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Arsenio Mataka
Cal/EPA Deputy Secretary
1001 I Street
Sacramento, CA 95814

George Alexeef
Director, OEHHA
1001 I Street
Sacramento, CA 95814

RE: Draft California Communities Environmental Health Screening Tool (CalEnviroScreen) Proposed Methods & Indicators

Dear Mr. Mataka and Dr. Alexeef,

The California Council for Environmental and Economic Balance (CCEEB) is a non-partisan, non-profit coalition of business, labor, and public leaders that advances balanced policies for a strong economy and a healthy environment. We appreciate the opportunity to participate in the Cumulative Impacts & Precautionary Approaches (CIPA) Working Group and to provide to you here our detailed comments on the draft CalEnviroScreen. CCEEB hopes that our comments help strengthen the scientific underpinnings of the model, as well as the broader policy development process related to how the tool results will be used and applied in California. Towards this end, we include both policy comments on the overall Cal/EPA process, and then technical comments on the method itself.

<u>Policy Comments</u>:

1) The methodology and input data need to be consistent with the tool's ultimate policy use.
2) Cal/EPA must provide clear policy guidance on appropriate use, including use outside of Cal/EPA.
3) Screening tools are not scientifically robust enough to be used for permitting or regulatory decisions or for evaluations under the California Environmental Quality Act (CEQA).

4) Results of the screening will influence private sector investment decisions. In order to provide project proponents certainty, Cal/EPA must be clear that results are not meant for use in reviewing project-level decisions.

Technical/Design Comments:

1) The tool requires significant redesign; Cal/EPA ought to invite a second comment period and an additional round of workshops following the release of a revised tool methodology and indicators.
2) Cal/EPA should eliminate arbitrary and confusing weighting of indicators and components in the currently proposed methodology. CCEEB supports testing alternative methods, such as a ranking approach as discussed by members of the September 7, 2012 Academic Panel Workshop, to see if other methods improve the model's validity.
3) Indicators need to be reevaluated for precision, consistency, and appropriateness to the component that they seek to measure.

What follows are detailed comments on each of the points summarized above.

Cal/EPA Process for Screening Communities for Cumulative Impacts

Develop Policy Guidance on How Screening Results Should Be Used

Cal/EPA should maintain authoring responsibility for the tool and lead by providing clear guidance for the appropriate use of screening results by Cal/EPA, its boards, departments, and offices, and by other state and local agencies and stakeholders. Towards this end, CCEEB requests that Cal/EPA commit to a process of engagement with stakeholders in order to determine how and when the screening tool should (and should not) be used.[1] Furthermore, we strongly urge CalEPA to clearly articulate that CalEnviroScreen should not be used to require additional regulatory requirements or additional CEQA review beyond what is already required under current federal, state, and local programs.

We understand from Cal/EPA comments made at the CI/PA working group meeting on August 7, 2012 that the tool is meant to help prioritize agency resources and is not intended by Cal/EPA for use in *its* permitting programs. However, Cal/EPA also suggests in a July 30, 2012 dated memo, under the "Potential Uses of the Results" section, that the tool could be used to supplement CEQA analysis (which affects permitting) and to inform local government policies. Furthermore, at the August 7

[1] The 2010 Cal/EPA-OEHHA report clearly mentions development of policy guidance. However, there is no process currently planned or even a commitment by Cal/EPA under the Brown Administration to take this next step. Relevant citations from the 2010 report include:
Page 31: "The guidelines would also explain when and how the screening method should and should not be applied. Public input will be an important element of this work moving forward."
Page 34: "Whether and how the scientific screening methodology should be considered in permitting processes is a topic that needs more discussion within Cal/EPA and more input from the CIPA Work Group and other stakeholders. In the meantime, the screening method…is not to be used in the CEQA or permitting context. This issue will be discussed further during the development of Cal/EPA's guidelines."
Page 35: "Cal/EPA could then use this information to inform priority setting and resource allocation to help reduce those negative impacts. However, this scientific screening method is not to be used for regulatory purposes until guidelines have been completed."

meeting, Cal/EPA staff suggested that the screening could be used to advance policies like the proposed Clean Up Green Up ordinance in Los Angeles, which includes permit restrictions, the imposition of additional mitigation above and beyond current requirements, and possible outright prohibitions on certain facility types. Thus, intended uses *outside* of Cal/EPA are clearly just as important as agency uses, and have the potential to significantly affect permitting and other regulatory decisions.

CCEEB is concerned by this ambiguity over intended uses. A screening tool cannot show causation, nor does it identify the source of a problem, only that a problem might potentially exist. For this reason, CCEEB has repeatedly pointed out that screening tools lack the requisite scientific rigor needed for making regulatory decisions. Yet at each and every regional workshop on the tool, representatives from community-based organizations have made clear that they expect the results to be applied in permitting decisions. OEHHA and Cal/EPA facilitators did not directly respond to these comments, thus community members continue to believe that applying the tool to permits is both appropriate and likely to occur. This has compounded misunderstanding about the tool's inherent limitations and how it can be used, and has left serious questions about Cal/EPA's intentions.

CCEEB's concern about so-called "redlining" policies is well recorded, both at the CI/PA working group and its predecessor the Cal/EPA EJ Advisory Committee. We continue to believe that such extreme measures could have serious negative and unintended consequences for communities they seek to help. For example, in 2009, the Bay Area Air Quality Management District ("District") considered a rule that would have applied more stringent permit standards in six communities identified by the District for being both low-income and impacted by toxic air contaminants. Coupled with changes to risk screening factors promulgated by OEHHA and the Air Resources Board, the proposed rule would have severely limited new air permits in these six communities since few sources would have been able to meet the additional stringency requirements. Importantly, each of these communities overlapped with regionally designated Priority Development Areas and state economic Enterprise Zones. Ultimately, and wisely, the District rewrote its rule and took a regional approach that did not unfairly disadvantage one community over another due to largely socioeconomic differences. The South Coast AQMD reversed a similar proposal to apply differential standards as part of its Clean Communities Program, also citing concerns about potential negative and unjustifiable economic impacts.

We flag an additional but related concern that, regardless of whether or not permit or regulatory restrictions are imposed, risk managers will use screening results to inform private sector investment decisions. Decisions made by the private sector could ultimately prove as important as those made by government actors. Therefore, Cal/EPA needs to be very explicit in explaining that the screening tool is meant for use in policy and program evaluations, and not for use in any specific project analysis or review of permit decisions. This will help provide much needed

certainty to project developers who may be considering investments in low-SES communities so that these communities are not unfairly disadvantaged.

CalEnviroScreen Method & Indicators

Tool revision necessitates a second round of stakeholder comments

CCEEB staff attended the September 7, 2012 academic panel workshop in Oakland, California. This was an excellent discussion of the technical aspects of the model, and we very much appreciate Cal/EPA and OEHHA for convening outside experts and considering their recommendations. We have attached as an appendix our notes from this meeting, which capture our best understanding of key issues and concerns raised.

Based on the academic workshop, we anticipate that the tool will be significantly revised. Furthermore, we understand that OEHHA will conduct sensitivity analysis on the tool to test alternate methods and to test the appropriateness of each component and each indicator. CCEEB fully supports and encourages OEHHA to go forward with the revision and sensitivity analysis. There is a great deal of interest in CalEnviroScreen as demonstrated by the recent public workshops. This reinforces how critical it is for OEHHA to improve the rigor and science behind the tool, and to correct the arbitrary and confusing aspects of the tool that can lead to misleading results.

Given the potential for substantial changes to the model, and given the significance of potential uses of the screening results, CCEEB believes that Cal/EPA and OEHHA must provide an additional opportunity for comments so that stakeholders can evaluate the revisions. We also urge OEHHA to make publicly available the results of its sensitivity analysis and to provide access to the databases that are inputs to the model. This will help all stakeholders understand how the model works and to test the underlying assumptions in the model, as well as the model's validity. Ultimately, these steps will ensure transparency and will lend to the credibility of screening results.

Method and Formula

CCEEB agrees with many on the academic panel who stated that the design of the screening depends on the intended use. We also strongly agree with the academic experts that neither the weighting and scoring nor the multiplicative approach has been adequately justified on a scientific basis, and that both can lead to misleading or confusing results, which in turn goes against OEHHA's stated goals of simplicity and transparency. As such, CCEEB supports recommendations made by several on the academic panel to move away from the current numeric approach, and instead apply a ranking approach that eliminates the arbitrary and confusing weighting and scoring of indicators and categories (i.e., binning, not scoring).[2]

[2] Thomas McKone, Jonathan London, Paul Mohai and others on the academic panel described in some detail how a rank-based approach could be applied. Our understanding is that this would rank each indicator (high, medium or low on potential impact), and that

In terms of the number of components in the model, CCEEB strongly agrees with several members of the academic panel that efforts should be made to simplify the model and reduce the number of categories and indicators. To this end, CCEEB recommends that OEHHA reduce the number of components from the current five (exposures, environmental effects, public health effects, sensitivity, and vulnerability) down to two (environmental stressors and population characteristics). This would allow OEHHA to construct a simple matrix for capturing the range of ranks across the two core components, and make it easier for users to visually see which factors drive the results. Whenever possible, duplicative or counter-intuitive indicators should be eliminated based on statistical sensitivity testing. Finally, CCEEB recommends that if OEHHA continues to apply weighting, then it should be done as late into the calculation as possible and with a full and explicit explanation of the policy rationale for weights and scoring.

Treatment of Public Health Indicators

CCEEB strongly agrees with the academic panel about moving the public health indicators from the stressors side of the formula to the population characteristics side. These data are more relevant to characterizing a community's vulnerability to health disparities, regardless of the cause. This is clearly illustrated in the sample maps, where we see a closer correlation between socioeconomic status (SES) and health outcomes than between health outcomes and either exposure or environmental effects.

With this shift in categories in mind, we believe that cancer and heart disease are poor indicators of vulnerability and should be removed. Asthma ER visits could be a reasonable indicator of access to health care, but should never be used as a surrogate for exposure since it misses cases of asthma managed through preventative care and ongoing access to medication. Health experts may be able to recommend better indicators of social vulnerability than asthma ER visits, such as low-birth weight, which seems to be a strong indicator of vulnerability. (Conversely, low-birth weight is not a strong indicator of exposure and should be dropped if the category is not shifted.)

Revision of Exposure and Environmental Effects Indicators

CCEEB agrees that the Exposure and Environmental Effects components should be collapsed into a single component, and, for purposes of clarity, not be referred to as "exposure" since most of the indicators are not direct measurements of actual exposure (i.e., if you call it exposure, then it should be limited to exposure). Instead, this component should be renamed as "environmental stressors."

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results would be expressed as a combination of rankings across components, rather than as an arbitrary multiplicative composite score of numerous independent indicators all weighted the same. Rankings could also be built into a simple matrix, allowing end users to easily "see" results for each component.

Environmental Stressors - Exposures
For air quality indicators (ozone and PM 2.5), we strongly support the approach described by Sierra Research in their comments from September 24, 2012. This approach mimics heating degree-days and does a better job at showing air quality improvements, even as standards continue to become more stringent.

For air toxics, we agree with comments provided by Sierra Research and support the use of State and air district monitoring data rather than EPA's Toxic Release Inventory (TRI) since State and air district data are more robust and provide a more accurate measurement of both emissions and exposure. For non-air toxics, TRI data may be appropriate, but we recommend that OEHHA use the risk-related endpoints and not the hazard-weighted pounds, as recommended by Dr. Lynne Haber in her comments to the academic panel.

Environmental Stressors - Environmental Effects
For environmental effects, all indicators can and should be strengthened in ways that avoid or minimize assigning harm (1) where there is little or no population in direct proximity and thus no real exposure potential, or (2) with respect to sites that have either completed remediation and clean-up activities or are otherwise operating in full compliance with all laws and regulations. These indicators, as currently envisioned, are overly broad and could result in unintentionally high scores for some areas where problems may not actually exist.

Refinement of Socioeconomic Indicators

As previously stated, CCEEB strongly disagrees with the multiplicative approach, which results in much greater weight being given to socioeconomic status (SES) than actual pollution, as was acknowledged at the academic panel. OEHHA's intention should be first and foremost to identify communities most burdened by pollution "[taking] into account sensitive populations and socioeconomic factors, where applicable and to the extent data are available." It's worth noting that when the working definition for cumulative impacts was first developed at Cal/EPA as guidance to the environmental justice pilot projects of 2005, consideration of socioeconomic factors was part of a larger discussion about whether and where disproportionate impacts were occurring. Studies at that time suggested that communities of low-socioeconomic status bore higher levels of pollution exposure across all media and from multiple sources. The concept of socioeconomic vulnerability—where, all things being equal, some communities are more *vulnerable* to an *equivalent* level of exposure—has more recently emerged and now dominates both the tool as well as Cal/EPA's consideration of cumulative impacts. Yet, at the same time, Cal/EPA seems to ignore the more fundamental question about whether the pollution burden and impacts are disproportionate, and how this could be either quantified or qualified.

CCEEB urges Cal/EPA and OEHHA to place the highest priority on multi-media environmental impacts. To this end, we reiterate our recommendation that OEHHA should test and apply alternative model designs, as discussed at the academic

panel workshop. However, should OEHHA decide to retain the numeric scoring, then CCEEB strongly recommends that the tool be modified to ensure that cumulative environmental impacts in a community are the prime output of the tool and that SES should not be used as a modifier or multiplier since this over weights the importance of SES when identifying communities for cumulative impacts.

Geographic Scale

The geographic resolution of the screening tool (zip codes, census blocks) should only reach as far as good quality data will reach. For most of the indicators, finding data down to the zip code level is already a challenge; finding good quality data at the census tract/block level will be even more challenging. Consequently, CCEEB recommends that OEHHA stay with the current level of geographic resolution unless it can be confirmed that good quality data are available for most, if not all, of the indicators at a smaller level of resolution.

Thank you again for allowing us the opportunity to comment. Cal/EPA's commitment to over burdened and disadvantaged communities is appreciated and applauded, as is its willingness to conduct fair and balanced proceedings that reflect the interests and perspectives of all stakeholders. We also acknowledge and appreciate the willingness of OEHHA's staff to test new tools and concepts, and to do so in a way that is both understandable and engaging to all stakeholders. In closing, we hope that all parties respect the beneficial role that businesses play as an integral part of these communities, and that CCEEB's participation can support the common goal of improving environmental, economic, and public health outcomes for all Californians.

Sincerely,

Gerald D. Secundy
CCEEB President

Bill Quinn
CCEEB Vice President and CIPA
Working Group Member

cc: Secretary Matt Rodriquez, Cal/EPA
Deputy Secretary Miriam Barcellona Ingenito, Cal/EPA
Director Ken Alex, Governor's Office of Planning and Research

Appendix 1

What follows are notes from the meeting of the academic panel that took place in Oakland, California on September 7, 2012. Paragraphs are paraphrased summaries of each panelist's comments. OEHHA and Cal/EPA staff responses are noted where appropriate. Although this is not a direct transcript, and some points have surely been missed, every effort has been made to preserve the tone and content of the discussion. As such, no editorializing is made, and all points recorded have been included.

These notes reflect our understanding of the panel discussion that occurred, and do not necessarily represent the positions of the California Council for Environmental and Economic Balance. We provide them here as a resource to all interested parties.

Opening Comments, Dr. Gina Solomon

- Different tools have different purposes. Tools are not mutually exclusive, can combine and drill down using other tools. Cal/EPA is interested in input on combining tools.

- Cal/EPA wants a tool that is scientifically defensible and practical and one that achieves valid identification of communities. Cal/EPA will update the tool.

INDICATORS, selection and scoring

- Low birth weight should be narrowed to term babies only since environment doesn't contribute to preterm births. Other health outcomes (i.e., asthma, cancer and heart disease) are problematic. Example from Alameda study: asthma ER visits are indicative of poverty and lack of preventative care. In other areas, asthma burden manifested in use of medicine for asthma. Heart disease and cancer could show same access of care problem. Unclear why all cancer is used as opposed to ones with a better relationship to the environment; washing things out using all cancer. However, unsure what would be the alternative.

- If the goal is to just flag all of these indicators combined, then health indicators can be seen as measures of the disease burden and not necessarily linked to the other indicators. Problem comes from thinking implicitly in terms of the environment since one indicator may not be entirely related to the second. Don't see them as multiplicative.

- Health outcome date has lots of limitations in terms of scale and application. These indicators are really about the vulnerability factors. Since this is a screening, it's not trying to show causation. Think less in terms of an effect, and more about representing vulnerability. Agree that asthma ER rates are about

access to care. Ask if data is in a scale that we can use. Low birth weight is an excellent indicator and used internationally.

- Indicators depend on use. OEHHA should consider building a toolkit from which different screenings could be drawn depending on use. In a toolkit, you could need indicators expressed both ways or in different combinations.

- These should be independent metrics. Should see a range of ranks across categories and different combinations instead of numbers: or binning, not scoring. A toolbox approach could rank across both counties and categories. It has a broader use and gets away from the problem of "adding vs. multiplying". Whenever you transform it, you build in a relationship that may not exist, so keep the data as raw as possible, but in a form you can use.

    - This isn't quantitative risk assessment. Almost like the air quality index: red light or green light.

    - How do you rank across 19 variables? You don't want 19 different outcomes.

    - Ranking each indicator by zip code doesn't mean it is quantitative. And software can run mid-max comparisons – it's just a sorting exercise. Can formalize decision-making criteria when deciding between two competing attributes.

- Keep in mind the availability of data. For example, ozone and PM are good data, but there are only 100 stations. The rest is extrapolation and guess work. It's good that the tool has multiple indicators for exposure. Some work, some won't for different areas.

- The current ranking and percentile approach at first seemed like a clever way to combine indicators. However, the way the math is applied is driving the results. OEHHA should take the metrics and figure out how best to combine them with the weight explicitly *not* based on math. After than, one can then figure out how to rank and apply percentiles. Right now, can't distinguish among shades of grey.

- Concern about ranking each indicator. For some indicators, there is a bright line between what is good and bad, but others, not so much. With ranking, there will always be zip codes in the top or bottom ten, no matter how good a community is. So the model needs to deal with bright lines, but also defer ranking and percentiles to a later step.

- Think about the use, and which indicators influence specific considerations. Do you want to make assessments at one point in time, or look at trends and changes over time? A temporal look leans toward absolute scores, not ranks. Do you want to highlight collaborations? If water is driving a community's score, then you want water people in the room, not asthma ones. If permitting and enforcement are being considered, then you need to set a bar and have a different standard of analysis.

    - Changes over time will be accomplished in a subsequent step. *[Staff Response]*

- OEHHA constructed the model based on the Cal/EPA definition of "cumulative impacts" with the goal of identifying the most heavily impacted communities. If we move public health effects, does that warrant a change to the definition? *[Staff Response]*

- Consider adding an indicator for the additional cases of mortality due to particulate matter. Can do this for air quality, but unsure if it can be done for water or pesticides.

- For pesticides, suggest adding proximity. Example from CDPH report on pesticide use and schools: a lot of use may not be around people. CDPH has data on accurate school boundaries as well as all women giving birth, geocoded for the state. This could be intersected with pesticide use.

- There are ways to augment the data. For example, we took every census tract in the United States and can say what fraction of a chemical release will end up in a population. This data can be used until population patterns change, maybe every ten years or so.

- From using percentile approaches, have found there is a lot of range among top categories. Using deciles is too crude. Is it really realistic for State to say these are the top 180 priorities? If everything is a priority, nothing is.
- It is an imperfect set of indicators. The way around this is to use as many as possible.

- Consider including NATA, which has data for every county for all source categories, plus weighting by risk or reference concentrations. NATA has 80 specific chemicals that can be isolated, including chromium, lead, and diesel. While not a measurement, it is a good estimation. EPA will use it for their screening tool.

    - We couldn't get data from EPA in a form that had the right scale *[Staff Response]*

- We got raw modeling results for our study. EPA runs a model for each location, then aggregates for all sources for each pollutant. We rolled this up to census tract and to county. It was quite an undertaking.

- With NATA, one can do can do source apportionment, which is a good thing. For example, if you are also using TRI data, you can remove stationary sources from NATA to avoid double counting. It's great that you can use NATA for diesel, but also use California not EPA risk estimates. If OEHHA does stay with zip codes, there are ways to aggregate NATA data from census tracts.

- Can reconfigure NATA data by census tract to any shape you want. This isn't easy or quick, but certainly possible. To a degree, NATA available by download is already disaggregated.

- Consider not just scale, but also statewide quality of data. For example, with pesticides, there are different chemicals and different uses.

- Consider adding regional stratification to ensure you are oversampling in places that otherwise might get left out. Take into account "known unknowns" as these have social implications. For example, systematic bias, undercounting undocumented workers or areas where there are fewer monitors. It's a question of coverage. If you don't account for these regional differences, you could accidentally downgrade some areas. If you are trying to improve interactions, and if the method reproduces ignoring certain groups, then this goes against the goal.

- Reformulate public health burden to be like excess number of cases, such as with cancer in NATA. This can be used defensively to justify policies since you can itemize the economic costs of these factors.

- Agree that for pesticide, it would be good to get application near sensitive receptors.

- Appreciate the balance in the model between transparency and validity.

- There are other types of location hazards with a fair amount of data, e.g., rail and ports. The impacts go beyond air quality, e.g., noise. Locational data is relevant to cumulative impacts tools because you are trying to take into account factors beyond pollution.

- Suggest omitting income in favor of poverty. Poverty is a strong indicator. Education is also good. Consider adding home ownership because property owners have better control over their direct environment and have better public

participation. Linguistic isolation is important to include, since this gets at social isolation.

- TRI is good, but RSEI is better. EPA has a public version that scores facilities in 1km squares. You can use estimates for each square and determine the whole burden from industrial sources. This gets more accurate results and gets geographic micro-data, quantity, toxicity, and population weighting.

- Concerned by the age variable, particularly seniors. Mapping "percent over 65" lands you in wealthy areas, which could actually be indicator of health as people live longer. Elderly and kids are inversely correlated and cancel each other out. This just introduces noise into the data, and camouflages areas. "Percent under 5" is ok, and is positively correlated to environment and pollution. Over 65 is just the opposite. Public health effects should capture this since those are indicators of vulnerability, not a result of pollution.

- I see public health effects as vulnerability – this works with the environmental justice mentality in which we have stressors, and then social vulnerability. If you use a ranking system, you can build this into a matrix and see both of these dimensions.

- Regarding linguistic isolation, do you underweight blacks and double-count Asians and Hispanics?

- Suggest including lead poisoning.

- Support inclusion of kids because of known impacts from air quality on lung function.

- Seniors have a lifelong accumulation of damage, and so are more sensitive. You need to parse data so they don't cancel each other out.

- Caltrans has data on the percent of light- and heavy-duty diesel vehicles to add to traffic density. However, California has made tremendous strides and the data is based on outdated varieties of engines and fuels.

- Consider using "years of potential life lost" and "life expectancy at birth". The California Endowment has used life expectancy to look at differences among zip codes.

- Make impaired water bodies more specific and relevant. Now, it includes things like turbidity.

- Agree that linguistic isolation should be included because of the difficulty in dealing with things like siting decisions and mitigations, or the ability to read warnings, such as with chemical use.

- Consider adding housing poverty, i.e., household spending on housing. This shows you instability in residence. Also, look at air conditioning, which related to climate change and indoor air quality.

- For future versions, think about mobility over day and time. People move around a lot.

- Ozone is regional in effect, and monitors are set in the worst locations.

- Consider using State air toxics monitoring data. Even though there will be steeper gradients, these data are real measurements.

- For traffic, find the TAC indicator that is a good measurement of exhaust. Get away from remote surrogates and get a direct surrogate to use in the model.

- For age indicators, it depends on use. Elderly are more susceptible, and you capture wealth elsewhere. But perhaps the overlap is with heart disease.

- You want two to three indicators, not 20. For example, could run rankings with PM in and then out, and then do rank correlation. If there is no change, then you can toss that indicator.

- Hearing a recommendation to reduce the number of components down to two. It would be useful to know if there is consensus on this. *[Staff Response]*

[LUNCH BREAK]

- Hearing people talk about breaking down from five components to two. If we do that, I'm unsure that cancer fits under vulnerability. *[Staff Response]*

- Don't agree with removing elderly.

- Use California toxics database rather than NATA.

- NATA performs pretty well, so focus on those contaminants with high correlation to measurements and where the model is performing well.

- Agree with reducing to two domains. The Cumulative Environmental Vulnerability Assessment uses only two: hazards and SES vulnerability.

- Unlike other factors, race isn't a "problem". Consider this in the sensitivity analysis to see its relevance compared to other indicators. If you do decide to include it, be careful how you treat it.

- OEHHA is coming up with a drinking water quality metric for the state. Will include this in the next version of the model, if possible. *[Staff Response]*

- Support suggestion to include NATA. In comparisons of NATA with monitoring data, we have found a high degree of correlation.

- Concern about the geographic unit and overlay with countywide health data. Suggest leaving this out if you cannot get zip code level data.

MODEL DISCUSSION - strengths and weaknesses

- This is not a predictive model – that should be made explicit. OEHHA could create a predictive model, for example, by using population to predict pollution.

- Model should be simple and transparent, but needs fidelity. You must have enough information to have fidelity, but no more.

- Reiterate comments on structure. With the final scores, like risk scores, there is a danger that people will misuse scale (e.g. score of 20 versus 1 doesn't mean that a community is 20 times more impacted). The scoring compresses orders of magnitude. Consider shifting to ranks since this isn't an absolute measure. People understand the ranking approach, for example, as with income.

- Seek parsimony. For some categories, there could be a smaller number of indicators that work statewide, whereas for others, maybe not. More allows something for everyone.

- If adding factors, then where grouping occurs is irrelevant. But using the multiplicative formula, problems can be compounded if you move indicators and then multiply. Use sensitivity analysis to test multiplication.

- Consider using an easy matrix rather than trying to reduce the number of indicators. Use a single exposure and a single vulnerability category to create a 4x4 matrix. Do ranking and scoring as late in the process as possible.

- Don't understand mapping back to different value intervals, and why ranges among scores are different. This throws away information and loses variation and resolution. Also, it forces weight on components. For example, exposure goes from 10 down to 3. It isn't necessary to map onto ranges.

- Don’t understand justification for multiplication, and what it does to distribution.

- Disagree about the irrelevance of moving indicators under an additive approach because of the different range and number of indicators in each category.

- For the EJ Screening Method, we decided not to weight indicators because there wasn't any scientific guidance that *a priori* would guide you to a weighting approach. Not sure there is a scientific justification for weighting, but there could be a scientific policy reason for this. If you do decide to weight, be very clear about WHY you are weighting. Same thing goes for adding vs. multiplying: be very transparent.

- In some instances, screening statewide makes sense. Other times, you want regional. Comparing urban vs. rural communities is like comparing apples and oranges, and could end up with an urban bias.

- Multiplying makes intuitive sense. It weights vulnerability higher than pollution.

- Agree that regional or other stratification is useful, e.g. rural-urban stratification.

- Scales can be useful for policy to see changes over time, particularly to see effect of resource allocation. For example, UC Davis uses a linear scaling from 0-100. In Sacramento, no school beat a score of 70.

- For all indicators, look for factor loading. See what indicators can be collapsed.

- Public health effects could be considered vulnerability rather than exposure. An advantage is that exposure and environmental effects are things we can regulate -- makes sense to categorize things in terms of what you can and cannot effect. Then when you develop a metric, you can say what was the leading indicator for that metric in that zip code. This tells you where to put resources.

- Regarding scaling, there are lots of arbitrary ways to go. No metric is normally distributed.

- The different scores are a result of weighting system. Weighting probably should vary depending on the use and what you want to achieve.

- If you move Public Health Effects, then you have a modulation of exposure. Is it possible to have three times the risk? Maybe a smaller number is more appropriate, or consider averaging rather than summing to come up with the modulation number.

    - Asthma sufferers experience 10-100 times lower range response when exposed to SO2.

- On moving the public health effects: each indicator has little influence over the score. Yet some, like asthma, we know very substantially influence risk. So how to collapse these indicators depends on whether there is a multiplier or not. We are interested in the panel's thoughts on this. *[Staff Response]*

- Humans have significant ranges of variation, e.g. peanut toxicity. This variation is not unusual. Concern about putting everything not exposure into vulnerability

- Screening is not risk assessment. Modulation and vulnerability are important, but for the purpose of screening, the key categories are burden. For sensitivity, could test alternative models.

    - A high rate of disease plus highly vulnerable...are these together or separate?

    - One could be a validation of the other.

- I'm agnostic on the categories. But could try to distinguish between intrinsic susceptibility, like age, and extrinsic factors, like SES. Can see low-income and low incidence of disease. Need to parse this out.

    - Isn't it exogenous like pollution or SES, and endogenous like diabetes?

    - I don't disagree, but in thinking about burden bin, there are those factors that can be acted upon vs. those that you cannot. It's a science policy decision.

- Consider adding prevalence of diabetes or obesity.

- Divide into factors where you have policy levers and ones where you don't. For example, there are significant levers for SES. Cumulative impacts starts to knock down silos among different actions so think about different types of alliances. You could include other agencies and tools, too.

- Concern about calling it exogenous or something static that we can't do anything about. SES isn't just about healthcare and diets – there is a political aspect about who gets attention, NIMBYism, and political clout to block unwanted projects. This is most important to EJ.

GEOGRAPHIC SCALE

- Census tracts have advantages: smaller size, and can be matched to other efforts like NATA or the EPA screening. The disadvantage is that no one knows which census tract they are in. Zip codes have meaning to the public.

- Support census tracts. You don't lose quality of the data, and scale is already on a population basis. Also, you can harmonize boundaries over time, and make more proximate in terms of actual neighborhoods. Why gloss over variability with zip codes? Census tracts are about half the size of zip codes.

- Have used both census tracts and blocks. Blocks are good for rural areas, but we are moving back to census tracts because of the margin of error at block level. Some think even census tracts are too small. Be aware of this problem.

- I have no strong feelings on scale, but caution OEHHA about finer resolution since you are trading interpolation errors for other improvements in the model. For air quality, the finer the resolution, the greater the error.

SENSITIVITY ANALYSIS

- Uncertainty arises from misclassification as opposed to getting the wrong number. Unsure how to test for this: if these are the metrics we use to identify, what metric do you use to test? If you had one, why wouldn't it have been part of the model?

- Find out what the tool is sensitive to, take it in, take it out, and look for changes.

- Sensitivity analysis should be performed. As a first step, remove individual indicators and check for duplicates. Check for when you expect to see changes but don't, which could indicate problems with the model's structure. Test the multiplicative approach and use this to decide when to apply ranking. Test income and bulk emissions density, i.e., pick 1-2 indicators and find high income, high emissions using a 4-box matrix. Are you getting counter intuitive results?

- There are three purposes for sensitivity analysis:
    1. Remove irrelevant indicators.
    2. Perform reality check. If changing the value of an indicator (or removing it entirely) does not affect the outcome in a way that makes sense, then that part of the model may need to be revised.
    3. Apply percentiles and ranking.

- How much change warrants excluding or removing an indicator? Uncertain that there will be a clear way to determine if something is redundant or useless. More concerned about indicators that add noise, like percent elderly. Flag indicators

that are incompatible with the others. Look at how the 19 indicators are correlated among themselves – are they supposed to be positively correlated within a component? If not, could indicate a problem with the model.

- Use factor analysis to ID which variables hang together, and separate them into categories.

- Use Groundtruthing, i.e., known EJ communities, to test the model.

- Look at different ways to score zip codes to see what patterns are revealed, e.g., matrix approach vs. rank ordering. If there is convergence, then that lends confidence in the method. Standard rank correlation, then standard statistics to test the hypothesis. Take top 200 ranks orders, and ask if they are different.

- Do statistical as well as visual testing. Reveal the layers. Maps can switch – how does that affect the score? Include some level of community engagement to identify data gaps that could be significant.

- Do something on model validity, e.g., look at the top quintile then compare it to life expectancy.

- Factor analysis is a good idea and is useful to condense indicators. Groundtruthing is important, despite community fatigue, since it helps identify systematic errors. Look to what is more actionable, i.e. what gives you data you can actually use in a practical way. Look at other methods, too.

- I like factor analysis as a technique. Doing it on rank order would provide a nice test.

- Regarding age factor and noise: it would be useful to consider whether there are a lot of very young or very old as an either or go or no go situation. Prevent them from canceling out. Sensitivity analysis could help with this.