. Other factors that often play into the final decision include evaluating and identifying technologies or solutions available in the foreseeable future that are required to reach the target, potential costs involved to integrate them, and an estimate of the broader economic impacts.[6] Thus, TRA and related policies or regulations play a major decision-making role in our society.

However, people in real life are simultaneously exposed to multiple contaminants from multiple sources and have multiple stressors based on their health status as well as living conditions.[7] Thus, the resulting cumulative health risk is also often influenced by nonchemical factors such as socioeconomic and health status of the people living in a community.[8] In such situations, the TRA method has a limited ability to quantify the resulting cumulative risk because it requires extensive characterization of the chemicals present, the routes and levels of exposure, and the dose-response relationship for hundreds of chemicals for which data are neither currently available nor likely to be generated in the foreseeable future.

In addition, the methodology does not exist to fully integrate geographic (e.g., proximity to sources), intrinsic (elderly, sex, health status), and extrinsic (socioeconomic status) factors into TRA.[9] These limitations have significantly contributed to the continued existence of disproportionately burdened or disadvantaged and unhealthy communities across the country, even in locations where the overall regional environmental quality may have steadily improved.[10]

Hence, recently in California, in addition to TRA, a community- or place-based cumulative impact (CI) assessment approach has been adopted and applied to some resource allocation programs aimed at investing in and rebuilding healthy communities. This approach substitutes the traditional concept of "risk" with the broader concept of "impact".[11]

What Is Environmental Justice?

Environmental Justice is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies.

Source: **U.S. Environmental Protection Agency**

Impact vs. Risk

Many use the terms risk and impact synonymously, suggesting that they describe the same outcome. However, the term *risk* means a probability of an injury or loss, while *impact* in this

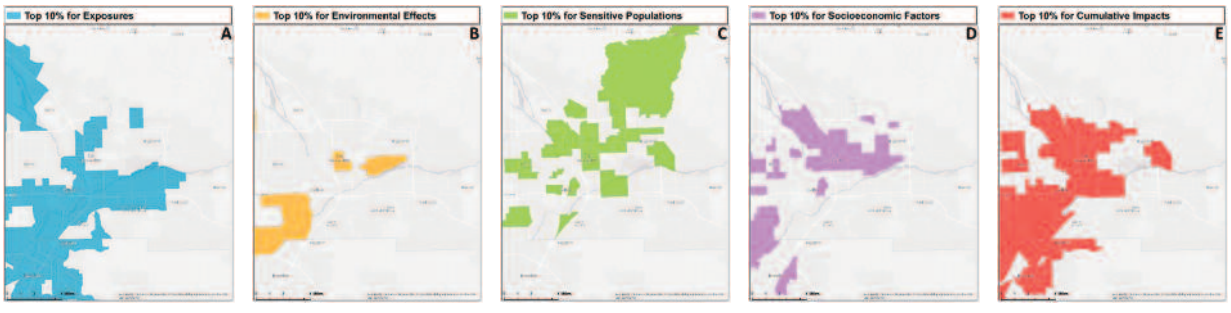

Figure 2: San Bernardino area map area showing the top 10 percent of impacted census tracts for individual components (A-D) and the cumulatively impacted tracts (E) across CA.

context refers more broadly to stressors that reduce the potential for health and quality of life. In the two hemispheres of human and environmental health, risk assessment suggests a quantitative approach to evaluating injury or loss, whereas impact assessment implies integrating both quantitative factors and those less readily measured or estimated, but that are known to be important to adverse outcomes.[1,12]

Over the past decade, as can be seen on their respective web sites, some agencies have mapped cumulative risk primarily from air emissions.[13] These include cumulative air emission risk analysis by Minnesota Pollution Control Agency, multiple air toxics exposure study by South Coast Air Quality Management District, and community air risk evaluation by Bay Area Air Quality Management District. Collectively, these efforts demonstrate a shift toward a "cumulative" methodology that integrates a multi-source, multi-chemical paradigm to estimate risk. This shift has advanced the field of risk assessment and served as a valuable foundation upon which to expand and develop the concept of cumulative impact that also considers changes in the quality of life.

The limitations of TRA to ascertain cumulative impact (CI) in any particular area or community affected jointly by pollutants in air, water, and soil have hindered agencies at the local, regional, and state levels in initiating area-specific actions to improve the health and resilience of a community, and have contributed to an atmosphere of mistrust between many regulatory agencies and communities. Regulators often speak only the language of probability and risk, while communities often articulate a burden of impacts on their health and quality of life.[14] Regulators often focus on risks from individual chemicals, sources, or policies; communities also may focus on individual sources or chemicals, but firmly in the context of what they perceive as an unacceptable backdrop of exposures and illnesses. This set of discrepancies is at the heart of the environmental justice movement.[10]

CalEnviroScreen

To bridge the divide between TRA and community concerns, multiple institutions are pursuing alternate approaches to evaluate CI.[15-17] Community-scale CI assessment approaches use scientifically justifiable, quantitative, and semi-quantitative methods that permit comparisons between communities or geographic areas. One such approach—CalEnviroScreen developed by CalEPA's Office of Environmental Health Hazard Assessment—facilitates the relative ranking of communities across the state, thus providing a snapshot of existing conditions across a wide variety of stressors.[15]

The CalEnviroScreen model integrates 19 indicators representing: **exposure** to air pollution, pesticides, and drinking water contaminants; **environmental effects** resulting from the presence of different types of noxious sources (e.g., solid waste and cleanup sites, hazardous waste facilities) in the vicinity; and **sensitive populations** and **socioeconomic factors** (e.g., asthma, low birth weight, poverty, unemployment) in the area. The two sets of maps illustrated in Figures 1 and 2 from the Bakersfield area in central California and San Bernardino area in southern California show the distribution of the census tracts in the top 10 percent, representing the most burdened for each of the four components and how these tracts shift when combined together to show those tracts that score higher for the CI.

In the first set of maps of the Bakersfield area (Figure 1), there are 106 census tracts in total. Among these, 31 tracts score in the top 10 percent for exposure (A), 3 for environmental effects (B), 26 for sensitive population (C), and 24 for socioeconomic factors components (D). However, as seen in the fifth map in the series (E), 29 tracts score in the top 10 percent for the CI when the scores of these tracts are combined according to the model used in the CalEnviroScreen. In the second series of maps of the San Bernardino area (Figure 2), the corresponding numbers are 175, 56, 5, 34, 38 and 53 tracts, respectively.

The scoring system also allows comparisons between communities with the same or similar score to better understand the relative contributions of individual indicators, representing factors that influence the CI in a community. This ability to prioritize or rank communities based on CI indicators enables assessors to more effectively represent the complex relationships between health outcomes, psychosocial stressors, and environmental exposures. The momentum to include CI assessment in the decision-making process is building across the country and newer approaches are being developed and introduced.

Utility of the CI Approach

In California, census tracts that are in the top 25 percent of the CalEnviroScreen scores are designated as "disadvantaged communities" for purposes of resource allocation or investment. The California Legislature used the CI framework to incentivize investment in disadvantaged communities with a specified percentage of the greenhouse gas reduction fund generated by the cap-and-trade program. This approach is noteworthy and represents a model that could be followed elsewhere. CI assessment at a local or regional level is also viewed as critical since most of the growth planning, siting, and permitting decisions take place at this level.

Some examples of actions that are being guided by CI considerations in communities include:

- Placing alternate buffer zone restrictions for new buildings such as homes, daycare centers, hospitals, or schools from sources such as agricultural fields, refineries, oil and gas operations, landfills, freeways, or ports.

- Modifying permit conditions such as by restricting the days and timing or methods of pesticide application near sensitive sites to reduce pesticide drift exposure and public concerns.

- Focus efforts to ensure compliance with existing regulations in communities with CI issues, including compliance assistance for businesses, improved public complaint tracking systems, multi-agency coordination, and targeted enforcement.

- Investing in job growth, transit assistance, affordable housing or health care in communities that score high for the socioeconomic factors and sensitive population components.

- Establishing alternate area-specific risk thresholds for new and existing sources.

Besides state-level efforts, such actions can also be pursued at a city level through city ordinances or through local governments because of the scale of variability involved, the number of factors contributing to CI in a given area,[18,19] and the higher level of jurisdictional, as well as independent authority that can be exercised.

Some business groups have argued that the identification of disadvantaged or unhealthy communities based on CI could lead to "redlining" those areas and could potentially lead to their economic isolation. However, this opinion has never been voiced nor endorsed by any of the community groups.[14,20,21] In fact, many of the communities have asked for such delineation so that a multitude of actions such as those listed above can be pursued at the local level.

Irrespective of the debate on precisely how it should be integrated into decision-making, CI assessment provides an additional layer of information beyond TRA, leading to more informed decision-making. Although the two tools are complementary in being the twin scientific bases for shaping healthier communities in any neighborhood, achieving environmental justice will depend primarily on reducing cumulative impacts. **em**

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