



**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
REGION IX  
75 Hawthorne Street  
San Francisco, CA 94105**

John Faust  
Office of Environmental Health Hazard Assessment  
1515 Clay St., Suite 1600  
Oakland, CA 94612

October 16, 2012

Dear Dr. Faust,

Thank you for the opportunity to provide comments on the *Draft California Communities Environmental Health Screening Tool* (CalEnviroScreen) report. The release of the draft CalEnviroScreen report is a significant step forward toward assessing cumulative impacts, as defined by the California Environmental Protection Agency (Cal/EPA). We commend Cal/EPA and the Office of Environmental Health Hazard Assessment (OEHHA) for their considerable efforts to produce this draft report, and the efforts undertaken to solicit feedback on the draft report from various stakeholders.

The comments attached to this letter were developed in consultation with EPA staff and managers from various programs. Furthermore, EPA comments on the 2010 Cal/EPA and OEHHA report, *Cumulative Impacts: Building a Scientific Foundation*, are also attached to this letter. Some of our previous comments are still applicable to the recent draft report.

Please do not hesitate to contact Jacquelyn Hayes at (415) 972-3259 or via email at [hayes.jacquelyn@epa.gov](mailto:hayes.jacquelyn@epa.gov), or Charles Swanson at (415) 947-4219 or [swanson.charles@epa.gov](mailto:swanson.charles@epa.gov) if you have any questions.

Sincerely,

Deldi Reyes (signed)  
Environmental Justice Program Manager  
Communities and Ecosystems Division

Enclosures

## General Comments

1. We commend Cal/EPA and OEHHA for their efforts to solicit stakeholder comments on the draft report as well as the documentation of the comments received during public workshops held across the state. Based on review of the comments received thus far, there is great interest in the appropriate utilization of the tool. Recognizing the limitations of the tool and the datasets it uses could help inform discussions of the utility of the tool. It is suggested that the limitations of the tool as well as the limitations of the datasets used in the tool are stated in the report, or provided in a supplementary technical guidance document.

In addition, a discussion that describes existing tools to assess overburdened communities, and compares CalEnviroScreen to these other tools could help elucidate how the tool could best be used. This discussion could also demonstrate how Cal/EPA and OEHHA are contributing to the field of assessing cumulative impacts.

2. Page 1 of the draft report states that the preliminary statewide analysis is being conducted to provide a baseline assessment and methodology which can be expanded upon and updated periodically as information becomes available. At some point, it may be useful to present temporal changes, if data are available.
3. It is recommended that more information about the selected quantitative approaches and data validation be added to the report. The current method for determining the component score involves taking the average of the percentiles of the indicators within each component. The averaging of percentiles could mask significant burdens or vulnerabilities in some communities. It is recommended that more information on the following topics be added to the report:
  - Why percentiles of indicators are averaged to derive the component score;
  - Why averaging periods for various indicators were selected (some have an averaging period of 2007-2009, others have 2004-2008, one has 2005-2009);
  - Why the range of scores for environmental effects and public health components are lower than the range of scores for the exposures component;
  - The derivation of the equation used to determine the cumulative impacts score; and
  - What indicators were considered and why particular indicators were selected (or not selected).
4. It is recommended that the individual indicator values and percentiles, in addition to the cumulative impact scores, for every zip code are made available. This would allow others to better understand which indicators are the drivers for the cumulative impact score of a given zip code.

## Specific Comments

### *Air Quality Indicators*

1. The methods used for determining the ozone and PM<sub>2.5</sub> indicator values are not consistent with the National Ambient Air Quality Standards (NAAQS).<sup>1</sup> It is suggested that reasons for choosing to use methods that deviate from the NAAQS for ozone and PM<sub>2.5</sub> be explained in the report.
2. It is suggested that the use of National-Scale Air Toxics Assessment (NATA) data be considered.<sup>2</sup>

### *Pesticide Use Indicator*

1. As stated in the draft report, pesticide exposure can occur through drift incidents, worker exposure at the time of application, and from consumption of residues on treated commodities. Pesticide exposure, however, can also occur from consumption of contaminated drinking water, drift that occurs even if all pesticide label instructions are followed, accidents, or pesticide misuse. Risks of all of these exposures increases with high levels of pesticide use.
2. The selection of pesticides to include for the pesticide use indicator calculation used a filter of hazard and volatility. Appendix A1 of the draft report states that pesticides included in the pesticide use indicator calculation include pesticides classified as “high” or “moderate” priority under the Birth Defect Prevention Act of 1984 (SB 950), or pesticides included on the Proposition 65 list (Safe Drinking Water and Toxic Enforcement Act of 1986). Of these pesticides, those with volatility less than 10<sup>-6</sup> mm Hg were excluded from the list.

If the cumulative impacts tool is intended to address both human health and non-human environmental impacts, then it would be appropriate to include pesticides that have been identified as causes of water quality impairment under Section 303(d) of the Clean Water Act (CWA). Limiting pesticides to only volatile and semi-volatile chemicals results in the omission of the pyrethroid class, which have high use in many areas, and which are among those causing surface water quality impairments.

3. The draft report states that the drinking water quality indicator is still under development. In the course of developing the drinking water quality indicator for the tool, it is suggested that any pesticides that are identified as potential drinking water contaminants be added to the pesticide list as well.
4. Table 1 below is being provided for informational purposes to help guide discussions and the development of the pesticide use indicator. Table 1 shows the pesticides included in the CalEnviroScreen pesticide use indicator calculation (page 67 of the draft report), pesticides included in Region 9’s draft list of priority pesticides in the San Joaquin Valley, and pesticides on the Prop 65, SB 950, and CWA 303(d) lists.

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<sup>1</sup> <http://www.epa.gov/air/criteria.html>

<sup>2</sup> <http://www.epa.gov/ttn/atw/natamain/>

Comments on the Draft California Communities Environmental Health Screening Tool (CalEnviroScreen), dated July 30, 2012

Please note that the Region 9 draft list of priority pesticides was developed based on pesticide use in the San Joaquin Valley only, whereas the pesticide list included in the draft report was developed based on statewide pesticide use. Furthermore, the method used by Region 9 to develop the draft list of priority pesticides starts with agricultural pesticide use in the San Joaquin Valley, separates fumigants from non-fumigants, groups by common mechanism of toxicity, and focuses on pesticides of higher relative toxicity. The Region 9 draft list reflects queries of the Pesticide Use Report (PUR) for 2010 agricultural pesticide use in the San Joaquin Valley. This list includes pesticides (or groups) ranked in the top 5-10 fumigants and non-fumigants for each county. Queries of the PUR database for other years or other counties may result in changes to this list. Pesticides with use levels that did not rank in the top 5-10 in a San Joaquin Valley county do not appear on the Region 9 draft list.

Pesticide	CalEnviro Screen	EPA Region 9	Prop 65	SB 950	CWA 303(d)
1,3-Dichloropropene	X	X	X	X	
2,2-Dibromo-3-nitrilo-propionamide	X				
2,4-D, dimethylamine salt				X	
Acephate (OP)	X	X		X	
Acrolein	X				
Aldicarb (NMC)	X	X		X	X
Allethrin (PYR)		X			
D-Allethrin (PYR)		X			
Azinphos-methyl (OP)*	X	X			X
Azoxystrobin				X	
Bensulide (OP)		X		X	
Bifenthrin (PYR)		X			X
Bioallethrin (PYR)		X			
S-Bioallethrin (PYR)		X			
Boscalid		X		X	
Bromoxynil heptanoate	X				
Bromoxynil octanoate	X		X	X	
Buprofezin	X			X	
Carbaryl (NMC)	X	X	X	X	
Carbofuran*	X				X
Carbophenothion (OP)*		X			

Comments on the Draft California Communities Environmental Health Screening Tool  
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Table 1. Pesticide List Comparison					
Pesticide	CalEnviro Screen	EPA Region 9	Prop 65	SB 950	CWA 303(d)
Chloropicrin	X	X		X	
Chlorothalonil	X	X	X	X	
Chlorpyrifos (OP)	X	X		X	X
Chlorthal-dimethyl	X			X	
Clomazone	X				
Cryolite				X	
Cycloate	X		X		
Cyfluthrin (PYR)		X		X	
Beta-Cyfluthrin (PYR)		X		X	
gamma-Cyhalothrin (PYR)		X			
lambda-Cyhalothrin (PYR)		X		X	X
Cypermethrin (PYR)		X		X	
S-Cypermethrin (PYR)		X		X	
Cyprodinil	X			X	
Dacthal					X
Dazomet	X	X		X	
DDVP (OP)	X	X	X		X
Deltamethrin (PYR)		X			
Diazinon (OP)	X	X		X	X
Dicloran	X			X	
Dimethoate (OP)	X	X		X	X
Dioxathion (OP)*		X			
Disulfoton (OP)*		X		X	X
Diuron		X	X	X	X
Endosulfan (OC)*	X				X
EPN (OP)*		X			
EPTC	X				
Esfenvalerate (PYR)		X		X	X
Ethalfuralin	X				
Ethephon (OP)		X			
Ethion (OP)*		X			
Ethoprop (OP)	X	X	X		
Fenamiphos (OP)*	X	X		X	
Fenpropathrin (PYR)	X	X			

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Table 1. Pesticide List Comparison					
Pesticide	CalEnviro Screen	EPA Region 9	Prop 65	SB 950	CWA 303(d)
Fenthion (OP)*	X	X			
Fludioxonil	X			X	
Flumioxazin	X			X	
tau-Fluvalinate (PYR)		X	X	X	
Fonofos (OP)*		X			
Formetanate HCL (NMC)		X			
Glyphosate + salts		X			
Glufosinate ammonium		X		X	
Hydrogen cyanamide	X				
Imazalail	X			X	
Imidacloprid				X	
Imiprothrin (PYR)		X		X	
Iprodione			X	X	
Linuron	X		X	X	
Malathion (OP)	X	X			X
Mancozeb		X	X	X	
Metalaxyl	X				
Metam potassium	X	X	X		
Metam sodium	X	X	X		
Methamidophos (OP)*	X	X			
Methidathion (OP)*	X	X			
Methiocarb (NMC)		X		X	
Methomyl (NMC)	X	X		X	
Methyl bromide	X	X	X		
MITC	X				
Methyl parathion (OP)*	X	X		X	
Mevinphos (OP)*		X			
Molinate*	X		X		
Myclobutanil	X		X		
Naled (OP)	X	X			
Oryzalin		X	X	X	
Oxyfluorfen				X	X
Oxamyl (NMC)		X			
Oxydemeton-methyl (OP)	X	X	X	X	

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Table 1. Pesticide List Comparison					
Pesticide	CalEnviro Screen	EPA Region 9	Prop 65	SB 950	CWA 303(d)
Parathion (OP)*		X			
Paraquat dichloride		X		X	
PCNB	X		X		
Pendimethalin		X			
Permethrin (PYR)		X		X	X
Phenothrin (PYR)		X			
Phorate (OP)		X		X	
Phosmet (OP)		X			
Phosphine	X				
Prallethrin		X			
Profenofos (OP)		X		X	
Propargite			X	X	
Propetamphos (OP)*	X	X			
Propoxur (NMC)	X		X		
Propylene oxide	X		X	X	
Pyrethrins (PYR)		X		X	
Pyrimethanil	X			X	
Resmethrin		X	X	X	
Simazine				X	X
S,S,S-Tributyl phosphoro trithioate (DEF) (OP)	X	X	X		
Sodium cyanide	X				
Sodium tetrathiocarbonate*	X	X		X	
Sulfur dioxide	X		X		
Sulfuryl fluoride	X				
Temephos (OP)		X			
Tetrachlorvinphos (OP)		X		X	
Tetramethrin (PYR)		X			
Thiodicarb (NMC)			X		
Thiram	X			X	
Tralomethrin (PYR)		X			
Triclopyr, butoxyethyl ester	X			X	
Triclopyr, triethylamine salt	X			X	
Trifluralin	X			X	X

Pesticide	CalEnviro Screen	EPA Region 9	Prop 65	SB 950	CWA 303(d)
Ziram	X			X	

Notes:

X = included in the list; OC = Organochlorine; OP = Organophosphate; PYR = Pyrethroid/Pyrethrin; NMC = N-methyl carbamate.

\*All uses cancelled. Some in phase-out periods.

For the EPA list, if use was reported in 2010 for a particular pesticide, then the pesticide is included in the list.

### ***Toxic Releases from Facilities Indicator***

1. The toxic releases indicator uses EPA Toxic Release Inventory (TRI) and Risk Screening Environmental Indicators (RSEI) data. Page 19 uses the phrase “hazard-weighted pounds.” It is recommended that the phrase be modified to “toxicity weighted pounds.”
2. Page 19 of the draft report states that data were downloaded from TRI.NET (available at: <http://www.epa.gov/tri/tridotnet/index.html>); however, RSEI results are not available in TRI.NET. Although TRI.NET does include hazard scores, these are not necessarily the same as those in RSEI.
3. It is recommended that the following caveats be noted in the report:
  - TRI chemicals released to water may occur substantially downstream of the releasing facility.
  - The pounds used in the RSEI model may not exactly equal the total pounds in TRI.
  - TRI does not cover mobile or area sources, so likely does not represent all of the risks from TRI chemicals.

### ***Impaired Water Bodies Indicator***

1. The impaired water bodies indicator is determined by the count of pollutants in impaired water bodies. The proposed indicator does not take into account the degree of impairment (i.e., what factor the standards are exceeded by), or the prevalence of water within a zip code. As an alternative, it is suggested that the indicator be refined from the count of pollutants to either (a) the fraction of water boundaries in the parcel which abut impaired waters, or (b) the percentage of all waters in or adjacent to the zip code which are listed as impaired; and then take the requisite percentile rankings based on that indicator.

### ***Other Potential Indicators***

1. The California Environmental Contaminant Biomonitoring Program is a collaborative effort between OEHHA, the California Department of Public Health, and the Department of Toxic Substances Control.<sup>3</sup> Would it be possible to include biomonitoring data in the CalEnviroScreen tool when biomonitoring data are made available?

<sup>3</sup> <http://www.cdph.ca.gov/PROGRAMS/BIOMONITORING/Pages/default.aspx>



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
REGION IX  
75 Hawthorne Street  
San Francisco, CA 94105

SEP 28 2010

Joan Denton, Executive Director  
Office of Environmental Health Hazard Assessment  
Sacramento Office  
1001 I Street,  
Sacramento, CA 95814

September 27, 2010

Dear Ms. Denton,

Thank you for the opportunity to provide comments on the public review draft "Cumulative Impacts: Building a Scientific Foundation" report. EPA Region 9 has appreciated the opportunity to participate and provide ongoing input as part of the State's Cumulative Impacts and Precautionary Approaches Workgroup (CIPA Workgroup). We believe this report represents a significant step in Cal/EPA and OEHHHA's continuum of cumulative impacts assessment strategies. At its core, the strategies and findings of the report emphasize that the unique sensitivities, vulnerabilities and socioeconomic factors of a community are critical determinants of public health in that community, and further, those factors must be assessed when arriving at determinations of cumulative impacts.

In reviewing this document, we sought comments from EPA Region 9 scientists in our various programs, and the suggestions shared in this letter reflect collective input from scientists, toxicologists and managers across our Regional Office. Below are our main recommendations. Additional detailed comments are included in Enclosure.

- *Use of the tool:* EPA agrees that the screening methodology should be used to prioritize programmatic targeting and to identify and compare impacted communities relative to others. We encourage Cal/EPA and OEHHHA to work towards developing a more robust cumulative impacts assessment tool capable of supporting actual environmental and regulatory decision-making. It is our hope that future efforts will focus on methods that can ultimately be incorporated into a more traditional risk analysis framework.
- *Groundtruth:* As the screening methodology is developed, it will be important to create maps and share them with the BDOs, CIPA Workgroup and the public to ensure that the tool accurately reflects the cumulative impacts communities are experiencing.
- *Multiplicative method:* Most other cumulative impacts tools have not used the multiplicative method. We suggest caution as the State moves forward in applying this multiplicative method, and a careful evaluation of the results to ensure they make sense.
- *Scale:* It is important that the cumulative impacts framework identify a geographic scale prior to obtaining data. Scale should be considered in collecting data to avoid the problems associated with bringing together data at different scales. For example, when county health data was aggregated down to the census tract in EJSEAT, specific communities experiencing the largest percentages of health

problems were masked. (See the NEJAC recommendations "Nationally Consistent Environmental Justice Screening Approaches, page 9).<sup>1</sup>

- *Additional Indicators:* We recommend considering additional datasets that could add value to the screening methodology. See Enclosure for more detail.
- *Flexible:* The framework should be flexible and allow for new data to be added as it becomes available. For example, in the early stages of the framework's implementation, it could make sense to include data from the 2000 census. At the release of the 2010 census data, the framework should allow for the new data to be included and the 2000 data to be removed. With flexibility, the framework will more accurately depict the cumulative impacts communities face.

In addition to commenting on the report, we would like to offer the following suggestions:

- *Continue CIPA workgroup:* As Cal/EPA and OEHHA move forward, we suggest that the CIPA Workgroup continue providing input into the process. We would gladly continue to serve and participate on the CIPA Workgroup.
- *EPA, Cal/EPA, OEHHA meeting:* EPA would like to offer to plan and host an open exchange of ideas among State and EPA scientists, and one of our senior regional toxicologists has agreed to help plan and facilitate this session. See Enclosure for suggested topics.

There is an urgent need to reduce pollution burden in vulnerable communities. We appreciate the thoughtful outreach to the CIPA Workgroup and the public in the development of this report and framework and encourage Cal/EPA and OEHHA to incorporate the feedback and begin implementing the framework in a timely manner to protect the environment and public health of communities most burdened by cumulative impacts. Finally, we recognize that this State-led effort has raised the bar for addressing cumulative impacts, and are happy to assist OEHHA and Cal/EPA as needed to move this process forward. Please feel free to contact Debbie Lowe at (415) 947-4155 or via email at [lowe.debbie@epa.gov](mailto:lowe.debbie@epa.gov) or her colleague Zoe Heller at (415) 972-3074 or [Heller.Zoe@epa.gov](mailto:Heller.Zoe@epa.gov) with any questions.

Sincerely,



Enrique Manzanilla, Director  
Communities and Ecosystems Division

Enclosure, Detailed Comments

<sup>1</sup> The NEJAC recommendations regarding EJSEAT:  
<http://www.epa.gov/environmentaljustice/resources/publications/nejac/ej-screening-approaches-rpt-2010.pdf>

ENCLOSURE

US EPA Region 9 Detailed Comments on the Public Review Draft  
“Cumulative Impacts: Building a Scientific Foundation” Report

**Cal EPA/OEHHA/EPA meeting:** We would like to offer the opportunity for a peer-to-peer detailed discussion about some of the emerging and critical issues related to cumulative impacts. Below is an initial list of potential topics for this in-person meeting. Please contact Debbie Lowe Liang or Zoe Heller to discuss this further.

- *Social Epidemiology:* Discussion on how the findings from social epidemiology can be used and applied in modifying and expanding traditional risk characterization paradigms to better support assessment of cumulative impacts and better understand the role of non-chemical stressors. The NAS Silver Book may provide some guidance on how to address non-chemical stressors in part by leveraging insight from social epidemiology.
- *Uncertainties, sensitivity, and vulnerability:* Discussion on what manner or to what degree current estimates of inter-individual variability inform our analysis of cumulative impacts in communities or sub-groups.
- *Ecological impacts:* Discussion on development of robust methods and procedures for increased consideration of ecological impacts into the proposed and future frameworks.
- *Integrated Science Assessments:* Discussion on the utility of integrated science assessments and problem formulation principles to better assess cumulative impacts.
- *Science and Regulatory Policy:* Discussion on the development of science policy and regulatory frameworks in which consideration of cumulative impacts can support decision making. The Environmental Law Institute’s document “Opportunities for Advancing Environmental Justice: An Analysis of U.S. EPA Statutory Authorities” might serve as a useful starting point for these discussions.<sup>1</sup> A similar analysis of the State’s statutory authorities and Civil Rights Act Title 6 obligations might be useful.
- *Social Determinants of Health:* Discussion of which social determinants of health should be prioritized for increased scrutiny and application in the consideration of cumulative impacts in communities and sub-groups.
- *Epidemiological Proxy Surrogates:* Discussion on putative mechanistic relationships between traditional toxicological endpoints and those endpoints used to measure the psycho-social stressors impacting the health of communities.
- *Cumulative Impact Tools to Support Risk Assessment:* There is a need to develop cumulative impact tools that can be used to support the risk assessments that are used for environmental decision-making. Region 9 toxicologists would welcome the opportunity to engage with Cal/EPA and OEHHA scientists on this issue.

In addition to the above topics, we would also be happy to engage in discussion on the other issues raised in our general comments, such as scale, indicator selection, groundtruthing, and the multiplicative method.

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<sup>1</sup> [http://www.elistore.org/reports\\_detail.asp?ID=41](http://www.elistore.org/reports_detail.asp?ID=41)

## Potential Indicators

In moving forward with the development of the screening methodology, we suggest sharing additional detail on the type and scope of indicators that might be used, the strengths of, and potential concerns with, each suggested indicator, and the basis for choosing that particular indicator and data source. While recognizing that Table 2 of the report suggests potential indicators rather than prescribing a complete set of recommended indicators, we recommend considering the following: providing a discussion on why percent population under age 5 is being recommended as the indicator for presence of children, rather than a greater age group; including additional environmental exposures as potential indicators of impacts, such as water quality, air toxics (for which the National Air Toxics Assessment could be used as a data source), and pesticide exposures; and including additional public health effects or indicators, such as:

- Preterm birth (in addition to low birth weight)
- Asthma Prevalence (in addition to asthma hospitalization rates)
- Blood lead levels
- Smoking rates
- Obesity rates

With regards to pesticides, researchers at the University of Washington and at UC Berkeley are learning a lot about children's exposure and susceptibility to pesticides. The literature coming from these research centers should be consulted in developing cumulative indices for pesticide exposure. Examples of pesticide exposure routes include: take-home exposure (clothing, shoes, etc from the field), breast milk from a mother who may also work or who may have worked in the fields, absorption of residues onto clothing, house dust, food, water, pesticide use in and around the home, either by professional or by homeowner, and pesticide use on pets.

### Detailed comments on specific pages:

**Page 1, Introduction:** This section states "...but can also be used by local governments and others who may consider cumulative impacts in their *decision-making* activities (emphasis added)." EPA agrees that the best use of the tool at this time is as a screening tool that can be used to support decisions about resources and prioritization. We suggest clarifying that the tool as yet, is not able to support *regulatory* decision-making. At the same time, we're mindful that some members of the CIPA Workgroup have expressed the need for a regulatory decision-making tool and we encourage Cal/EPA and OEHHA to continue to further the science on this issue.

**Page 3, The Need to Address Cumulative Impacts:** "*No proof of harm is not proof of no harm.*" The third paragraph in this section discusses the myriad of human factors which influence or exacerbate the impacts of pollutants on health. A subset of these factors remain amenable to direct measurement in the context of the exposure assessment component of traditional risk analysis, while many of the other factors identified are essentially quantifiable proxies or surrogates for the socioeconomic or psycho-social determinants of health. These distinctions should be clarified in the narrative of this section so that the more well-defined

components of traditional risk analysis can be used to support and supplement not only the current screening-level approach, but also Cal/EPA's efforts to develop more quantitative and robust methods and procedures to assess and characterize the entire range of cumulative impacts.

**Page 8, Types of Scientific Information Reviewed in this Chapter:** The narrative and bullet-points in this section detail the complementary lines of scientific evidence which suggest increased levels of impact associated with cumulative exposures. It may be useful to supplement the bulleted points in this section with a brief description of the manner in which more traditional chemical risk analysis either captures or misses the elements associated with cumulative impacts. For instance, bullet #1 addresses the relationship between environmental pollution and health effects. These relationships are frequently captured in traditional risk analysis by descriptions of the dose/response relationship between a chemical stressor and an identifiable toxicological endpoint. The other bulleted points detailing disparities in exposures and conditions, intrinsic and non-intrinsic sensitivities, and existing health disparities are, with notable exceptions, poorly characterized in traditional chemical risk assessments. A more comprehensive characterization of these differences may better inform stakeholders of the relative strengths and uncertainties associated with traditional forms of analysis, and further to provide opportunities where leveraging methods from traditional risk analysis may be used to better inform the entire range of cumulative impacts.

**Page 14, Chapter 1 on Sensitivity:** We suggest providing a discussion on the interaction of risk factors over the life of an individual that are important to health status. Each person has a unique set of risk factors. Risk factors include: protective genes, developmental risk, stress, smoking, current disease, SES, exercise, gender, behavior, nutrition/diet/obesity, bad genes, work-related chemical exposure, and chemical exposures. We also suggest providing a discussion on impaired body defenses and diminished response capacity.

**Page 14-16, Sensitivity Based on Intrinsic Factors:** We suggest adding a discussion on identifying Tribal cultural practices.

**Page 16, Sensitivity Based on Non-Intrinsic Factors:** The narrative in this section provides a focus on many elements of those non-intrinsic factors or social determinants which influence and attenuate public health. In addition, the narrative provides estimates for the range of impact that has been described and found in the social epidemiological literature germane to health outcomes and psycho-social factors. This section of the report also identifies several investigations which document an increased likelihood of morbidity or mortality associated with the social determinants of health - generally ranging from a factor of two to four (2 - 4x) times increased risk. The narrative in this section correctly emphasizes that the relationship between the social determinants of health and pollution exposure impact health outcomes via differing mechanisms. A good number of the measurable social economic factors which influence health outcome remain proxy surrogates for an underlying mechanism impacting physiology or health. It may be useful to supplement this section of the report with additional background regarding the methods used to assess inter-individual variability in the context of more traditional chemical risk analysis. By contrasting the methodological basis for assessing inter-individual variability in

traditional risk analysis with increased estimates of impact associated with the social determinants of health, stakeholders may gain a more complete appreciation for the uncertainties and limitations associated with traditional chemical risk analysis.

**Page 18, Health Disparities and their Relationship to Pollutant-Related Disease:** The narrative in this and its preceding section detail the relationship between those conditions with an environmental etiology and overarching health disparities. As Cal/EPA moves forward in refining and developing more robust methods to assess cumulative impacts, the limitations associated with traditional risk analysis should be consistently contrasted with more progressive approaches. The traditional reliance on exposure and toxicity assessment in predicting a level of impact (or risk) in communities is uncertain and may underestimate the full dimension of impact absent a more cumulative approach. This line of evidence may suggest that an expanded and modified risk characterization paradigm is requisite to support regulatory decision making. More precisely, the thresholds for acceptable cancer and non-cancer (systemically toxic) impact that are common in traditional chemical risk assessments may require supplementation with metrics developed by social epidemiology to better account for the full range of impact which is inclusive of the social determinants of health. In so doing, regulatory stakeholders and impacted communities may arrive at a more comprehensive understanding of the entire level of impact either in a defined community, or that associated with a regulatory decision.

**Page 22, Conclusion:** The fourth paragraph in this section alludes to the types or mechanisms of pollutant interactions which are traditionally associated with exposure to chemical mixtures. In addition to additivity and multiplicity, the section should be expanded to include other putative interactive mechanisms such as potentiation and antagonism.

**Page 24, Burden of Pollution: Exposures, Public Health Effects and Environmental Effects:** The subsection entitled **Exposures: Contact with Pollution** should be expanded to include the food-chain or food-web as a potential source of pollution transport in addition to air, water and soil. The narrative in the subsection detailing the traditional routes of human exposure to chemicals (inhalation, ingestion & dermal uptake) should be expanded to include those indirect pathways of human exposure germane to cumulative impact.

**Page 31, Chapter 3:** We suggest adding a discussion on uncertainties and a meta-analysis. As the methodology is developed also consider sensitivity analyses.

**Page 49, References:** Here are two documents that might be provide useful insight into cumulative impacts. Phthalates and Cumulative Risk Assessment: The Task Ahead<sup>2</sup> and Toxicity Testing in the 21st Century: A Vision and a Strategy.<sup>3</sup>

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<sup>2</sup> Document can be found at: [http://www.nap.edu/catalog.php?record\\_id=12528](http://www.nap.edu/catalog.php?record_id=12528)

<sup>3</sup> Document can be found at: [http://www.nap.edu/catalog.php?record\\_id=11970](http://www.nap.edu/catalog.php?record_id=11970)