

**Science Advisory Board (SAB) Draft Report (6/27/14) to Assist Meeting Deliberations - Do not Cite or Quote**

This draft is a work in progress, does not reflect consensus advice or recommendations, has not been reviewed or approved by the chartered SAB, and does not represent EPA policy.

EPA-SAB-14-xxx

The Honorable Gina McCarthy  
Administrator  
U.S. Environmental Protection Agency  
1200 Pennsylvania Avenue, N.W.  
Washington, D.C. 20460

Subject: SAB Review of the EPA's Draft Technical Guidance for Assessing Environmental Justice in Regulatory Analysis

Dear Administrator McCarthy:

The EPA's Office of Policy (OP) and Office of Environmental Justice (OEJ) requested that the Science Advisory Board (SAB) review the draft report titled *Technical Guidance for Assessing Environmental Justice in Regulatory Analysis* ("EJTG"). The EJTG document provides information to assist EPA analysts, including risk assessors, economists, and other analytic staff, in evaluating potential EJ concerns in the context of rule development (i.e., regulatory actions). The EJTG presents the analytic expectations for EJ analyses to help ensure that potential EJ concerns are appropriately considered.

In response to the EPA's request, the SAB convened an expert panel to review the EJTG. The SAB was asked to comment on: the clarity and technical accuracy of the guidance; the inclusion of the most relevant peer reviewed literature; appropriateness and sufficiency of the six analytic recommendations listed in the EJTG are to ensure consistency, rigor and quality across assessments; the clarity and accuracy of the guidance on when and how to conduct an analysis of the distribution of costs; and key methodological or data gaps specific to considering EJ in regulatory analysis. The enclosed report provides the SAB's consensus advice and recommendations. This letter briefly conveys the major findings.

The SAB commends the agency for undertaking the very important and complex task of addressing environmental justice in regulatory decision-making. Overall, the EJTG is a comprehensive compilation and presentation of EJ concerns and the complex issues, factors, parameters, processes and methods. The SAB would like to offer several recommendations to improve the clarity and rigor of EJ analyses.

To increase the document's clarity, the EJTG needs to include better definitions for key terms (e.g., disproportionality, EJ populations, susceptibility and vulnerability). The EJTG should provide specific, clear options and examples of best practices for consideration by analysts. Making use of decision trees, diagrams, checklists, and other means to summarize key guidance may be helpful to steer the analyst to the most important elements of the guidance and those areas where consistency is essential.

The SAB understands the need for the EJTG to remain flexible but is concerned that the EJTG may become less effective without further specificity. Phrases such as "if feasible" or "when

possible” convey a lack of commitment and may lead to inconsistency in addressing EJ concerns. Moreover, the EJTG should not favor quantitative over qualitative analyses, since both are important and useful. The best and most relevant data should be included in the analyses, not just the most recent.

To ensure consistency and transparency, the recommendations for analysts as presented in the EJTG also should ask analysts to explain under which conditions specific recommendations were not followed. The terms differential and disproportionate impacts should be described earlier in the document where the purpose of the guidance is spelled out. The discussion of these impacts should be made clearer and less detailed and complex. Conceptual maps may help to highlight the contributors and drivers of EJ and thereby make them easier to communicate.

The SAB notes that the use of the current standard risk assessment model is emphasized in the guidance as the primary means to quantify adverse health impact from chemicals in the environment. The EJTG does not, however, indicate how cumulative impacts should be evaluated, quantified, or otherwise considered in an EJ analysis. More guidance is needed on how to incorporate and evaluate cumulative impacts both quantitatively and/or qualitatively. The agency should consider adopting a more holistic approach to assessing risk and cumulative impacts. A more expansive discussion of the limitations of the information used to complete an EJ assessment will add value by identifying the sources and potential impacts of uncertainties on the effected populations.

The EJTG should direct the analyst to be transparent about how differences across groups are identified for each potential scenario that may result from a regulatory action in the EJ analysis. The EJTG should encourage analysts to conduct sensitivity analyses across alternative metrics or include stakeholders early in the analytical process to determine the most relevant metric(s). Additionally, the SAB found that there was a lack of sufficient guidance on when and how to conduct an analysis of the distribution of costs. The EJTG should more clearly identify when cost analyses are appropriate and analysts should be required to document the basis for any exclusion. Clearer guidance regarding the time frame that should be used in cost analyses is also needed. Furthermore, the EJTG should provide direction on how to characterize the uncertainty inherent in cost estimates.

The SAB agrees with the research gaps and priorities identified by EPA and the public, including, the need for better distribution of air monitoring locations, use of cumulative impact assessments, use of appropriate data sources and maintenance of privacy, more complete demographic information, identification of non-chemical stressors, and the use of qualitative data in an appropriate manner. The SAB recommends that EPA address these issues systematically by undertaking a strategic planning exercise to better focus short-term needs versus long-term priorities.

The SAB appreciates this opportunity to review this important EJ guidance and looks forward to EPA’s response to these recommendations.

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**U.S. Environmental Protection Agency**  
**Science Advisory Board**  
**Environmental Justice Technical Guidance Review Panel**

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**U.S. Environmental Protection Agency  
Science Advisory Board**

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## **EXECUTIVE SUMMARY**

This summary is organized to follow the format of the charge questions that are divided into the following topics: Overall Impressions, Key Questions for Analysts, Key Recommendations (Section 1.2), Differences and Disproportionate (Section 2), Contributors and Drivers (Section 3), Human Health Risk Assessment (Section 4), Suite of Methods (Section 5), Distribution of Cost Analysis and Research Gaps. The response to the questions under each topic are summarized below with further discussion of the issues and recommendations contained in the body of the report.

### **Overall Impressions**

The SAB panel commends the agency for developing the *Draft Technical Guidance for Assessing Environmental Justice in Regulatory Analysis (May 1, 2013 Draft)* (also referred to as EJTG) for incorporating environmental justice principles into regulatory analyses. In general, the EJTG is a comprehensive compilation and presentation of EJ concerns and the complex issues, factors, parameters, processes and methods. It also presents examples of the necessary elements to conduct a rigorous, credible, and meaningful assessment of environmental justice during the development of a regulatory action. The EJTG will be useful for understanding EJ issues and will improve the process for including EJ concerns in rule-making. It will also be an important resource for use by other agencies. The SAB panel offers recommendations and advice on how to improve the clarity, transparency and utility of the guidance.

To increase the guidance document's clarity, the EJTG needs to include better definitions for the terms that are used (e.g., cumulative risk, co-factors, susceptibility, EJ populations and communities). By limiting its scope, the EJTG can reduce redundancy and the risk of providing conflicting instructions. In addition, the SAB panel strongly recommends the use of detailed examples to guide the analyst through conducting the EJ analysis for regulatory action. The EJTG should provide specific, clear options and examples of best practices for consideration by analysts. The EJTG should emphasize the role of the analyst and focus on providing relevant and complete information to guide an environmental justice analysis while devoting only a minimum amount of text to explain the role of the decision/policy-makers in the same context. While understanding the need for national level guidance for EJ methodologies, the SAB panel also

noted that including state, local, and community level data and assistance is essential for an accurate EJ analysis.

## Key Questions and Recommendations for Analysts

### FLEXIBILITY AND FEASIBILITY

By attempting to provide flexibility for analysts through ensuring that guidance is not “overly prescriptive,” the recommendations in the EJTG are too broad; hence, the SAB panel contends that the EJTG should provide more specificity. One solution is to be more prescriptive regarding the use of some types of data, stating where it is appropriate to use, while leaving flexibility for the application of qualitative information where applicable and available. Analysts should be provided with guidance on how to account for uncertainties due to limitations of available data and gaps in knowledge. Including a table that presents alternative analytical methods along with examples (citations) of where they have been applied effectively, key assumptions embedded in the approaches, and evaluations of their strengths and weaknesses will also be helpful. Also, making use of decision trees, diagrams, checklists, and other means to summarize key guidance may be helpful to steer the analyst to the most important elements of the guidance and those areas where consistency is essential. To further ensure consistency and transparency, the recommendations presented in the EJTG should also instruct analysts to declare under which conditions specific recommendations were not followed. This could take the form of a protocol or checklist that outlines how specific recommendations in this guidance are addressed, or the reasons why they are not addressed. Such a checklist should also include a statement that addresses the issue of qualitative information in the EJ analysis or analytical design. Further, there should also be a clear statement or process for determining “feasibility,” as instructed in the guidance and documenting it as part of the EJ analysis, so that these decisions can be readily understood.

### QUALITATIVE VERSUS QUANTITATIVE DATA

The EJTG should reinforce the concept that the use of good data, either quantitative or qualitative, is important. The quality of the data can be measured by the metrics that are used in the sciences, such as rigor of the study design, statistical power, corroboration, universality, proximity, relevance and cohesion. The “highest quality and most relevant” data should be explicitly favored in all instances- rather than “newest” data. Moreover, EPA should provide more guidance about

accounting for and incorporating qualitative data in EJ analyses, including, how the information should be integrated and what weight it should be given in decision-making.

#### Differential and Disproportionate Impacts

Regarding differential and disproportionate impacts, SAB panel members commented the text provided in the EJTG is overly complex and too detailed to be of practical use to an analyst. In addition, some members recommended that the terms differential and disproportionate impacts be described earlier in the document where the purpose of the guidance is spelled out.

#### Contributors and Drivers of EJ

Conceptual maps would be a particularly effective heuristic for this section. Moreover, SAB panel members concluded that the “Contributors and Drivers” section is a premature inclusion in the EJTG. Without agency guidance on cumulative risk and impact issues, it does not make sense to encourage analysts to attempt to incorporate some of these factors in ad hoc compilations on non-standard data sets, SAB panel members suggested. SAB panel members noted the omission of any simplified framework or graphical representation of contributors and drivers to environmental injustice commonly found in the social determinants of health literature.

#### Human Health Risk Assessment

##### CUMULATIVE RISK ASSESSMENT

The lack of guidance on cumulative risk assessment, dose-response assessment for chemicals in a mixture, and exposure assessment are the primary technical challenges for the EJTG. EPA's guidance on cumulative risk assessment has to be updated and the analyst should be able to estimate the toxicity of individual chemicals and chemical mixtures. However, the EJTG does not indicate how cumulative impacts should be evaluated, quantified, or otherwise considered in an EJ analysis. More guidance is needed on how to incorporate and evaluate cumulative impacts both quantitatively and/or qualitatively.

Adopting a Health Impact Assessment (HIA) approach – a more holistic approach to assessing risk and cumulative impacts should be considered. Given the acknowledgment of the lack of data or information that might be available when doing such an assessment (for instance, information on the toxicity of specific compounds and on the cumulative effects of mixtures or multiple

exposures), the assessment should serve as a way to highlight data gaps or lack of available information. For example, if a more expansive discussion of the limitations of the information used to complete the EJ assessment was included, the value of the assessment may increase.

#### RISK ASSESSMENT MODEL

SAB panel members noted that the use of the current/standard risk assessment model is emphasized in the guidance as the primary means to quantify adverse health impact from chemicals in the environment. Some SAB panel members suggest that EPA consider the possibility that the current/standard risk assessment model may not be suitable for assessing complex environmental justice concerns. The current/standard risk assessment model has technical limitations, as well as, being difficult to understand and to adjust for impacted communities with multiple sources of stressors.

If risk assessment continues to be the model of choice for EPA, then there should be a subsection in the EJTG to present the difficulties associated with risk assessment and chemical regulation; the technical limitations and gaps; the lack of mechanisms to incorporate most qualitative data, in particular social welfare considerations; an inability to incorporate cumulative impacts of multiple dissimilar stressors; the lack of effective public involvement inherent in the model and its application; and complexity that leads to a lack of transparency and accountability. The SAB panel also noted that the use of uncertainty factors in developing dose-response assessments for an individual chemical might address the general population as a whole, but does not specifically address differential or disproportionate vulnerability of an environmental justice community. This is especially true when multiple stressors, factors, and conditions exist to increase the vulnerability and sensitivity of that subpopulation to a far greater extent than what would be expected in the general population when exposed to a single stressor, which is how risk assessment is used. Additional uncertainty factors may not be appropriate as they may become the focus and lead to inaction. Instead, it may be more beneficial to transparently discuss the sources and potential impacts of uncertainties on the effected populations.

#### Suite of Methods

##### LITERATURE REVIEW

The SAB panel found this section to be an admirable attempt at providing a literature review of an immense body of research; however, it could be improved. Since this section presented

background information, it warrants an earlier location in the EJTG. While additional references will better reflect the state of the literature to the benefit of EPA analysts, this section should provide pathways to the literature instead of a comprehensive literature review. In addition, the social science literature review should be improved. The EJTG should include narratives and references to health disparities as drivers and contributors, as well as, relevant EPA National Environmental Justice Advisory Council (e.g., NEJAC 2004) reports. Further, the EJTG should be updated to include many new references to conduct risk assessment. Since these references have not been provided in the EJTG, it is not clear if the EPA analyst will refer to the latest references.

#### IMPACTS OF ANALYTICAL CONSIDERATIONS

##### *Best practices*

The EJTG (Section 5.4 in particular) could benefit from a table or matrix of “best practices”. This should also include information about prior use and identifying some advantages and disadvantages of each concept/method/practice or noting where their application is most appropriate. Likewise, Section 5 would be more useful if the key research design elements in EJ analyses were clarified. Several SAB panel members suggested that the scoping questions found in the EJTG be guided by the circumstance of the assessment and developed in consultation with the affected populations and stakeholder workgroups. Conducting an empirical, prospective EJ analysis of EPA rules inevitably entails several major components: (1) defining the “metric of interest” or dependent variable, (2) defining the comparison group, (3) identifying the counterfactual distributions, (4) defining the scope of the analysis, and (5) spatially identifying and aggregating effects. Section 5.4 discusses only (2), (4), and (5), and its discussion of the scope (Section 5.4.2) is limited. Section 5.4.2 should also be expanded to explicitly address *temporal* scope.

The EJTG does not provide clear guidance to analysts with regard to resolving differences in spatial resolution between two or more geospatial datasets. A list of best geospatial practices should be added to the EJTG to provide guidance on these issues or refer analysts to other EPA documents that discuss them, if one exists. The SAB panel envisions a set of these training videos aimed at topics like exposure, epidemiology, resilience, GIS, statistical power, and many others.

Moreover, the EJTG needs to enforce the concept that analyses and decisions must be transparent and readily understandable by the public.

Some SAB panel members proposed the addition of a recommendation on geographic assessment, either as a separate recommendation or to provide better guidance on the selection of a baseline. SAB panel members recommended that the EJTG should provide guidance to identify and characterize “hot spots” in the most meaningful context and provide resources and examples (in an appendix) illustrating approaches and best practices. The SAB panel also noted that it would be worth examining whether there are any lessons learned from previous assessments to serve as a guide for future assessments. For instance, EPA’s Office of Environmental Justice (OEJ) may have data or information on EJ populations that can be used to assist in the evaluation of potential EJ concerns. A “data repository” may be created for this purpose.

#### *Transparency and consistency*

The EJTG should promote more transparency and consistency in all aspects of an environmental justice analysis. Clearer instruction to analysts should be provided when faced with choices over which control variables to employ, implicitly defining the comparison population. The SAB panel recommends that at least a working model with clear guidance (including what variables to control for when selecting comparison populations, how to incorporate quantitative and qualitative differences when selecting comparison populations, demographic versus geographical considerations, national versus state versus local data and level of refinement needs) should be included in the EJTG until there are better methods developed in the future. A suggested clarification for that language is that the stressor is a concern for people at the relevant life stage or physical state. The EJTG should be clear and consistent in its use of the terms susceptibility and vulnerability when referring to population and individual differences. It is important to understand that the characteristics defining the population as an EJ concern are not necessarily the characteristics that make individuals more susceptible to the hazard. Rather, an EJ population is regarded as more vulnerable due to their potential increased exposure to hazards and ensuing health effects.

Distribution of Costs

1 It is not clear whether EPA is considering costs from the perspective of individual well-being. In  
2 this case, costs such as changes in prices and workers' wages are relevant, or are limited to the  
3 wording of Executive Order (E.O.) 12898, which refers to disproportionate impacts to health or  
4 exposure. If the goal of considering EJ in rulemaking is to ensure that everyone should experience  
5 some minimum level of health or clean environment, then economic costs should not be included  
6 in the analysis. In these situations, it is plausible that a rule could provide a net reduction in  
7 population risk, but an exacerbation of differential risk.

8 The EJTG states that in order to assess the "differences in the baseline incidence [of  
9 environmental harms or risks] and determine if the distribution increases or decreases differences"  
10 some information is required. That information should include, the pre-regulation environmental  
11 conditions, the projected environmental conditions without regulation and the projected post-  
12 regulation environmental conditions for the EJ group and for a comparison group. In practice,  
13 even if other regulatory analyses for the rule define these scenarios, the EJTG should direct the  
14 analyst to be transparent about how the *differences across groups* are identified for each scenario  
15 in the EJ analysis. In reality, the EJ discourse has not settled on a single metric (e.g., distribution  
16 of  $\Delta E$  or change in distribution of  $E$ ). If the EJTG is not meant to implicitly define what "justice"  
17 looks like through its prescriptions for analysts, the EJTG should encourage sensitivity analyses  
18 across alternative metrics or inclusion of stakeholders early in the analytical process to determine  
19 the most relevant metric(s). If there is not a clear guidance from the rule, as to scope, then  
20 sensitivity analysis would be appropriate to identify the impact on the results of any  
21 environmental impact or effect. Thus, this may be a consideration for research needs, but it is  
22 such a critical element to the EJ analysis that at least a working model with clear guidance needs  
23 to be included in this document until there are better methods developed in the future.

## 24 25 Public Involvement

26 Although the EJTG describes public involvement as an essential element of achieving  
27 environmental justice, there is no prescriptive mechanism specified for ensuring that the public is  
28 involved in an environmental justice analysis. Public involvement must be more inclusive than  
29 reaching out to general stakeholders who will not be experiencing first-hand the potential impacts

1 of a rule or regulation in a community. SAB panel members noted that a mixed methods approach  
2 can promote meaningful public involvement, a critical aspect of EJ.

3 A more effective means of ensuring public involvement in risk assessment has not been  
4 adequately addressed or emphasized in the EJTG. Words like “if feasible” or “if possible” were  
5 used to guide the analyst on considering public involvement. This is a major concern and will not  
6 address one of the principles of environmental justice, that is, public involvement should be  
7 integrated into the process of risk assessment from start to finish (including decision-making). It  
8 is important to note that statements such as “*when feasible*” and “*if possible*” may suggest to  
9 impacted communities that EPA lacks a commitment for incorporating public involvement and EJ  
10 concerns into the risk assessment process.

11 Finally, there are some key methodological and conceptual omissions and ambiguity in the EJTG,  
12 as follows:

- 13 • Define and identify a comparative control population for evaluating differential impacts.
- 14 • The distinction between differential impacts and disproportionate impacts.
- 15 • “Normal” for the sake of establishing a baseline of acceptable risk.
- 16 • The concepts of sustainability and prevention.
- 17 • How disproportionate environmental (ecological) impacts of a rule or regulation should be  
18 factored into an overall, multi-stressor analysis.
- 19 • Transparency and accountability to the public.
- 20 • Distribution of costs.
- 21 • Define the range of endpoints needed for a holistic or integrated equity analysis (dose,  
22 physiological health, ecological and environmental health, socio-cultural and economic  
23 health, and so no).



## INTRODUCTION

In July 2010, the Environmental Protection Agency (EPA) released the "Interim Guidance on Considering Environmental Justice During the Development of an Action." This guidance provided agency analysts and decision-makers with information on when to consider environmental justice in rule making. As a complement to this document, the Office of Policy, Office of Enforcement and Compliance Assurance, and the Office of Research and Development lead an effort to develop the *Draft Technical Guidance for Assessing Environmental Justice in Regulatory Analysis (May 1, 2013 Draft)* (also referred to as EJTG). The purpose of the EJTG is to provide technical direction to EPA staff and managers to aid them in incorporating environmental justice into the development of risk assessment, economic analysis and other scientific input and policy choices as an integral part of the agency rulemaking process. The EJTG contains guidance on how to assess disproportionate environmental and public health impacts of proposed rules and actions on minority, low income and indigenous populations in a variety of regulatory contexts.

EPA asked the SAB to conduct a review of the EJTG to assess the appropriateness and scientific soundness of the technical guidance. In response to EPA's request, the SAB convened an expert panel to conduct the review. The panel held two public face-to-face meetings (June 19-20, 2013 and January 30-31, 2014) to deliberate on the charge questions (see Appendix A) and consider public comments and then held a public teleconferences (July 22, 2014) to discuss its draft report. The SAB panel's draft report was considered and approved by the chartered SAB on a XXXX. Oral and written public comments were considered throughout the advisory process.

## RESPONSE TO CHARGE QUESTIONS

### Overall Impressions

#### Question 1

**The *Technical Guidance for Assessing Environmental Justice in Regulatory Analysis (EJTG)* provides EPA economists, risk assessors and other analysts with information on how to assess potential environmental justice (EJ) concerns during the development of a regulatory action. It is intended to introduce consistency and rigor to the analytic consideration of EJ, while maintaining flexibility in how analysts implement the guidance.**

***Please provide your overall impressions of the clarity and technical accuracy of the EJTG for analyzing and presenting quantitative or qualitative information on potential environmental justice concerns in the development of EPA regulations.***

#### Response

The SAB panel commends the EPA staff for developing the *Technical Guidance for Assessing Environmental Justice in Regulatory Analysis (EJTG)*. The document is thoughtful in providing guidance for analysts. Moreover, the EJTG represents major philosophical and communication steps for the agency and EJ communities, as a major strength of the guidance is that it seeks to incorporate EJ analysis into the frame work of regulatory analysis.

In general, the EJTG is a comprehensive compilation and presentation of EJ concerns and the complex issues, factors, parameters, processes and methods. It also presents examples of the necessary elements to conduct a rigorous, credible, and meaningful assessment of environmental justice during the development of a regulatory action. Appendices can enhance the organization of the EJTG and provide case studies with greater detail. Developing a separate document or appendix with the more detailed information and providing more applicable guidance in the main document will allow the analyst to find the key technical elements without having to wade through too much information.

1 The SAB panel strongly recommends the use of detailed examples to guide the analyst through  
2 conducting the EJ analysis for regulatory action. More prescription on what to do and how to do  
3 it in identifying decision points and key methods to use (including what data to consider) will also  
4 assist the analyst. To increase the documents clarity, the EJTG needs to include better definitions  
5 (e.g., cumulative risk, co-factors, susceptibility, EJ populations and communities). Furthermore, a  
6 more complete glossary of terms would improve the EJTG and provide analysts with a consistent  
7 definition of the terms used throughout the document.

8  
9 The EJTG can be improved by reducing redundancy. To strengthen the EJTG, the SAB panel  
10 recommends that the EJ guidance leverage the information in existing guidance documents on  
11 risk assessment for the regulatory analysis. Indeed, the EJ guidance will be easier to use if it does  
12 not try to repeat general risk analysis guidance. Limiting the scope of this guidance also reduces  
13 the risk of providing conflicting instructions.

14  
15 The SAB panel notes that the narrative and glossary in the EJTG lack definitions for *quantitative*  
16 and *qualitative* data, which leads to confusion in the examples in Section 5 for the use of the  
17 proposed methods. A simple way to define or distinguish them is that *quantitative data* are  
18 numerical and *qualitative data* are textual. The EJTG appears to erroneously equate qualitative  
19 data with anecdotal evidence. The EJTG does not clearly describe how to analyze and present  
20 quantitative or qualitative information about potential environmental justice concerns during EPA  
21 rulemaking. Throughout the EJTG, there are references to quantitative and qualitative methods,  
22 often including comparisons that suggest a hierarchy of methods, with quantitative methods being  
23 universally preferred. The text should make clear that both approaches can be used with success  
24 and that in some cases qualitative methods can be the best analytical tool. The method selected  
25 should be based on context, scope and scale of analysis, and appropriateness of a given method  
26 for the questions posed by the analyst. In some cases, mixed methods may be the best approach.

27  
28 In addition, the SAB panel strongly recommends that EPA provide clear guidance about how  
29 qualitative data can be used in EJ analyses. The draft EJTG makes clear that qualitative  
30 information should be considered but it does not sufficiently describe how qualitative information  
31 should be integrated and considered in decision-making. This guidance is especially critical in

1 instances where qualitative data is the only information available. Clear guidance should be  
2 provided to analysts on how to account for uncertainties due to limitations of available data and  
3 gaps in knowledge. The SAB panel also suggests that the terms quantitative, qualitative, analyst,  
4 decision maker, and policy decision are defined in the EJTG narrative or glossary to increase the  
5 clarity, technical accuracy and meaningful community involvement.

6 Overall, the guidance should be more specific. It makes sense for the EJTG to be brief in  
7 providing a roadmap for the analyst, without being overly (and unhelpfully) prescriptive.  
8 However, the EJTG would benefit from the inclusion of brief text on additional case studies, best  
9 practices, guiding principles, and terminology/concept definitions. There are many places where  
10 it advises the analyst to do what is appropriate and relevant. The guidance should provide the  
11 analyst more help in determining what factors are appropriate and relevant, and what factors  
12 should be considered when making judgments about this. One solution is to add more  
13 prescriptive language in the text. In addition, the EJTG needs to provide guidance on how to  
14 select key elements of an EJ analysis that must be part of the analysis and provide specific  
15 instructions or choices for an analyst or manager to proceed. EPA may also consider integrating  
16 the principles and practices of the health impact assessment model, including deviation from  
17 single chemical exposure risk assessments and consideration of a more holistic approach that  
18 incorporates stressors other than chemicals and economic burden (Hicken, et al., 2011).

19  
20 The EJTG can also be improved by providing specific and clear options and examples of best  
21 practices for consideration by analysts. This will strengthen the document by providing the  
22 analyst with tools they can utilize. SAB panel members also noted that the current examples are  
23 not clear and do not provide the analyst with clear guidance. Providing the analyst with a range of  
24 best practices will facilitate making appropriate choices, which in turn can promote consistency  
25 among evaluations conducted by different analysts. It is also suggested that a section for  
26 frequently asked questions or an overview be provided for analysts.

27  
28 Some members of the SAB panel suggest that EPA consider the possibility that risk assessment  
29 may be incompatible with assessments for environmental justice. EPA may want to consider the  
30 availability and feasibility of alternative approaches that may provide a richer basis for decision-  
31 making. It is understandable that the risk assessment model is emphasized in the EJTG as the

1 primary means to quantify adverse health impacts from chemicals in the environment. EPA has  
2 invested decades and countless resources to develop regulations based on risk assessment and  
3 therefore moving away from this model would be a huge step.

4  
5 If risk assessment will continue to be the model of choice for EPA, then there should be a  
6 subsection in the EJTG devoted specifically to the historical problems associated with risk  
7 assessment and chemical regulation; the technical limitations and gaps; the lack of mechanisms to  
8 incorporate most qualitative data (e.g., in particular social welfare considerations); an inability to  
9 incorporate cumulative impacts of multiple dissimilar stressors; the lack of effective public  
10 involvement inherent in the model and its application; and the lack of transparency and  
11 accountability.

12  
13 The effects of cumulative exposures and cumulative impacts are mentioned as important factors  
14 to consider when assessing the presence of disproportionate impacts in a subpopulation. However,  
15 there is no further elaboration in the draft EJTG as to how cumulative impacts should be  
16 evaluated, quantified, or otherwise considered in the EJ analysis. The lack of guidance on  
17 cumulative risk assessment, dose-response assessment, and exposure assessment are the primary  
18 technical challenges for the EJTG. The SAB panel was concerned about the use of the health risk  
19 assessment model as the basis for assessing multiple stressors and impacts unrelated to an  
20 individual exposure to a single chemical. Concerns were raised that the environmental justice  
21 analyses will be integrated into the process alongside risk assessment and cost-benefit assessment.  
22 However, risk assessment requires a highly quantitative relationship between the “cause” and the  
23 “effect” variables, generally using dose-response models. Thus, the EJTG does not demonstrate  
24 that the interplay of factors, sources, susceptibilities, and other attributes discussed in the  
25 document can be modeled that way. These concerns can be addressed by adopting a Health  
26 Impact Assessment (HIA) approach or another more holistic approach to assessing risk.  
27 Cumulative impacts assessment is integrated into the overall more holistic HIA approach.  
28 Another opportunity to be more responsive to this concern is in EPA’s call for planning, scoping  
29 and other activities that are consistent with EJ evaluation voiced in its new “Framework for  
30 Human Health Risk Assessment to Inform Decision-Making,” (EPA 2014).

1 The EJTG needs to speak in a singular voice and incorporate a ‘graphic roadmap, flow charts,  
2 decision trees, or checklist directing, facilitating, leading and integrating the content, narrative and  
3 the reader. Additionally, the guidance is not clear on when the EJTG is used. Clear criteria should  
4 be included for any inclusion or exclusion of data that is used. The problem formulation step  
5 should articulate the reason for conducting an EJ analysis and explain if the human health  
6 standard in question is not health protective from an EJ perspective. The guidance should include  
7 a flow chart that can help the EPA analysts with decision making to consider EJ issues. A flow  
8 chart or roadmap with “Yes” and “No” paths will help document the various reasons for either  
9 conducting or not conducting an EJ assessment. Also, making use of decision trees, diagrams,  
10 checklists, and other means to summarize key guidance might be helpful to steer the analyst to the  
11 most important elements of the guidance and those areas where consistency is essential. When  
12 multiple chemical exposures are of concern, discussing the modes of action of the individual  
13 chemicals, if known, would assist the analyst in determining possible interactions of the  
14 chemicals at the cellular and subcellular level to better describe cumulative impacts. The EJTG  
15 should also include a discussion on the mode of action of the chemical and systematically  
16 evaluate all the information using an Evidence Integration process (Rooney, 2014; NAS, 2014).

17  
18 The SAB panel believes the EJTG would benefit from an acknowledgement that some regulatory  
19 actions might experience differential compliance related to some of the same drivers that shape EJ  
20 concerns. In these situations, it is plausible that a rule could provide a net reduction in population  
21 risk, but an exacerbation of differential risk. As a simple example/scenario, it is plausible that  
22 compliance with the Lead Renovation, Remodeling, and Painting Final Rule (U.S. EPA 2008)  
23 could vary by housing type, neighborhood, household attributes and other factors strongly tied to  
24 race/ethnicity. For families living in multiunit properties owned by noncompliant landlords, their  
25 differential exposure relative to renters in a higher socioeconomic status could increase. To be  
26 clear, in most cases, these effects would not be dominant, but it is worthwhile acknowledging that  
27 these dynamics are relevant when thinking about the net impacts of EPA rules. Further, there is  
28 value in acknowledging these effects to highlight the importance of considering compliance issues  
29 in rulemaking and subsequent enforcement.

The EJTG guidance refers to some EPA documents but omits many other relevant EPA documents and key references. The EJTG should be updated to include many new references to conduct risk assessment. Moreover, these references have not been provided in the EJTG and it is not clear if the EPA analyst will refer to the latest references. EPA's guidance on cumulative risk assessment has to be updated so that analysts would be able to estimate the toxicity of individual chemical and chemical mixtures. In addition, the social science literature review should be improved. The EJTG should also include narratives and references to health disparities as drivers and contributors as well as relevant NEJAC reports to the Administrator.

There are some key methodological or conceptual omissions or ambiguity in the EJTG. These include:

- Definition and identification of a comparative control population for evaluating differential impacts.
- The distinction between differential impacts and disproportionate impacts.
- “Normal” for the sake of establishing a baseline of acceptable risk.
- The concepts of sustainability and prevention.
- How disproportionate environmental (ecological) impacts of a rule or regulation should be factored into an overall, multi-stressor analysis.
- Transparency and accountability to the public.
- Distribution of costs.
- Unique considerations for subsistence populations

To improve the data quality, the SAB panel suggests that the document provide guidance on how to identify an appropriate control population for comparison to a potential environmental justice community. This extremely important element of an impact assessment is bound to be inconsistent from one analysis to another and is subject to creating extremely flawed analyses of disproportionate risk. There are several factors that need to be considered, for example, what variables to control for when selecting comparison populations, how to incorporate quantitative and qualitative differences when selecting a control populations, demographic v. geographical

1 considerations, national v. state v. local data and level of refinement, and so forth. This might be a  
2 consideration for research needs but it is such a critical element to the EJ analysis that at least a  
3 working model with clear guidance needs to be included in this document until there are better  
4 methods developed in the future.

5  
6 Moreover, the EJTG needs to enforce the concept that analyses and decisions must be transparent  
7 and readily understandable by the public. To achieve this, the analyst and manager should provide  
8 a detailed account of his/her decision-making. Including a systematic review of the data being  
9 considered, with clear inclusion and exclusion criteria. Often, accountability and transparency are  
10 linked; therefore, requiring this level of documentation would go a long way to achieving  
11 consistency and defensible decisions. More transparency needs to be included with a discussion  
12 of the data with its limitations and the assumptions. Better data collection may be possible with  
13 new technologies that track human behavior. However, this is a future research need which can  
14 improve and enhance EJ analysis in the future.

15  
16 Although the EJTG describes public involvement as an essential element of achieving  
17 environmental justice, there is no prescriptive mechanism specified for ensuring that the public is  
18 involved in an environmental justice analysis. First, EPA should consider preparing a public  
19 version of the document that translates the EJTG for the public. Secondly, analysts should be  
20 required to seek input from impacted communities or citizens (at a minimum public comment) for  
21 unique exposure pathways, end points of concern, and data sources to consider in the analysis.

22  
23 Finally, the EJTG follows the 2010 Interim Guidance on Considering Environmental Justice  
24 During the Development of an Action. A more appropriately clear and accurate title for  
25 consideration is: *2013 Technical Guidance for Assessing Environmental Justice During the*  
26 *Development of an Action*. Furthermore, it should be made clear in the *2013 Technical Guidance*  
27 *for Assessing Environmental Justice During the Development of an Action* is an extension, a  
28 further development and expansion of the 2010 Interim EJ Guidance via the EJ Plan 2014. It was  
29 suggested that the development of EJTG within the framework of the 2010 Interim Guidance as a  
30 starting point, essentially modifying and expanding 2010 to articulate and demonstrate the critical  
31 analytical methods and tools necessary to engage stakeholders and conduct a meaningful



assessment of EJ during an Action Development Process (ADP). Thus, the utilization and integration of the 2010 Interim Guidance may facilitate meaningful public involvement and the very relevant, thorough and important considerations, questions, and recommendations provided in the EJTG public comments.

## Quantitative risk and benefit analysis

### Question 2

*The EJTG suggests that if quantitative risk and benefit analysis is done in support of the rule, analysts should rely on these data to do a quantitative EJ assessment when feasible. The level of quantitative analysis is expected to vary by regulation and be affected by data, analytic, or other constraints. If quantified benefit or risk information is not available then a qualitative EJ analysis is still expected.*

*Are these directions appropriate? Do they strike the right balance between developing information that is useful to the decision making process and the cost (time, resources, data constraints) of doing quantitative EJ assessments.*

*Please provide advice on methods and best practices for conducting rigorous, high-quality EJ analyses, both quantitative and qualitative, that may be conducted in support of a national rule (including data needs or other issues associated with such assessments).*

### Response

The SAB panel found the EJTG to be too long for a general public audience but too limited for an analyst without substantial experience. Those with experience in conducting risk assessments and risk management projects understand that without much firmer guidance than the information in the EJTG, the task of doing EJ assessments remains daunting. For example, an economist without extensive experience would have great difficulty understanding risk assessment, epidemiology, exposure, and human health data. In contrast, someone from the biological sciences, chemistry and other lab sciences without experience would find it difficult to address the risk management issues.

1 There are several options available to address these concerns. One is to have a group of  
2 interdisciplinary analysts work on each assessment and divide their responsibilities according to  
3 their experience and academic background. This method is used when developing environmental  
4 impact assessments (EIA) under the National Environmental Policy Act (NEPA). Second, case  
5 studies could be added to the EJTG as appendices. The small text boxes currently in the document  
6 do not suffice, unless there is a direct link to an example. Third, it would be advisable to hold  
7 continuing education seminars from experts in the elements of the EJ analysis process. Fourth,  
8 time and resources have increasingly prohibited the use of long training sessions. Agencies have  
9 responded by developing shorter 15-25 minute training modules. The SAB panel envisions a set  
10 of training videos aimed at topics like exposure, epidemiology, resilience, GIS, statistical power,  
11 and many others. Absent this kind of information, the analysts are expected to make important  
12 recommendations with highly inconsistent backgrounds and without proper support. Finally, the  
13 EJTG can provide very detailed instructions on how to do the analysis. Ideally, that could be  
14 done, but would take a great deal of time to compile and test.

15  
16 The SAB panel is concerned about the stated bias toward quantitative data and analysis. SAB  
17 panel members noted that the key is high quality data, whether it is quantitative or qualitative is  
18 less important. Moreover, the quality can be measured by the metrics that are used in the sciences,  
19 such as rigor of the study design, statistical power, corroboration, universality, proximity,  
20 relevance and cohesion. In some situations, high quality nominal and ordinal data are more certain  
21 and available, and hence, more reliable than a less than rigorous quantitative database. Ideally, the  
22 analysts will gather all the data, assess the quality of all data and then use the best data rather than  
23 focus exclusively on quantitative/interval data.

## 24 25 **Key questions for analysts**

### 26 27 **Question 3**

28 *Section 1.1 presents 5 key questions analysts should address when analyzing the environmental*  
29 *justice considerations during the development of a regulation. Are these questions clear and*  
30 *appropriate for considering EJ during the development of a regulation?*

## Response

Section 1.1 of the EJTG poses three questions and describes five steps that the analyst should take. The first question asks how the public participation process provided transparency and meaningful participation for the EJ population at risk. A great deal of literature addresses public participation. The extent of public participation is not clearly delineated in the EJTG. Current standards require a public meeting, but sometimes these are not satisfactory and many times there are 3-4 public meetings during which people's assessment of the decision evolves (McComas *et al.*, 2003).

The second question asks the analyst to make a judgment about "disproportionate environmental and public health impacts." Disproportionality, however, is not defined. It is not clear whether an impact requires a 5%, 50%, or one or two standard deviations of difference to be considered disproportionate. An analyst may be able to estimate differential impacts and should indicate, as best they can, the uncertainty associated with their findings; however, in order to answer question 2, the analyst would have to make *a priori* decisions about the level of disproportionality that requires action. It is more useful that the analyst report the data and the uncertainty associated with it and leave the determination of disproportionality to the policy and decision-maker.

The third question is tied to the answers of the first two questions, and the first requires reconsideration where the outcomes and final decision are considered. The SAB panel considered the third question as appropriate and consistent with the analysis.

The five steps begin with the statement that analysts should follow the five steps, "when feasible." What does "when feasible" mean? The SAB panel recommends that this statement be revised to state that either the analysts should follow these steps or explain why they could not.

From the risk analysis perspective, the five steps make sense. The first two steps are part of risk assessment; the second two are risk management (Greenberg *et al.*, 2012) and they should be labeled as such. The fifth step asks the analyst to integrate across risk assessment and risk management. Rather than providing a singular assessment, the analyst should instead focus on the

data and other information and seek to offer a variety of options clearly presenting the uncertainty associated with the analysis.

## Key Recommendations (Section 1.2)

*The EJTG makes six recommendations to ensure consistency, rigor and quality across assessments.*

### Question 4

*Are the six analytic recommendations listed in Section 1.2 appropriate and comprehensive? Are they consistent with the state of the literature while providing flexibility to EPA program offices in the analytic consideration of EJ in the development of a regulation?*

### Response

There is concern that some of these recommendations should be more comprehensive, and the efforts to provide flexibility for analysts by ensuring that guidance is not “overly prescriptive” results in recommendations that are too broad. The SAB panel considers the six recommendations to be generally appropriate and reasonable, but consistency with the research literature needs to be improved. More specific guidance should be provided in terms of both analytical approach and information sources, as described below.

While the SAB panel understands the intent of EPA’s reasons for wanting the technical guidance not to be “overly prescriptive”, members agree that it should be more so. There are instances in these recommendations, and elsewhere in the EJTG, where the analyst is advised to conduct some analysis “when feasible and applicable” (Recommendation 5), “appropriate and relevant” (Recommendation 6). The document lacks guidance or help for the analyst in determining the conditions under which an analysis is applicable, appropriate, or relevant. This overly flexible approach may lead to a lack of consistency and even rigor in EJ analyses. Therefore, a more specific and prescriptive guidance would likely be welcomed by analysts and save time and resources during analytical design. In this way, there is inconsistency in the recommendations relative to the state of the literature.

1 A clear statement or process for determining “feasibility”, and documenting it should be part of  
2 the EJ analysis so that these decisions can be readily understood. Allowing analysts too much  
3 latitude to define what is “feasible”, “applicable” or “relevant” many not always address EJ  
4 concerns adequately, and in some cases may introduce error or bias to the analysis itself. The  
5 stated goals and key priorities for the EJTG include having a more consistent analytical approach  
6 and standardization of metrics. For these reasons, and also for appropriate transparency, the SAB  
7 panel recommends that the EJTG be more specific and, where appropriate, more prescriptive in  
8 analytical approach and standards.

9  
10 To ensure consistency and transparency, the EJTG recommendations should also include a  
11 declaration outlining conditions under which specific recommendations are not followed. This  
12 could take the form of a protocol or checklist that outlines how specific recommendations in this  
13 guidance are addressed, or the reasons why they are not addressed. Such a checklist should also  
14 include a statement that addresses the issue of qualitative information in the EJ analysis or  
15 analytical design. For example, the guidance could state that “Qualitative data may be considered  
16 in addressing potential EJ concerns provided that the information is determined to be valid and  
17 reliable” with some explanation of how the qualities of validity and reliability were evaluated.  
18 Other approaches to ensure consistency and transparency could include a series of lists of “best  
19 practices” for specific types of analyses (e.g., selecting and aggregating geospatial data, proximity  
20 analysis, when to use sensitivity analysis, selecting acceptable statistical techniques appropriate to  
21 the data characteristics, etc.) illustrated by carefully selected examples from peer-reviewed  
22 research literature. Such examples might better serve analysts than some of the summaries in  
23 boxes now in the draft. Other approaches may include a separate section on research design with  
24 examples, and a matrix of methods that summarize the strengths and weaknesses of each method,  
25 as well as its implicit assumptions.

26  
27 The SAB panel suggested replacing references about using the “most recent data” with the  
28 reference “highest quality data”. Since, in some cases, the most recent may not be the highest  
29 quality - for example, using the most recent single year U.S. Census Bureau American  
30 Community Survey (ACS) estimates will introduce greater error into an analysis than using the  
31 most recent 5-year rollup simply because of sample size. However, other SAB panel members

consider the paragraph immediately under Section 1.2, which states, “Rather, they encourage analysts to conduct the highest quality analysis feasible, recognizing that data limitations, time and resource constraints, and analytic challenges will vary across media and with the specific regulatory context” captures this sentiment appropriately. One solution to provide more prescriptive guidance regarding the use of some types of data, where it is appropriate to do so, while leaving flexibility for the use of non-quantitative information in cases where it is the highest quality available.

As an example, the SAB panel suggests the following edits to Recommendation 1 (our suggestions are italicized):

For regulatory actions where impacts or benefits will be quantified, some level of quantitative analysis for EJ is recommended (see Section 5.1).

- ~~When feasible~~ Analysts should present *the highest quality, most current and complete information available* on estimated health and environmental risks, exposures, outcomes, benefits and other relevant effects, disaggregated by race/ethnicity and income *if possible*.
- When such data are not available, it may still be possible to evaluate risk or exposure using other metrics (e.g., prevalence of affected facilities as a function of race/ethnicity or income, evidence of unique or unusual (i.e., atypical) consumption patterns or contact rates).
- *In all cases, analysts should include a discussion of the quality and limits of these data (completeness, accuracy, validation). It is also advisable to discuss data gaps and suggest analyses that could provide more definitive answers to key EJ questions if that data were available.*

Next, there is disagreement among SAB panel members regarding the guidance for comparison of scenarios. One point of view is that the present wording is strong and clear, and that it is important to guide analysts to design these comparisons with specific relevance to regulatory actions. This comes with the suggestion that the EJ analysis need not include or repeat specific approaches for quantitative analysis of risk that are already conducted by the agency and described in appropriate documentation elsewhere. Furthermore, it would only be necessary for

the guidance to refer to standard analytical practice for estimating risk currently used by EPA, thereby eliminating any confusion regarding analytical procedures, and avoiding any tendency for non-technical readers to conclude that risk analysis included as part of an EJ analysis is done differently.

Finally, others expressed concern that the “baseline scenario” to be used in comparisons is neither comprehensive nor adequately defined. They recommend that the discussion of techniques and data sources required to develop this baseline should provide more detail. Specifically, guidance is lacking regarding the process for defining control populations and establishing a baseline that is appropriate for use in comparisons. These elements are referenced in Text Box 1.1, but should be further refined or described to provide additional, more specific guidance on such elements. Case studies may help to illustrate the concepts and provide further clarity for analysts.

#### Question 5

*Are there any analytic recommendations that should be added? Any that should be removed?*

#### Response

Some SAB panel members proposed the addition of a recommendation on geographic assessment, either as a separate recommendation or to provide better guidance on the selection of a baseline. Many areas, such as communities that are located around ports, for instance, have similar environmental concerns as well as potential EJ concerns. It would be worthwhile examining whether there are any lessons learned from previous assessments to serve as a guide for future assessments. To facilitate this effort, it would be helpful to maintain a list of sources that might be accessed in completing an assessment. For example, EPA’s Office of Environmental Justice (OEJ) may have data or information on EJ populations that could be used to assist in identifying a baseline and in evaluating the potential EJ concerns. The idea of a “data repository” was suggested that could also serve as an authoritative and easy to access source of the publicly available dataset used in EJ analyses.

1 Additionally, given the acknowledgment of the lack of data or information that might be available  
2 when doing an assessment (for instance, information on the toxicity of specific compounds and on  
3 the cumulative effects of mixtures or multiple exposures, or information about subsistence use of  
4 natural resources), the assessment should serve as a way to highlight data gaps or lack of available  
5 information. For example, if a more expansive discussion of the limitations of the information  
6 used to complete the EJ assessment was included, the value of the assessment may increase.  
7 Another example of how such an assessment might be valuable is by investigating what can be  
8 learned using information that is available from other regulatory bodies. For example, the  
9 California EPA's Office of Environmental Human Health Assessment (OEHHA, 2002) uses a  
10 state-approved Inventory Update Reporting (IUR) estimate for diesel particulates to calculate an  
11 estimated lifetime cancer risk for diesel exposure. Although the U.S. EPA does not have an IUR  
12 for diesel, OEHHA has derived a potency estimate for this mixture of compounds and has  
13 classified it as a carcinogen under California legislation (Proposition 65). Ultimately, this type of  
14 information may help serve to advise the agency in future work and highlight data gaps.

15  
16 Some reviewers had concerns that Recommendation 6 in the EJTG was not sufficiently clear and  
17 unambiguous on the subject of costs, as they can be defined differently, depending on context. It  
18 is not clear whether EPA is considering costs from the perspective of individual well-being,  
19 where costs such as changes in prices and workers' wages are relevant, or are limited to the  
20 wording of Executive Order (E.O.) 12898, which refers to disproportionate impacts to health or  
21 exposure. If the goal of considering EJ in rulemaking is to ensure that everyone experiences some  
22 minimum level of health or clean environment, then economic costs should, perhaps, not be  
23 included in the analysis. If such costs are included, it will be difficult to describe their  
24 distributional effects in many cases, because the distribution may depend on general-equilibrium  
25 effects in the economy (national, open to foreign trade) that arise as consumers, industries, and  
26 others react to changes in prices. In the interest of transparency and appropriate guidance to  
27 analysts, EPA should provide clearer guidance on this question. It was also suggested that  
28 Recommendation 6 be omitted entirely, or the role of costs be amplified throughout the guidance.



## Differences and Disproportionate (Section 2)

*The EJTG distinguishes between analytically defined differences in impacts and making a determination of disproportionate impacts. It also suggests 6 types of information that may be useful to the decision maker for determining whether differences are disproportionate and may warrant Agency action (Section 2.4).*

### Question 6

*Is the description of differences in impacts and disproportionate impacts clear and do reviewers agree with this distinction?*

### Response

SAB panel members noted that while the distinction between differential impacts and disproportionate impacts as EPA means to define them is clear, the text provided in the EJTG is overly complex and too detailed to be of practical use to an analyst. Moreover, the SAB panel concluded that the EJTG should emphasize the role of the analyst and focus on providing clear and complete information to guide an environmental justice analysis while devoting only a minimum amount of text to explain the role of the decision/policy-makers in the same context. The text should clearly explain that determining whether there is a disproportionate impact “that may warrant Agency action” is a policy judgment made by the decision-makers and informed by the analysis. Further, the finding of a disproportionate impact is neither necessary nor sufficient for EPA to address adverse “differential” impacts; the two issues are separate and distinct.

Following extensive discussion, the SAB panel members agreed that providing a brief definition or description of the terms “differential” and “disproportionate” impact including how they are evaluated and by whom is appropriate to retain because analysts will be required to provide relevant information to decision-makers. However, further detailed discussion and reference to disproportionate impact should be removed from the EJTG to avoid confusion. In addition, some members recommend that these terms be described earlier in the document where the purpose of the guidance is spelled out. Another concern expressed by some members is that the current definitions, including the use of the word “substantial,” are not effective or useable as is and recommend that EPA rework the definitions to be clearer and more prescriptive.

Are the types of data listed to aid the decision maker helpful?

SAB panel members agreed that the emphasis of Section 2.4 of the EJTG should be to provide clear and complete guidance to the analyst on what to consider when assessing differential impacts. Regarding how to present the information to decision-makers, it would be essential then to revise Section 2.4 to expand upon the information provided in the bullets on page 11 by providing more detail and examples. As it is written now, the six bullets on page 11 are only superficial and mostly subjective and as such would provide only limited guidance to an analyst. In addition, the SAB panel recommends that any examples provided include information from actual instances or case study examples where an authoritative entity (e.g., federal or state government, a significant municipality, court case) found impact(s) that were deemed disproportionate to the degree that corrective actions were taken or penalties imposed.

Some SAB panel members had specific comments, concerns, or recommendations related to types of data or terms used in describing the useful information for decision-makers:

- Make elements of EJ assessments as straightforward and easy for the public to understand as possible. It is equally important to disclose clearly any elements of uncertainty in the analysis (e.g., sample size, potentially incorrect assumptions like using proximity as a surrogate for exposure).
- With the exception of the last two bullets on page 11, the list of information useful to decision-makers requires or involves quantification. EPA should consider adding an additional statement on page 11 reinforcing the concept that the use of good data, either quantitative or qualitative, is important.
- The fifth bullet recommends the inclusion of an uncertainty analysis. However, this guidance is too vague to effectively assist analysts in incorporating an uncertainty analysis in their assessment and presenting useful information to decision-makers. This is an example of where more detail and clear examples need to be provided in the EJTG.
- The SAB panel recommends the EJTG should be clear and consistent in its use of the terms susceptibility and vulnerability when referring to population and individual differences.

1        These are not interchangeable terms. Although the terms are defined in the glossary it would  
2        be helpful to also include an example (real or hypothetical) on how the terms should be used  
3        in an environmental justice analysis. For example, according to the EPA Framework on  
4        Cumulative Risk Assessment (see EPA 2003, NEJAC 2004), a subpopulation is vulnerable if  
5        it is more likely to be adversely affected by a stressor than the general population. There are  
6        four basic ways in which a population can be vulnerable: susceptibility/sensitivity, differential  
7        exposure, differential preparedness, and differential ability to recover.

- 8        • Defining “biological significance” has recently been the subject of a National Academy of  
9        Sciences publication ([http://www.nap.edu/openbook.php?record\\_id=11970](http://www.nap.edu/openbook.php?record_id=11970)). While some  
10        sublet biochemical change(s) may not be or result in an adverse effect(s) that is/are  
11        biologically significant, many upstream and seemingly benign changes in certain biological  
12        responses may result in a significant adverse health outcome downstream; therefore, it would  
13        be helpful to cite this publication in the EJTG and to provide examples for analysts.
- 14        • As noted in the EJTG, a critical piece of information for decision-makers is the inclusion of  
15        information about cumulative impacts in the assessment. However no definition, method, or  
16        approach is provided in the EJTG to guide analysts about how to include cumulative impact  
17        analysis in their assessments. Both the public comments and SAB panel members expressed  
18        the importance of including cumulative impacts from multiple stressors (chemical and non-  
19        chemical) and conditions. Clearer guidance, both in Section 2.4 and elsewhere in the  
20        document, to guide analysts should be provided.

21  
22  
23        Are there other categories of data or information that should be added to this list?

- 24  
25        • It is difficult to ascertain when a qualitative vs. quantitative analysis is recommended or  
26        needed. The SAB panel recommends presenting quantitative data and qualitative data  
27        separately with examples and more detailed guidance.
- 28        • It is not clear if the last bullet in the list includes exposure sources from using consumer  
29        products and from occupational exposure. Decision-makers should know the extent to which  
30        both sources influence the overall analysis of impact.

- 1 • In some situations, a hot spot analysis could be useful. While the term “hot spot” can be used  
2 in several different ways in spatial analysis, the hot spots of most concern for EJ will be those  
3 specific locations with multiple risks. Rather than analyzing large geographic areas for  
4 specific risks, an analyst might analyze few specific locations for multiple risks. The list on  
5 page 11 would hold but it does imply a broad spatial analysis instead of a hot spot analysis.  
6 Perhaps it would be helpful to indicate that both could be useful, depending on the situation.
- 7 • Census block demographics. Also, consider locations, numbers and types of facilities and  
8 their distances from the center of the census block group within 1 and 3 kilometer radii. (One  
9 member commented: “Part of the needed spatiotemporal environmental stressors baseline data  
10 base; what is happening on the ground?”)
- 11 • Subsistence populations and unique exposure pathways. While these are mentioned in the  
12 guidance, additional guidance on how to recognize potentially differential degrees of exposure  
13 would be useful to the analysts, even in populated areas.

14  
15 Other comments on Section 2.4  
16

17 There is some inconsistency with regard to the use of exposure assessment statistics in this section  
18 compared to other sections in the EJTG. Whereas median and geometric mean can tell part of the  
19 story, a distribution of exposures around the mean tells a more complete story. However, without  
20 specific guidance on what values to select, this level of guidance is not helpful for maintaining  
21 both rigor and consistency.  
22

23 The issue of ‘disproportionate’ is related to how to disaggregate the analytical data and how fine a  
24 scale is intended. There is always a high-end tail of exposure and sensitivity, and you can find out  
25 who is in that tail if you disaggregate enough. It is a policy question whether action is taken, but  
26 the analyst can at least describe the characteristics of who is in the higher percentiles. Sometimes  
27 this might be clustered in an ethnic or low-income group, other times this group might include  
28 children, the elderly, disabled or the sick regardless of ethnicity or income. The uneven  
29 distribution of stressors does not always sort along the lines of race or income.  
30

Assuming that the definitions are moved to the front of the document as recommended, the SAB panel

## Contributors and Drivers of Environmental Justice

*Section 3 provides a brief overview of the contributors and drivers of Environmental Justice.*

*This overview is intended to provide analysts with some considerations that might drive the analytical decisions used when examining environmental justice for a regulatory decision.*

### Question 7

*Does the discussion of contributors and drivers adequately reflect the state of the literature? Is it clear and technically accurate? Are there any additional factors that should be included in the discussion?*

### Response

While the SAB panel found this section to be an admirable attempt at providing a literature review of an immense body of research, it could be improved in the following ways.

- Since this section presented background information, it warrants an earlier location in the EJTG.
- A paragraph on the “Contributors and Drivers” topic should be added early in Section One.
- Section Three should become Section Two with an additional paragraph on Environmental Injustice Contributors and Drivers added early in Section One.

On the question of adequately reflecting the literature, SAB panel members noted the omission of any simplified framework or graphical representation of contributors and drivers to environmental injustice commonly found in the social determinants of health literature. Other SAB panel members concurred and noted that concept maps would be particularly effective heuristic for this section. For example, in a 2002 *Environmental Health Perspectives* article, Morello-Frosch *et al.* (2002) proposed a political economy and social inequality framework for future research. Likewise, Krieger (2001) described the “social production of disease” or a “political economy of health” perspective in the *International Journal of Epidemiology*. SAB panel members agreed that while such additions will better reflect the state of the literature to the benefit of EPA

analysts, this section should provide pathways to the literature instead of a comprehensive literature review. SAB panel members also recommended a conceptual map from a December 2004 National Environmental Justice Advisory Council (NEJAC) Cumulative Risks/Impacts Group located on page 28 of the following report-*Ensuring Risk Reduction in Communities with Multiple Stressors: Environmental Justice and Cumulative Risks/Impacts*.

SAB panel members agreed that the new Section 2 should include a graphical figure that represents a prominent conceptual framework from the literature on the contributors and drivers (social and biological) of health disparities.

On the question of additional factors, SAB panel members observed that there was no discussion of occupational social context. They also noted the omission of any discussion on tribal social context in this section. SAB panel members recommended the new Section 2 should address different social contexts such as occupational and tribal and their differing contributors and drivers to Environmental Injustice.

On the question of clarity and accuracy, SAB panel members suggested that the concepts “contributors” and “drivers” needed clarification. The SAB panel noted that this section should address the concept of “hotspots, exposure to them, and the drivers of differential susceptibility to hotspots (like residential sorting behaviors and housing discrimination). It was noted that Section 3 was repetitive in some places, and redundant elsewhere that weakens this section’s attempt to reflect the literature. Moreover, the omission of any discussion of the contributors and drivers of health disparities in the context of environmental justice is a concern. A clearer discussion of contributors and drivers existed in the 2010 Interim Guidance for the Action Development Process. A SAB panel member also suggested that restating the synthesis of studies finding that “the sources of environmental hazards tend to be located and concentrated in areas that are dominated by minority, low-income, or indigenous populations” would be more accurate in reverse as follows: “minority, low-income or indigenous populations tend to be located and concentrated in areas that are dominated by sources of environmental hazards” which should lead into a description of “the links between the residential and environmental hazard stratifications for these populations.”

1  
2 The technical guidance omits key aspects of the historical role of EPA implementation and  
3 enforcement of regulations may have played in socioeconomic disparities and contributing to  
4 environmental injustice. A SAB panel member stated that the use of risk assessment and the lack  
5 of implementation of the precautionary principle are major drivers of how regulatory decisions  
6 might continue to discriminate against environmental justice communities. There is an extensive  
7 academic literature on this perspective and reflects the consensus among a number of risk  
8 assessment critics. For instance, in a 2002 *Environmental Management* article, Jason Corburn's  
9 said, "While risk assessment continues to drive most environmental management decision-  
10 making, its methods and assumptions have been criticized for, among other things, perpetuating  
11 environmental injustice. The justice challenges to risk assessment claim that the process ignores  
12 the unique and multiple hazards facing low-income and people of color communities and  
13 simultaneously excludes the local, non-expert knowledge which could help capture these unique  
14 hazards from the assessment discourse. . . traditional models of risk characterization will  
15 continue to ignore the environmental justice challenges until cumulative hazards and local  
16 knowledge are meaningfully brought into the assessment process".

17  
18 Similar concerns were raised in: (1) a National Research Council document entitled  
19 *Understanding Risk: Informing Decisions in a Democratic Society* (Stern *et al.*, 1996); (2) a 1999  
20 EPA Science Advisory Board (SAB) report entitled *Integrated Environmental Decision-Making*  
21 *in the Twenty-First Century*; and (3) a 2011 National Research Council document entitled  
22 *Sustainability and the U.S. EPA*. None of these major reports are cited in the EJTG that reinforce  
23 the suggestion that a critique of traditional risk assessment and its role in contributing to  
24 environmental injustice is an additional factor warranting discussion in the Contributors and  
25 Drivers section.

26  
27 Some SAB panel members raised concerns that the analysis of environmental injustice's  
28 contributors and drivers may not be suitable for rulemaking. Without an agency guidance on  
29 cumulative risk and impact issues, it does not make sense to encourage analysts to attempt to  
30 incorporate some of these factors in ad hoc compilations on non-standard data sets, SAB panel

members suggested. Therefore, SAB panel members concluded that the Contributors and Drivers section is a premature inclusion in the EJTG.

## Scoping Questions

*The Guidance directs analysts to use a series of scoping questions at the planning stages of a human health risk assessment to integrate EJ into analyses conducted for the rulemaking.*

### Question 8

*Is section 4 clear and technically accurate? Are the scoping questions outlined in Section 4.3.2.1 appropriate? Do the scoping questions adequately identify opportunities for incorporating environmental justice into a human health risk assessment? Should certain scoping questions be prioritized at various stages of the risk assessment (e.g. exposure, dose-response)?*

### Response

Is section 4 clear and technically accurate?

Overall, SAB panel members agreed that EJ concerns are an appropriate fit within human health risk assessment (HHRA) with respect to sensitive and vulnerable populations and with the subsistence exposure pathways, and with any group of people that is identified as potentially having disproportionate exposure and/or disproportionate vulnerability. SAB panel members acknowledged that the use of the risk assessment model is emphasized in the guidance as the primary means to quantify adverse health impact from chemicals in the environment, but some SAB panel members suggested that a framework based on the risk assessment model may be problematic for both its technical limitations as well as its reputation for being difficult to understand, and potentially unfair to impacted communities with multiple sources of stressors. It was suggested that the guidance include reference in Section 3 of the draft to historical difficulties associated with risk assessment and chemical regulation, including: technical limitations and gaps; the lack of mechanisms to incorporate most qualitative data, in particular social welfare considerations; an inability to incorporate cumulative impacts of multiple dissimilar stressors; the lack of effective public involvement inherent in the model and its application; and the lack of



transparency and accountability. The California Comparative Risk Project and other comparative risk projects were recommended can provide a historical perspective and critique of the risk assessment model<sup>1</sup>. In addition, the SAB panel recommends that EPA consider integrating the principles and practices of the health impact assessment model, including deviating from single chemical exposure risk assessment and considering a more holistic approach that incorporates stressors other than chemicals and economic burden (Hickens et al 2012). Risk assessment could be more broadly defined as opposed to focusing solely on conventional human health concerns. EPA's Comparative Risk method was mentioned as an example to address everything that is "at risk" including quality of life and well-being. The EJTG should be more prescriptive in broadening the risk assessment beyond health and economics, if this is a goal.

The SAB panel raised some general concerns regarding the use of a status quo risk assessment as a model rather than tailoring it to address specific environmental justice concerns. Four key elements identified as missing or not adequately incorporated into the risk assessment guidance included:

- Including more effective means of public involvement in risk assessment was not adequately address or emphasized. Words like "if feasible" or "if possible" were used to guide the analyst on considering public involvement. This is a major concern and will not address one of the principles of environmental justice, that is, public involvement is inviolate and should be integrated into the process of risk assessment from start to finish (including decision-making). In this case, public involvement must be more inclusive than reaching out to general stakeholders who are not experiencing first-hand the impact of a rule or regulation in a community, for example.
- Cumulative impacts are evaluated quantitatively when numerical data are available and qualitatively when not. EPA needs to provide more prescriptive guidance on how EJ analyses should account for and incorporate qualitative data, and that the agency provide sufficient specificity as to how the information should be integrated and what weight it should be given in decision making. Guidance is also needed on how to account for uncertainties due to

---

<sup>1</sup> See <http://oehha.ca.gov/multimedia/pdf/comprisk1994.pdf>

1 limitations of available data and gaps in knowledge if qualitative data is the only information  
2 available.

- 3 • Identification and characterization of “hot spots” should be included in the analysis. SAB  
4 panel members recommended that the EJTG should define the term “hot spots” in its most  
5 meaningful context and provide resources and examples (in an appendix) illustrating  
6 approaches and best practices. Another SAB panel member noted that it would be worth  
7 examining whether there are any lessons learned from previous assessments to serve as a  
8 guide for future assessments, for instance, EPA’s Office of Environmental Justice (OEJ) may  
9 have data or information on EJ populations that could be used to assist in the evaluation of  
10 potential EJ concerns. This idea was captured in the idea of a “data repository”.
- 11 • The use of uncertainty factors in developing dose-response assessments for an individual  
12 chemical. These uncertainty factors might address the general population as a whole, but do  
13 not specifically address disproportionate vulnerability of an environmental justice community.  
14 This is especially true when multiple stressors, factors, and conditions exist to increase the  
15 vulnerability and sensitivity of that subpopulation to a far greater extent than what would be  
16 expected in the general population when exposed to a single stressor, which is how risk  
17 assessment is most commonly used.

18  
19 SAB panel members again noted that statements such as “*when feasible*” and “*if possible*” that  
20 may act as “lightning rods” for impacted communities should be changed or deleted. Use of such  
21 language may suggest that EPA lacks a commitment for incorporating public involvement into the  
22 risk assessment process. A specific example of language that may be considered by some groups  
23 to be inflammatory and was recommended for revision included the statement on page 23, the last  
24 sentence section 4.3.1, (paraphrased), “*The scope of the HHRA also will be affected by ...*  
25 *limitations in time and resources.*” It was highlighted that an EJ community does not want to  
26 hear that EPA does not have the time or resources to help them.

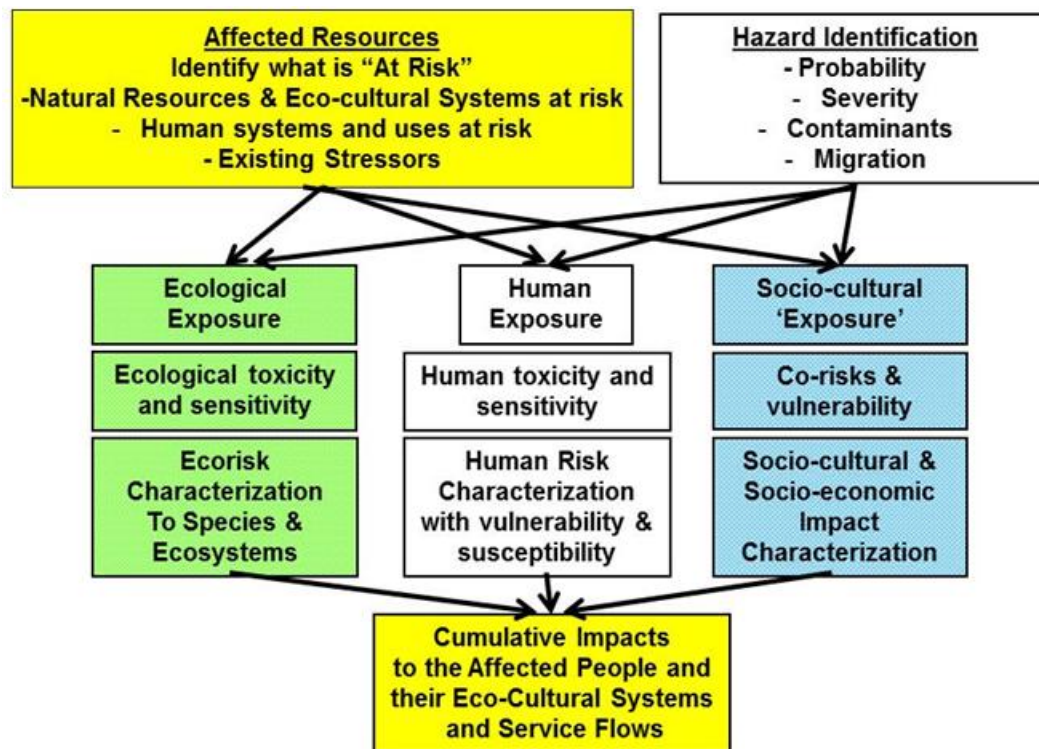
27  
28 In order to clarify section 4, one commenter suggested a small edit in the first paragraph of  
29 Section 4.3. Commenter suggested that the text seems misleading, since racially/culturally diverse  
30 (minority), low-income or indigenous populations are of EJ concern by definition. Commenter  
31 suggested that the text be changed from “*it is important that HHRAAs conducted in support of*

1 *regulatory actions explicitly consider health risks that may disproportionately accrue within*  
2 *minority, low-income or indigenous populations since these demographic attributes may reflect*  
3 *underlying vulnerability and susceptibility to environmental stressors” to “it is important that*  
4 *HHRAs conducted in support of regulatory actions explicitly consider health risks that may*  
5 *disproportionately accrue within minority, low-income or indigenous populations since these*  
6 *demographic attributes define subpopulations of concern for environmental justice.”*

7 The 3rd paragraph of Section 4.3.2.1 was highlighted as needing clarification. The language in the  
8 guidance, “*Similarly, communities with potential EJ concerns may experience differential risks*  
9 *due to higher susceptibility (e.g., due to lifestage or pre-existing health conditions) to the stressor*  
10 *being regulated*” raises a conceptual issue that should be clarified. If you assume that everyone at  
11 some life stage (e.g., prenatal) is more susceptible to a particular stressor that may be regulated,  
12 then if one income/racial/ethnic group has more children than the majority, does that fact by itself  
13 make the stressor an issue for EJ? A suggested clarification for that language is that the stressor is  
14 a concern for people at the relevant life stage. It is important to understand that the characteristics  
15 defining the population as an EJ concern are not necessarily the characteristics that make  
16 individuals more susceptible to the hazard. Rather, an EJ population is regarded as more  
17 vulnerable due to their potential increased exposure to hazards and ensuing health effects.

18  
19 In addition, the issue of co-stressors and the broader identification of what is “at risk” in a  
20 community was highlighted. The willingness to include quality of life or well-being is a matter of  
21 open-mindedness and a term like HIA should be used in order to force some thinking outside the  
22 conventional box. In addition, the SAB panel suggests that the Figure 1 shown below (outlining  
23 an affected resources step prior to hazard identification step and exposure assessment steps, and a  
24 cumulative impacts step after human and ecological risks are evaluated) be blended with Figure  
25 4.2 in the EJTG, in order to demonstrate how HHRA can include co-stressors or co-risk factors.

26  
27  
28  
29 Figure 1  
30



The effects of cumulative exposures should be highlighted as important when assessing the presence of disproportionate impacts in a subpopulation. The EJTG does not indicate how cumulative exposures should be evaluated, quantified, or otherwise considered in an EJ analysis. For example, Sections 4.3.2 (Planning and Scoping) and 4.3.3 (Problem Formulation) are sections where a discussion of cumulative exposures could be included. The SAB panel recommended that the guidance include a consideration of the cumulative environmental health risks faced by low-income and minority populations or, at the very least, provide a detailed explanation for its decision to exclude consideration of cumulative risks. Moreover, the SAB panel noted that EPA should explicitly refer users to any cumulative risk assessment (CRA) guidance it develops. Cumulative HHRA should not be limited to the mode of action and target organ interactions and evaluating multiple chemicals of concern/pathways/media is important to consider in an assessment.

Are the scoping questions outlined in Section 4.3.2.1 appropriate?

1 Getting EJ issues recognized can be difficult, even when minority/ethnic groups are vocal and  
2 well-recognized (specifically, flaws in the community participation aspect that impact  
3 participation from Tribes). Initial demographic and income screens are not adequate in  
4 determining whether an EJ concern exists; for instance, these screens are not appropriate for tribes  
5 and other groups who may experience increased risk due to exposures from subsistence pathways.  
6 Assessors should be required to find out who uses natural resources within the impact area, thus  
7 giving more emphasis on pathways of exposure earlier in the screening assessment, independent  
8 of a formal delineation of the EJ community. This is especially needed when the EJ community is  
9 dispersed or represents only a stratum of the overall population.

10  
11 Should certain scoping questions be prioritized at various stages of the risk assessment  
12 (e.g. exposure, dose-response)?

13 Several SAB panel members suggested that the scoping questions be guided by the circumstance  
14 of the assessment and determined in consultation with the affected populations and stakeholder  
15 workgroups. It was noted that each HHRA is unique based on the situation being assessed, the  
16 regulatory action being considered, the resources and office conducting it and therefore may call  
17 for different priorities in assessing risk.

18  
19 Several SAB panel members felt that the EJTG was inadequate in addressing the exposure  
20 assessment, and highlighted that the exposure assessment is a critical (and difficult) step in the  
21 risk assessment process. Exposure assessment is the one part of the risk assessment model that  
22 may identify or miss disproportionate impacts of a stressors depending on the available data, the  
23 experience of the analyst, and the proper use of tools and methods available to assess exposure.  
24 Also, the EJTG did not provide sufficient guidance to the analyst and more prescribed methods  
25 and sources of information should be included.

26  
27 The EJTG also lacked guidance for identifying an appropriate control population for comparison  
28 to a potential environmental justice community. This will likely lead to inconsistent analyses and  
29 result in flawed assessments of disproportionate risk. The identification of an appropriate control  
30 population is a critical element to the EJ analysis. As a result, the SAB panel recommends that at  
31 least a working model with clear guidance (e.g., including what variables to control for when

selecting comparison populations, how to incorporate quantitative and qualitative differences when selecting a control populations, demographic versus geographical considerations, national versus state versus local data and level of refinement needs) should be included in the EJTG until there are better methods developed in the future.

## Methods for Considering Environmental Justice

### Question 9

***Does Section 5 provide a clear overview of the methods that could be used for considering environmental justice? Are there other methods that should be added to the discussion?***

### Response

For the most part, Section 5 provides a clear *overview* of some methods for use in analyzing EJ.

It offers an overview, not a detailed review, of some methods. In general, the main concern is that the Section 5 does not provide enough detail about the methods that can and, more importantly, should be used. Additional clarity along the lines discussed below is recommended. For the second part of Question 9, there are some other methods that could be used that are not mentioned. This includes HIA and other social science methods (e.g., mixed methods, approaches using qualitative data).

The SAB panel notes that the narrative and glossary in the EJTG lack definitions for *quantitative* and *qualitative* data, which leads to confusion in the examples in Section 5 for the use of the proposed methods. A simple way to define or distinguish them is that *quantitative data* are numerical and *qualitative data* are textual. The EJTG appears to erroneously equate qualitative data with anecdotal evidence. Examples of when an analyst would use qualitative data to answer the research question should be given. This is likely to be when EJ analyses seek to describe processes or to understand people's values, behaviors, motivations, or cultures; although it is worthwhile to note that social science and ethnographic methods can yield numerical data about people's values etc. An outline of the diversity of qualitative data analytic methods would also be useful, see Tesch (2013), pp.72-73.

1 Where restrictions outside the scope of the EJTG constrain the selection of data or methods, these  
2 limitations should be made explicit and the rationale for selecting a particular type of data should  
3 be included. Otherwise, “highest quality and most relevant” data ought to be explicitly favored in  
4 all instances- rather than “latest” data (pp.4, 44). In principle, qualitative methods should not be  
5 favored differently than quantitative methods. EPA should not assume that numerical or statistical  
6 data are always the highest quality and preferred data – they can be precise but inaccurate. At the  
7 other end, textual data can be imprecise but correct or accurate. Analysts should be instructed to  
8 justify their choice of data and analytical methods. However, the exception is if other rules or  
9 feasibility (time, resource constraints within EPA) dictate; otherwise, the EJTG should not pre-  
10 judge the intrinsic superiority of either quantitative or qualitative approaches.<sup>2</sup>

11  
12 More broadly in Section 5, there are important gaps and confusion about evaluating feasibility  
13 and presenting information. For example, the introduction (p.36 in the EJTG) identifies what the  
14 analyst should do “when feasible,” which suggests that the EPA is using a screening process to  
15 determine feasibility of conducting an EJ analysis. The process and the criteria for feasibility are  
16 absent in Section 5 of the EJTG. Footnote 51 (p.42 in the EJTG) references a “screening  
17 analysis” without a full discussion. In addition, Section 5.1 does not discuss how to evaluate the  
18 feasibility of doing an analysis. For a section titled “Evaluating the Feasibility...,” it either needs  
19 to avoid its use of “when feasible” in favor of explaining criteria and process for determining  
20 feasibility or retitle the section to accurately characterize its contents (e.g., “Data and  
21 Methodological Considerations in Assessing Potential EJ Concerns”). This is an appropriate  
22 section to better address several related concerns expressed by the SAB panel, such as: evaluating  
23 feasibility, articulating the research design, and selecting among alternative data sources and  
24 analytic methods.

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25  
2 Whether it is OMB stipulations or other concerns about validity, reliability, and generalizability, qualitative data analysis can meet high quality standards. If done correctly, qualitative approaches can be generalized to a national level or at least *transferred* to other contexts. As is true across all inferential methods, purposeful sampling for cases would be key to the findings being useful in other or broader contexts. Three strategies are employed to assist with transferability: thick description, purposeful sampling and triangulation. Thick description paints a highly detailed picture of the context and boundaries so that the key issues can be discerned for other contexts. Purposeful sampling refers to the many ways of designing a research study with qualitative data, depending on the purpose of the study and the guiding questions. Triangulation is the use of multiple data points to draw conclusions.

Section 5.2 stresses the need for detailed information about the baseline distribution *and* the projected distribution of outcomes (or at least the distribution of regulatory impacts). Most of the bulleted list in Section 5.3 (p.41) refers to information about the baseline. Parallel bullet points about information reporting expectations related to the projected distribution of outcomes should be added. (Additional discussion of this issue appears in response to charge Question 10.)

#### Additional methods

Alternative methods could be identified and evaluated. This includes qualitative and mixed methods approaches. Ideally, the research design could incorporate both qualitative and quantitative approaches, possibly giving analysts feedback on their investigations from the people who are potentially impacted by the rule. A mixed methods approach can promote a critical aspect of EJ- ensuring meaningful involvement.

Additional methods to be added are the use of EJ or “cumulative impacts” screening tools or methods. One such tool, EJScreen, under development by EPA, is mentioned once in the EJTG, but there are many other efforts that represent the varying approaches, data types, analytical methods, and scoring/weighting systems and rationale that could be useful to analysts. The public comments also mentioned this and listed several other screening approaches that should be included in the EJTG (e.g., Cal-EPA’s EnviroScreen).

Including a table that presents alternative analytical methods along with examples (citations) of where they have been applied effectively, key assumptions embedded in the approaches, and evaluations of their strengths and weaknesses will also be helpful.

## Impacts of Analytical Considerations

### Question 10

*Section 5.4 discusses analytical considerations that may have a significant impact on results.*

*Are these considerations appropriate for assessing EJ in the context of a regulation? Are there considerations that should be added/removed from the discussion?*



## Response

SAB panel members agreed that these considerations are relevant for conducting and EJ analysis, and there are more considerations that are important to add to the discussion.

Section 5.4 in particular could benefit from a table or matrix of “best practices”. This should also include information about prior use and identifying some advantages and disadvantages of each or noting where their application is most appropriate. Likewise, the whole of Section 5 would be more useful if the key research design elements in EJ analyses were clarified. Conducting an empirical, prospective EJ analysis of EPA rules inevitably entails several major components, including: (1) defining the “metric of interest” or dependent variable, (2) defining the comparison group, (3) identifying the counterfactual distributions, (4) defining the scope of the analysis, and (5) spatially identifying and aggregating effects. Section 5.4 discusses only (2), (4), and (5), and its discussion of the scope (Section 5.4.2) is limited, as noted below. In addition, the EJTG could benefit from a richer, more detailed and more prescriptive discussion of each of these crucial points in order to better guide analysts.

### Defining metrics of interest.

Selecting the metrics to assess EJ concerns is a critical component of any EJ analysis. Section 5.2 makes two bold and restrictive statements in this regard. These statements are hidden in an overall confusing explanation in Section 5.2. First, it notes that analysts need to characterize both the pre- and the post-regulation distribution of environmental quality (or, equivalently, a baseline distribution and a distribution of changes in environmental quality). The argument is that knowing just the distribution of the change in environmental quality ( $\Delta E$ ) owing to the rule is insufficient for an EJ analysis. The EJTG can be improved by stating that a useful EJ analysis could still be done if only the distribution of  $\Delta E$  is known. It might not be ideal, but reasonable quantitative and qualitative EJ analyses have been based on just  $\Delta E$  before, and it would be unfortunate if the absence of baseline distributional information is used to prevent an analysis of the distribution of  $\Delta E$ .

1 The reality is that the EJ discourse has not settled on a single metric (e.g., distribution of  $\Delta E$  or  
2 change in distribution of  $\Delta E$ ). While an EJTG that prescribes a single conceptual measure takes  
3 away discretion from future analysts, it also implies potentially objectionable policy priorities by  
4 any such measure.<sup>3</sup> The choice in the metric might implicitly target policy to equalize pollution  
5 levels or environmental risks across groups or to equalize gross *or* relative environmental  
6 improvements across groups. Noonan (2008) argues for less ambiguity in defining the metric of  
7 interest. The EJTG's assertion that EJ analyses should assess convergence in the distribution of  
8 environmental quality or stressors rather than equity in the distribution of  $\Delta E$  goes a long (and  
9 controversial) way to taking a policy stand here. More prescription about measuring  
10 environmental impacts, in particular whether analysts should be measuring in relative (as rates or  
11 per capita) or gross terms, would help.<sup>4</sup> The results of an EJ analysis can differ significantly  
12 depending on the use of a maximum individual risk (MIR) or a population risk measure (Turaga  
13 *et al.* 2011). If the EJTG is not meant to implicitly define what "justice" looks like through its  
14 prescriptions for analysts, the EJTG should encourage sensitivity analyses across alternative  
15 metrics or inclusion of stakeholders early in the analytical process to determine the most relevant  
16 metric(s).

#### 17 18 Defining comparison groups.

19 The description of comparison groups (Section 5.4.2) should be clarified. If the objective of EJ  
20 analysis is to compare environmental conditions (exposure/risk/etc.) for EJ groups identified on  
21 the basis of income/race/ethnicity/other, then the relevant comparison group for each EJ group  
22 would be the population that is as similar as possible, but lacking the characteristic defining the  
23 group as of EJ concern.

24 An important question is on what variables this similarity is based. Clearer and better guidance in  
25 Section 5.4.2 is needed. Race/ethnicity, family income, and other (permanent) characteristics can  
26 affect an individual over their entire lifetime, contributing in various ways to their current

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3 For instance, the example on p.40 seems to imply that a policy that had only a 5% reduction in asthma cases for minorities and a 10% reduction for others might not appear unjust if the baseline incidence rate for minorities was more than double that of others. Regardless, a metric consistent with dispersing new pollution sources would not be seen as "just" by some.

4 The language on p.40 should be revisited to ensure consistency with evaluating the rate of incidence rather than number of cases.

1 situation. One possibility is to select a population ‘as similar as possible’ before the birth lottery is  
2 resolved (i.e., the uncertainty about who one’s parents will be), in which case the comparator  
3 would be the general population excluding those that are of EJ interest. Other approaches –  
4 especially when the defining EJ characteristic is something that individuals have some discretion  
5 over (e.g., region of residence, religion, education)<sup>5</sup>– might imply many other controls or  
6 alternative research (e.g., quasi-experimental) designs in order to identify the proper comparison  
7 group. Recognizing alternative explanations for unequal baseline (and potentially future)  
8 distributions, the use of multivariate statistical analysis to control for these factors offers the  
9 analyst considerable latitude to implicitly define a comparison group (insofar as the findings are  
10 then conditional on the covariates). This is particularly important in many EJ analyses, where  
11 common EJ group characteristics like race and income or subsistence lifestyles are highly  
12 correlated. EJ studies in the literature employ an inconsistent variety of conditioning variables,  
13 sometimes including both race and income. These various controls not only affect the findings,  
14 they often implicitly define the comparison groups. The EJTG should promote more transparency  
15 and consistency. The EJTG should give clearer instruction to analysts faced with choices over  
16 which control variables to employ that implicitly define the control group.

17  
18 Section 5.4.2 also presents an argument based on differing ideas presented by two researchers in  
19 published articles; this disagreement has been discussed elsewhere in the EJ research literature.  
20 The EJTG recommends that the analyst conduct a sensitivity analysis in this case, as if marginal  
21 differences in geographic extent are a principal determinant in error or bias for the results. In  
22 work subsequent to the articles cited in the EJTG, this argument has been resolved using a better  
23 analytical approach and should be cited instead of those detailing the competing points of view,  
24 and would serve as a much better source of information for analysts seeking appropriate

---

<sup>5</sup>Tribes will argue that their birth into a tribe determines location and religion – tribal members cannot move from their homeland, and dislocation causes immense harm (e.g., Trail of Tears). Religion is also often seen as immutable. Education might seem to be a matter of choice, but not so much in poor communities. For example, the Creator gave tribes particular natural resources in their home regions, and partaking of those foods is a requirement of natural law (religion). So, tribal members may knowingly eat contaminated fish because that is the food the Creator gave them. They do not see that they have a choice, although they might reduce the amount of fish they feed their children. Someone has to continue the First Foods consumption, and adults may accept the burden of eating contaminated foods on behalf of the tribe.

1 methodological direction on this issue. The two papers that best detail this approach are Mohai  
2 and Saha (2006, 2007).

3  
4 Identifying counterfactual distributions.

5 As presented on page 40 of the EJTG, in order to assess the “differences in the baseline incidence  
6 [of environmental harms or risks] and determine if the distribution increases or decreases  
7 differences” some information is required about:

- 8 • the *baseline* (pre-regulation) environmental conditions for the EJ group and for a  
9 comparison group;
- 10 • the *counterfactual* (projected-yet-absent regulation) environmental conditions for the EJ  
11 group and for a comparison group; and
- 12 • the *projected* (post-regulation) environmental conditions for the EJ group and for a  
13 comparison group.

14 In principle, this presents no less than six different distributions. The counterfactual and the  
15 projected distributions need to be known or assumed in order to identify the rule’s impact. The  
16 baseline distribution (per p.40 of the EJTG) needs to be known to fully assess the justice of that  
17 impact. EJ assessments will typically require comparing distributions between at least two groups  
18 for each of those scenarios (baseline, counterfactual, projected). In practice, the analysis may be  
19 much simpler, perhaps because the baseline and counterfactual distributions are assumed to be the  
20 same. (The “baseline” definition in the Glossary (p.54) confuses matters by defining the baseline  
21 as both the status quo and as the counterfactual.) In practice, even if other regulatory analyses for  
22 the rule define these scenarios, the EJTG should direct the analyst to be transparent about how the  
23 *differences across groups* are identified for each scenario in the EJ analysis.

24  
25 Defining the scope of analysis.

26 This section simply mentions the possibility that rules may require EJ analyses at a sub-national  
27 level. Because the result of an analysis of difference in impact is significantly affected by the  
28 selection of geographic extent (e.g., Baden *et al.* 2007), the analyst should make certain that the  
29 specific scope selected for analysis is policy-relevant or rule-relevant. If there is not clear  
30 guidance as to scope from the rule, sensitivity analysis would be appropriate to identify the impact

on the results of any “boundary effect” – this should be also discussed in 5.4.2 and added as a recommendation.

Section 5.4.2 should also be expanded to explicitly address *temporal* scope. This is partly wrapped up in decisions about identifying counterfactuals (how things would be in the absence of the rule) and how far into the future to project post-rule. Regardless, analysts should have clear guidance on where to place temporal bounds in the analysis. Such bounding implicitly defines what sort of behavioral responses to regulations are included in the analysis (e.g., reducing emissions, switching technologies, averting behavior and defensive investments, relocation of polluting activities or receptors/residences), which are likely consequential for results of EJ analyses. EJ analysts should be given more guidance and less discretion here. Insofar as the rule’s RIA prescribes the temporal boundaries for analysis (per Section 5.2, p.40), EJ analysts should be invited to report on the likely implications of the bounding choice.

Spatially identifying and aggregating effects.

The wording of this section does not provide clear guidance to analysts with regard to resolving differences in spatial resolution between two or more geospatial datasets, in particular on how to avoid two classic “bad geospatial practices” in this regard: ecological fallacy (impact of spatial resolution on conclusions one can accurately draw) and the modifiable areal unit problem (source of bias that can impact statistical tests if data are aggregated incorrectly). A list of best geospatial practices could be added to the EJTG to provide guidance on these issues.

Further, the EJTG could usefully provide guidance on data sources by expressing a preference for certain types of data – notably individual-level data (rather than spatial aggregates) and exposure data (rather than crude proxies and buffers-around-sources). Some of these issues appear in Text Box 5.3, where a presumption of aggregated data remains even in the “data rich” context, but guidance on ecological fallacy and aggregating effects belongs in Section 5.4.3.<sup>6</sup>

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<sup>6</sup> The preference for finer-scale data (p.43) should be tempered and guided by context. Finer resolution allows detection of more and smaller hotspots, but does not imply better measures of exposure. Highly resolved environmental quality data puts more pressure on data describing where and when receptors (people) are. Eventually groupings can get small enough that inequities in risk become inevitable.

This section also suggests analysts use buffer circles in a GIS to select and aggregate census-related data, often called a “cross-walking” procedure, but does not include the various ways that this can be done. These include: selecting tracts that intersect the buffer circle, selecting tracts with centroids (or geographic center, depending on which is used by the analyst) captured by the buffer circle, or using the geo-processing capability of the GIS to actually intersect the buffer circle with the tract polygon, and transferring attributes from tracts to the buffer area using area-weighting or population-weighting. All of these methods have been used in the EJ research literature, and all carry assumptions that need to be acknowledged by the analyst and the specific method selected that is most appropriate to the analysis that is being conducted.<sup>7</sup>

#### Other Comments

Section 5.4.4 describes instances where interpreting a geographic pattern can be difficult because many metrics are correlated, and the relative role or strength of various determinants is not known. The EJTG notes “regression techniques are able to partially control for these factors,” but offers the analyst no specific direction. The EJTG could usefully cite research here, which the analyst could use to examine how other researchers have approached this problem using various multivariate techniques (e.g., Pastor, Morello-Frosch, and Sadd (2006); Pastor, Sadd, and Morello-Frosch (2004a, 2004b, 2005); Pastor, Sadd, and Hipp (2001); Sadd, Pastor, Boer, and Snyder (1999); Boer, Pastor, Sadd, and Snyder (1997)). These works also include citations to work by others that could be included in the EJTG, as well.

## Analysis of the Distribution of Costs

### Question 11

**Is there sufficient guidance on when and how to conduct an analysis of the distribution of costs? Is the guidance associated with distribution of costs appropriate?**

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<sup>7</sup> As the GIS of choice for federal agencies is the ESRI, Inc. software suite, a good summary review can be found in the ArcGIS help files:

[http://resources.esri.com/help/9.3/arcgisengine/java/gp\\_toolref/geoprocessing/proximity\\_analysis.htm](http://resources.esri.com/help/9.3/arcgisengine/java/gp_toolref/geoprocessing/proximity_analysis.htm)

## Response

The SAB panel does not agree that there is sufficient or appropriate guidance on when and how to conduct an analysis of the distribution of costs. The SAB panel noted two different potential ways to address these shortcomings.

In the first approach, SAB panel members suggest that the costs would not be addressed in the EJTG. The solution to the problem of inadequate guidance on costs is to be clearer about the conscribed nature of the EJTG and point to other sources/parts of the process for a discussion on costs. Three separate arguments that were put forth suggest this approach.

First, the distribution of costs is collected and analyzed in other parts of the regulatory development process and thus to include them here is unnecessarily duplicative. Second, EJ is about disproportionate impacts to health (or exposure to environmental stressors), and not about total well-being.<sup>8</sup> This interpretation can be justified by the view that health (or a clean environment) is a merited outcome, and everyone should experience at least some minimum benefit. Under this definition, it may be inappropriate to consider costs. Furthermore, particular concerns were raised that consideration of costs could be used as an argument against protecting the health of particular EJ communities. One dimension of this concern is the potential that in traditional cost-benefit approaches, measures of benefits utilizing a willingness to pay metric will lead to low benefit measures due to the lower ability to pay in EJ communities. Finally, the discussions regarding how to fix the guidance on costs highlighted the complexities involved in providing guidance on costs. Many of these issues are addressed below.

One potential response to these concerns would be a determination that it is beyond the scope of the EJTG to adequately address these concerns. The second approach proposed by the SAB panel is to expand the treatment of costs in the EJTG. There is a consensus that there is a lack of sufficient guidance on when and how to conduct an analysis of the distribution of costs. Section 5.5.1 states that the need to undertake an exploration of the distribution of costs should be

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<sup>8</sup>In indigenous communities, personal and community health are inseparable from environmental quality, culture, and many other factors (Donatuto, 2011)

1 assessed on a ‘case by case’ basis, and then proceeds to give examples of when such an analysis is  
2 warranted based on characteristics of the case or assumptions about the effect of a rule. This  
3 section also states that ‘Data or methods may not exist to fully examine the distributional  
4 implications of costs across population groups of concern.’ In this second case, the reader gets the  
5 impression that ‘difficult to perform an analysis’ is the sufficient condition for ‘unnecessary to  
6 perform an analysis.’

7  
8 While it is entirely possible that data constraints may prevent a serious analysis of cost  
9 distributions in many instances, feasibility is a different rationale than relevance or  
10 appropriateness. The sentence in the middle of page 51 that notes cost analyses are not always  
11 necessary, combined with its footnote (58) misleads, because it confuses necessity with difficulty  
12 in measurement and infeasibility. Adding further confusion, the following sentence implies that  
13 considering cost distributions might not be necessary because they are evenly distributed. An  
14 analyst would get better guidance if the entire paragraph up to the word “Whether” were deleted.  
15 Better still, the EJTG should more clearly identify when cost analyses are appropriate.

16  
17 Specific suggestions regarding the question of when to conduct a cost analysis include the  
18 following:

- 19 • Where analyses are omitted, the analyst should be required to document the basis for the  
20 exclusion. Specifically, was the exclusion the result of a qualitative or quantitative determination  
21 based on attributes of the rule or its assumed effects, or was it based on the lack of relevant data  
22 or methods?
- 23 • The EJTG lists examples of cases where consideration of the distribution of costs is  
24 warranted, including: “...costs to consumers may be concentrated among particular types of  
25 households such that they impose a noticeable burden...; identifiable plant closures or relocation  
26 of facilities; or behavioral changes in response to a rule or regulation.” This list is helpful, but it  
27 exemplifies the need to have more examples and case studies available for analysts. The list does  
28 not provide enough context/rationale to guide (potentially) similar analyses.
- 29 • Under Section 5.5.2 (Other Impacts), in providing guidance on estimating non-health  
30 endpoints the analyst is instructed: “When data are available, analysts should use them in the



evaluation.” This is another example where if the analyst can propose scenarios where non-health endpoints may be important, but data availability is a limitation, which prevents or limits analysis, the analyst should be instructed to note this limitation.

With regard to whether the guidance associated with distribution of costs is appropriate, the SAB panel identified several areas that need further clarification. One key set of concerns relate to issues of scope and the types of responses and/or adjustments that will be accounted for in the analysis. Issues can be categorized into two main areas: short run versus long run analysis and general versus partial equilibrium analysis.

#### Short Run versus Long Run Analysis

What time frame should be used in cost analyses? This is important because the distributional effects can change over time. As an example, consider the distribution of costs associated with the requirement for additional pollution controls on automobiles. Such regulatory changes cause the cost of cars to go up. This burden initially falls on higher income individuals (who buy cars more rapidly) over time, lower income people will possibly buy new cars, or experience a cost as, in the long-run, the price impacts in the new car market spill over into the used car market. Thus, this type of policy will likely become more regressive over time. Obviously there are lots of examples of this sort that can be used.

Conversely, what about regulations that impose upfront costs on consumers that are "paid back" over time? A simple case is a policy that required the purchase of Low Carbon/High Efficiency appliances. There would be potentially large upfront costs, but likely long-run savings. The time component and personal behavior/choice are important here.

#### General versus Partial Equilibrium Analysis

In general, an accurate accounting of the distributional cost impacts of a policy will require a general equilibrium analysis. The EJTG should provide guidance on if and when a partial vs. general equilibrium analysis will be required. Another way to look at this issue is in terms of what

set of costs should be considered. Should only first order costs be considered? Should second order costs also be considered, and the costs to whom? It would be helpful if this section of the guidance could highlight what other considerations are important to EJ analyses (e.g., those particularly likely to arise in assessing cost) and to define the scope or put some bounds on what the (cost) analyses should consider. One possible suggestion is that direct consumer costs would be appropriate for EJ analyses but the general equilibrium or second-order (cost) effects would not be expected to be covered by an EJ analysis. Factors such as compliance, averting behavior and precision/range of estimates also need to be addressed. For example, should analysts assume complete compliance? If not, how should this be reflected in the analysis? How should analysts address the potential role of averting behavior? If a policy induces a change in behavior -- where and how does that get taken into account? A related issue is the treatment of adjustment costs. How should they be accounted? Furthermore, the EJTG should provide guidance on how to characterize the uncertainty inherent in cost estimates.

## **Key Methodological or Data Gaps**

### **Question 12**

*What are the key methodological or data gaps specific to considering EJ in regulatory analysis? Which factors should be prioritized in the near-term to improve how EPA considers potential EJ concerns in regulatory analyses?*

### **Response**

The EPA Core writing team led by the Office of Environmental Justice, Office of Policy, and Office of Research and Development has done an excellent job surveying and querying EPA personnel and the interested public on methodological and research gaps and needs in the EJ area. The team identified long and short-term research priorities among various EPA offices and regions that they presented in Tables 1 and 2, respectively. SAB panel members have identified research planning, staffing needs, data gaps, and methodological needs in this section, which can strengthen the EJTG.

1 Research Planning

2 To a significant degree gaps noted by the public reflect the research gaps and priorities expressed  
3 by agency personnel. These include, better distribution of air monitoring locations, use of  
4 cumulative impact assessments, use of appropriate data sources and maintenance of privacy, more  
5 complete demographic information, identification of non-chemical stressors, and the use of  
6 qualitative data in an appropriate manner.

7  
8 In examining these gaps, the SAB panel noted that the short-term and long-term needs expressed  
9 are quite similar, suggesting the need for a greater degree of strategic thinking on longer-term  
10 priorities. There is a danger that without careful alignment of immediate needs and longer-term  
11 aims, there may be considerable misdirection in research that may require frequent readjustment  
12 of objectives and scope. One approach, common in the ORD community, is to differentiate  
13 between short-term “outputs” and longer-term “outcomes,” the latter providing guidance as the  
14 results of short-term projects become available. Only the “framework for using available data” in  
15 Table 12-2 appears to address this need (without further explanation), while other long-term  
16 priorities mimic those presented as short-term. Longer-term priorities that could emerge might  
17 come about through work with other agencies that are concerned with demographic and  
18 behavioral trends (Labor, Commerce, Homeland Security), and agencies that address long-term  
19 human and ecological health needs (NIH, Health and Human Services, Food and Drug  
20 Administration, Center for Disease Control). For example, The FDA’s Office of New Drugs has a  
21 wealth of experience with drawing conclusions from limited sample size and quantifying differing  
22 reaction to an agent according to race or ethnicity. A “brainstorming” session with appropriate  
23 staff members in these agencies might reveal protocols, practices and reference materials valuable  
24 to the ORD/risk assessment staff developing cumulative risk and impact guidance. Similarly, the  
25 CDC’s expertise in biomonitoring might be used to better assess community exposures.

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Table 1

GENERAL RESEARCH PRIORITIES—TOP 5 SHORT TERM PRIORITIES (DRAFT)	Offices identifying priority
Analysis: chemical and non-chemical stressors, Cumulative effects, behavioral effects, costs, health impacts	OAR; OCHP; OCSPP; OP; OW; Regions
Data gaps: chemical and non-chemical stressors, cultural, product use, workplace characteristics, finer resolution air quality data	OAR; OCHP; OCSPP; OEJ; OP; OW; REGIONS
Review of criteria used to characterize EJ communities	OAR; OCSPP; OW
Methodology: distribution of risk, receptor approach, different types of rules, and validity of assumptions in BCA	OAR; OCSPP; OEJ; OSWER; OW
Improve tools: behavioral responses, combined risk including non-chemical stressors, IRIS for system specific endpoints.	ORD; OSWER

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Table 2

GENERAL RESEARCH PRIORITIES—TOP 5 LONG TERM PRIORITIES (DRAFT)	Offices identifying priority
Data gaps: chemical, non-chemical, cultural, product use, demographic characteristics, health outcomes, group dose response, workplace characteristics, finer resolution air quality data, new environmental burdens	OAR;OCHP;OCSPP; OEJ;OW
Analysis: consistent analytical approach, other routes of exposure, health indicators	OAR;OCSPP;OW;REGIONS
Framework, guidelines for using available data	OCSPP
Methodology: standardization of metrics, differential burdens, disaggregating BCA for EJ analysis	OAR;OCHP; OEJ; OP;ORD;OW; REGIONS
Improve tools: for policy makers, vulnerability by lifestage, characterizing vulnerable communities.	OAR;ORD

## STAFFING NEEDS

The SAB panel expressed some concern that the EPA may not have the full complement of expertise among its research scientists to fully address EJ needs and priorities. To a significant extent the agency relies on its cadre of economists (behavioral economists) to discern complex human behaviors. While this is certainly a valid approach, insights from the learning, sociological, anthropological and psychological science communities might also provide complimentary expertise that could result in new methods of data management and interpretation, and more robust ways of treating uncertainty. This is especially the case as long-term trends are considered. Recruitment of appropriately trained postdoctoral researchers, temporary inter-agency transfers, community-based participatory researchers, and creative use of the STAR research program would assist in meeting short-term personnel needs. Regarding the latter, a well-structured set of EJ-focused research areas might bring new thinking into the agency, and result in a greater array of information with which to work.

## Data Needs

During the SAB panel's meetings, there were frequent concerns expressed by agency personnel that data extent, quality, and availability were often insufficient to carry out the EJ mission—i.e., the agency is “data poor.” While this may be the case in some instances, for example the locations and numbers of air quality monitoring stations or low dose exposures and their impact as contributors and drivers of risk, the SAB panel is concerned that other data sources and methods of analysis are being overlooked or not fully integrated into analyses. Structure-activity relationships (QSAR), Relative Potency Factor, and EPA's NexGen methods can all be used to fill in data gaps. In addition, the investigation of EJ issues requires examining the problem both from the behavioral and social equity perspectives and the environmental risk perspective. Making use of surrogate and metadata, and the application of advanced methods of cyber-analysis (data mining, ontological matching, and disambiguation) to build more robust and useful data sets are ways of transforming a “data poor” problem into one which is “data rich.”

The SAB panel devoted considerable time to issues related to data sufficiency, accuracy, and appropriateness, particularly for the detection of EJ-relevant “hotspots.” An important aspect of

this involves using more, optimized monitoring locations, models that better incorporate the implications of monitoring locations, and techniques for better integrating dispersion models for areas not directly monitored. Better (and more accessible) techniques for including model errors into EJ analyses (which typically use questionable proxies for environmental quality or risks at a particular location without formally accounting for error in that measurement) would help. Even basic data indicating the spatial extent of regulated hazards could bring substantial improvements.

Beyond better characterizations of pollutant levels in space and time, a concomitant concern is better characterization of pollutant receptors in space and time. The convenience of Census data, and the new limitations brought on by the shift to ACS data with less granular geographic range, bring with it important limitations in assessing actual exposure. The SAB panel notes that improving the spatial precision in measuring risks should not come at the expense of improved temporal precision and a better understanding of how this contributes to the overall goal of improving the characterization of exposure. Accordingly, EPA should invest seriously in research to better understand actual exposure, i.e. reflective of how receptors actually behave, rather than reliance on standard models of fixed behavior. Shifting empirical analyses to aggregate units (e.g., Census tracts) and relying on location of residence (rather than areas spent outdoors or using indoor and workplace risks) departs from unbiased estimates of actual exposure and adds to the uncertainty associated with the analysis. Technologies, such as, the incorporation of cell phone tracer data (anonymously) could add an element of mobility to risk analyses that is currently lacking. Similarly, the Longitudinal Employer Household Dynamics program holds great promise for improving spatial and temporal precision in measuring receptors' location and travel habits. Efforts to make use of this information – and to promote more researchers' access to the data for these purposes should be encouraged. Additionally, while better use of geospatial and spatial econometric models is needed, the EPA might facilitate the ease with which analysts can employ such models. Making spatio-temporal models easier to access, especially those with limited dependent variables would help greatly.

The SAB panel also recommends that group-specific estimates of dose-response relationships, as well as estimates of workplace and indoor exposures be improved. The standardization of the use

of the block group level census for demographics and as the spatial unit of analysis; as well as the comparison of environmental stressors and their impacts at 1 and 3 kilometer radii for proximity analyses will enhance the rigor and the quality of EJ analyses. TRI data, commonly used in EJ analyses, could be released in ways that include more information about the data itself (e.g., when releases are estimated or measured) and in ways to allow more “accurate” use of the data. Its ubiquity and ease-of-use also leads to misuse, and EPA can do more to improve how it is used. Efforts to better model “hotspots of pollutant receptors” should parallel better models of pollutant hotspots (i.e., Does more precise identification of pollutant hotspots increase or decrease the bias in estimated exposure?).

Because the field of EJ is fairly dynamic, it would be useful to develop a repository of relevant empirical methods and analytical toolkits, as well as, geospatial/temporal data, including environmental and psychosocial stressors, facilities, and demographics relative to impacts. Such a repository should include those which have been created by and maintained by other agencies or stakeholders. The repository would be expected to grow with the field and facilitate more and better analyses, including external review of EPA actions. Each EJ analysis can also be used to identify data needs for this repository, if analysts are required to document the data gaps and uncertainties which shaped their analysis.

#### Methodological Needs

The SAB panel strongly encourages the EPA to work toward the incorporation of cumulative impacts and multiple facility proximity in its analyses of its proposed rules and regulations as they pertain to environmental justice and identification of disproportionate impact. The SAB panel understands the challenges posed by cumulative assessments, and understands that, practically speaking, a complete and robust assessment might not be feasible until further methods and tools are developed and data become available. However, examples of cumulative health impact assessments, an alternative to traditional risk assessments that takes into account both quantitative and qualitative data continue to be documented (Dannenberg *et al.* 2008). Further, with current knowledge and methods available, a trained practitioner should be able to identify limitations in



their analysis and consider characterizing (both quantitatively and qualitatively) the degree of uncertainty introduced short of a complete impact assessment.

While understanding the need for national level guidance for EJ methodologies, the SAB panel noted that state, local, and community level data and assistance is essential for an accurate EJ analysis. In addition, it might become necessary in many cases to engage community leaders, EPA regional offices, and others in dialogue to fully understand what information they can contribute to the analysis and what exposure or other concerns a community might have. For example, it isn't clear that proposed methodologies are adequate for evaluating subsistence communities (whether tribal or other rural populations) where dietary needs are met largely through hunting and fishing activities. To this end, the panel recommends adopting one of the suggestions made in the public comments regarding funding pilot projects with states, locals, and communities to develop and test mechanisms for sharing data and information and engaging communities in order to inform an EJ analysis. Section 4.3.2.3 of the EJTG should include a specific recommendation of early, thorough, and culturally and linguistically competent community involvement in order to identify and address relevant data gaps.

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**Appendix A*****Table: Select Evidence of Federal Actions' Unequal Impacts***

<b>Authors</b>	<b>Regulatory/ issue context</b>	<b>Research question</b>	<b>Finding</b>
<b>Gianessi et al. (1979)</b>	Clean Air Act	Do uniform CAA standards yield uniform results?	No. The poor appear to gain the most.
<b>Hird (1990)</b>	CERCLA	Is the cleanup pace or spending at NPL sites correlated with neighborhood income?	Neither.
<b>Hamilton (1993)</b>	hazardous waste processing facilities	Did the post-CERCLA regulatory regime change siting of hazardous waste facilities	No longer drawn to counties with more minorities; collective action explained more
<b>Gupta et al. (1996)</b>	CERCLA cleanup decisions	Do demographics affect EPA remedial decisions?	No. Permanent remedies were not favored different in minority or poor areas.
<b>Sigman (2001)</b>	CERCLA	Do demographics affect listing, cleanup pace?	Somewhat. Community income affects pace; progress is faster with more Hispanics.
<b>O'Neil (2007)</b>	CERCLA (listing on NPL)	Do neighborhood demographics predict the likelihood of a proposed site getting listed to the NPL? Did EO 12898 increase equitability of Superfund program?	Proposed sites in poor and minority tracts are less likely to be listed. Post-EO, sites in minority tracts are even less likely to be listed.
<b>Daley (2007)</b>	CERCLA cleanup decisions	Does EPA supporting local citizen groups affect remedial decisions?	Yes. Forming CAGs and TAGs leads to more health-protective clean-up approaches.
<b>Noonan (2008)</b>	CERCLA cleanup progress	Does neighborhood race or income predict NPL deletions?	Deletions uncorrelated with race, less likely in wealthier areas.
<b>Shimshack and Ward (2010)</b>	mercury advisories in fish	Did advisories alter consumption? Differently for different groups?	Fish consumption fell, even for groups not at risk
<b>Baryshnikova (2010)</b>	air emissions at pulp & paper mills	Does regulatory pressure yield inequitable impacts on plant abatement	Children and high-school dropouts enjoy less abatement; no difference for minorities and poor
<b>Ringquist (2011)</b>	Clean Air Act	Does the SO <sub>2</sub> trading regime transfer pollution to minority communities?	No. Minority communities received fewer imports.

**Science Advisory Board (SAB) Draft Report (6/27/14) to Assist Meeting Deliberations - Do not Cite or Quote**

This draft is a work in progress, does not reflect consensus advice or recommendations, has not been reviewed or approved by the chartered SAB, and does not represent EPA policy.

**Bibliography for Appendix A**

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## Appendix B

### Additional Recommended Edits

The SAB panel suggests the following edits of the five steps in section 1 (our suggestions are italicized):

- “Assess exposure, relevant health and environmental outcomes, and other relevant effects *separately by population group and within each population group* in the baseline, *including the extent of uncertainty in the data and how that uncertainty impacts the results.*
- Assess differences in these exposures, relevant health and environmental outcomes, and other relevant effects *separately by population group and within each population group* in the baseline *for the most recent decade and in the local community (e.g., 1, 3 and 5 mile radius) at highest risk. Include an assessment of the quality of the data, and uncertainties that impact the results.*
- Assess exposure, relevant health and environmental outcomes, and other relevant effects *separately by population group for each option, including the extent of uncertainty in the data and how that uncertainty impacts the results.*
- Assess differences in these exposures, relevant health and environmental outcomes, and other relevant effects across population groups for each option, *for the next decade and in the local community (e.g., 1, 3 and 5 mile radius) at highest risk. Include an assessment of the quality of the data, and uncertainties that impact the results.*
- Assess how estimated differences in these exposures, relevant health and environmental outcome and other relevant effects across population groups increase or decrease as a result of each option compared to the baseline. *Include an assessment of the key variables that account for these differences and an assessment of the quality of the data for these key drivers. If these drivers are pronounced in particular types of places, indicate the kinds of locations, and if they appear at varying times, indicate how soon we might expect to see evidence of their effects.”*

The SAB panel suggests the following edits to improve section 2:

- Change the title to “Defining Differential Impacts.”
- Para 1, Cut after ...policies, programs and activities.”
- Cut Text Box 2.2
- Para 2, Cut after ...implement the Executive Order and also the three bullet points.
- Para 3, Cut first sentence.
- Para 3, Change sentence 2 to ...whether there are differential impacts.
- Para 3, before “Examples of the kinds...” insert “The decision makers will use this to determine if the differences are disproportionate and require agency action.
- Cut the last two paragraphs.

**Other points of clarification for section 5:**

- Text box 5.1 is not a good example of qualitative analysis. It is essentially an example of using secondary data. What this is a good example of is unclear to the reader.
- Change the word “statistics” to “data” on p.42.
- A new passage in Section 5.3.1 on presenting qualitative data summaries should be added.
- The emphasis on statistical significance (p.48 and Section 5.4.4) directs attention to analytical precision without sufficient attention to accuracy and bias. This should be emphasized more. The third and fourth concerns in Section 5.4.4 (i.e., non-socioeconomic factors that may have influenced stressor source location and using distance as a proxy for exposure), is simply too limited in appreciating sources of bias and in understanding the complexity using control variables in multivariate analyses in implicitly defining counterfactuals. Incorporation of co-stressor information should be encouraged.
- The italicized recommendation (p.44 and p.4) should instead say that ‘Analysts should follow best practices appropriate to the question at hand. If infeasible, explain.’
- As Section 5.3 indicates baseline health data, the EJTG should also incorporate other triggers (e.g., for asthma) and co-stressors. This includes incorporating background pollutant concentrations and other potential confounders like indoor pollution concentrations (especially insofar as they co-vary with expected regulatory impacts).



- 1       • The EJTG should instruct analysts to provide qualitative and quantitative characterizations  
2       of the data used in the analysis, including how pollutants effects arise and margins of  
3       safety. Analysts should be advised to provide qualitative or quantitative characterizations  
4       of the (differential) effect sizes identified in their analysis.
- 5       • The title for Section 5.3 refers to methods to assess EJ concerns, yet frequently refers to  
6       *presenting* information (which is not the same as *assessing*). Semantic clarity here would  
7       help. Further, Section 5.3.2.1 poses Visual Displays as an analytic method, yet it is not.  
8       This important subsection should be relocated.
- 9       • See the Appendix A for a summary table and a list of peer-reviewed, empirical EJ studies  
10      of EPA's actions. EPA staffers requested such a list. Some of these studies might prove  
11      useful citations in the EJTG as examples of useful approaches. It is a very limited  
12      literature that accomplishes what EJTG directs analysts to do. (The list would grow  
13      substantially larger if state and local rules were included.)

14  
15 **Additional points of clarification for section 5:**

- 16      • The issue of spatial autocorrelation in inferential statistics is common and important to EJ  
17      analyses, and it should be elaborated upon in Section 5.4.4 (rather than relegated to  
18      footnote 56). The EJTG should include more complete explanations and guidance on how  
19      to test for spatial autocorrelation, as well as guidance on how to properly work with  
20      spatially auto-correlated data to accomplish reliable statistical measures.
- 21      • Sensitivity analyses should be emphasized more. They should be done for all key  
22      assumptions. (The "when feasible" qualification is not needed on p.4 and p.44.) This is  
23      true generally, and not just a matter of Summary Statistics (p.44) and should not be limited  
24      to demographic data resolution (p.44) or comparison group definitions (p.49). For  
25      instance, distances and buffers for proximity-based analyses typically merit sensitivity  
26      analyses consistent with underlying uncertainty in the model. Analysts should document  
27      why sensitivity analyses were not performed.
- 28      • Analysts should be guided to characterize uncertainties, especially sampling and modeling  
29      uncertainties that might affect findings. EJ analyses should not portray exposures or  
30      population data as known with certainty when substantial uncertainty exists.

- 1       • An analytical consideration worth mentioning in Section 5.4 is non-environmental and  
2       non-health related impacts of EPA rules. This could include accounting for impacts on  
3       cultural practices or resources with particularly high value.
- 4       • More examples would help, as well as mentioning how the examples described in the  
5       EJTG could have been improved by adhering to the guidelines.
- 6       • Time-activity information, especially as it differs across comparison groups, should be  
7       taken into the analysis. The same is true of differential consumption of local natural  
8       resources, whether wild or domesticated. Both types of information are required for  
9       exposure analysis.
- 10      • The EJTG should include the latest references to conducting risk assessment (e.g., EPA  
11      2013, National Research Council 2007).
- 12      • The sentence on page 50 that reads: “Analysts will need to examine what the coefficient  
13      [sic] estimate implies (e.g., how different is poverty across these geographic areas).”  
14      Could be improved to read “Analysts will need to examine what the coefficient estimate  
15      implies (e.g., how different is poverty across these geographic areas), and summarize and  
16      report those differences in a manner appropriate for policy relevance.”
- 17      • The word “probably” should be struck from Section 5.4.