

National Environmental Justice Advisory Council

A FEDERAL ADVISORY COMMITTEE TO THE U.S. ENVIRONMENTAL PROTECTION AGENCY



Recommendations for Integrating Environmental
Justice into the EPA's Research Enterprise

June 30, 2014



ACKNOWLEDGEMENTS

The National Environmental Justice Advisory Council (NEJAC) acknowledges the efforts of the NEJAC Research Work Group (Work Group) in preparing this report. The NEJAC also acknowledges the stakeholders and community members who participated in the Council's deliberations by providing public comments. In addition, the work group's efforts were supported by the U.S. Environmental Protection Agency (EPA) staff, notably co-designated federal officers (DFO) of the work group, Dr. José Zambrana, Jr., and Ms. Gelena Constantine.

DISCLAIMER

This report was written as part of the activities of the NEJAC, a federal advisory committee providing independent advice and recommendations on the issue of environmental justice to the Administrator and other officials of the EPA. In addition, the materials, opinions, findings, recommendations and conclusions expressed herein, and in any study or other source referenced herein, should not be construed as adopted or endorsed by any organization with which any work group member is affiliated.

This report has not been reviewed for approval by the EPA, and hence, its contents and recommendations do not necessarily represent the views and the policies of the Agency, nor of other agencies in the Executive Branch of the federal government.

Recommendations for Integrating Environmental Justice into the EPA's Research Enterprise

June 30, 2014

A Report of Recommendations of the
National Environmental Justice Advisory Council

A federal advisory committee to the U.S. Environmental Protection Agency

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Gina McCarthy
Administrator
U.S. Environmental Protection Agency
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Washington, D.C. 20460

Dear Administrator McCarthy:

The National Environmental Justice Advisory Council (NEJAC) is pleased to submit the report, *Recommendations for Integrating Environmental Justice into the EPA's Research Enterprise*, for the Agency's review. The NEJAC developed this report in response to the EPA's request for advice, detailed in the Agency's March 2012 charge document, *Opportunities to Investigate Environmental Health Disparities through the EPA Office of Research and Development's (ORD) Newly Organized, Sustainability-Driven Research Programs*.

The NEJAC's Research Work Group diligently considered the EPA's five Charge Questions and developed 36 sets of Findings, Recommendations and Suggestions for Implementation: 19 in response to Charge Question 1, six in response to Charge Question 2, five in response to Charge Question 3, and three each in response to Charge Questions 4 and 5.

Our findings, recommendations and suggestions for implementation cover five themes related to each charge question:

- Critical Opportunities for Addressing Environmental Inequities.
- Community-Inclusive, Meaningful and Continuous Participatory Processes.
- Customizing ORD Tools and Other Outputs to be Effective for Local Decision Makers, Impacted Communities and Other Stakeholders.
 - Criteria for Independently Assessing the Impact of ORD's Research.
 - Critical Agency Skills Needed to Address Environmental Justice.

The findings and recommendations address each theme across five topic areas:

- Research Needs, Gaps and Framework.
- Research Agenda Development in Collaboration with Stakeholders.
- Research Implementation, Partnership and Funding.
- Research Translation and Communication.
- Research Evaluation.

As a follow up to this effort, the NEJAC requests a meeting between the EPA, members of the NEJAC and members of the NEJAC Research Work Group to discuss the recommendations presented in this document. We request that this meeting occur within two months of the date of this letter. As part of the agenda, we recommend that ORD staff and the NEJAC work together to identify short- and long-term goals and set priorities among the recommendations. The NEJAC also requests an official response from the EPA on this report within four months of the meeting, or by October 2014.

Given the history of environmental racism, classism and legacy environmental pollution that contributes to environmental health disparities, achieving environmental justice continues to be a challenge. While the EPA's research and development enterprise is needed to provide the scientific foundation, methods and tools the Agency needs to fulfill its mission to protect human health and the environment, it is also critical to support "the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies." We are pleased that the EPA requested the NEJAC's advice on the EPA's ORD's research enterprise and hope that this document meets the needs of the request.



Chair

cc: NEJAC Members
NEJAC Research Work Group members
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Abbreviations and Acronyms

AA	Assistant Administrator
ATSDR	Agency for Toxic Substances and Disease Registry
BOSC	Board of Scientific Counselors
CARE	Community Action for a Renewed Environment
CBPR	Community-based Participatory Research
CHPAC	Children's Health Protection Advisory Committee
CDC	Centers for Disease Control and Prevention
C-FERST	Community-Focused Exposure and Risk Screening Tool
DFO	Designated Federal Officer
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
FACA	Federal Advisory Committee Act
FEMA	Federal Emergency Management Agency
HAP	Hazardous Air Pollutant
HHS	U.S. Department of Health and Human Services
HIA	Health Impact Assessments
HUD	U.S. Department of Housing and Urban Development
IHS	Indian Health Services
IPA	Intergovernmental Personnel Assignment
IRIS	Integrated Risk Information System
NACEPT	National Advisory Council for Environmental Policy and Technology
NAS	National Academy of Sciences
NEJAC	National Environmental Justice Advisory Council
NGO	Nongovernmental organization
NIEHS	National Institute of Environmental Health Sciences
NIH	National Institutes of Health
NIMHD	National Institute on Minority Health and Health Disparities
NOAA	National Oceanic and Atmospheric Administration
NRC	National Research Council
OEJ	Office of Environmental Justice
OMH	Office of Minority Health
ORD	Office of Research and Development
PPACA	Patient Protection and Affordable Care Act
RFA	Request for Applications
SAB	Science Advisory Board
SAP	Synthesis and Assessment Product
STAR	Sustainability Tools for Assessing & Rating

EXECUTIVE SUMMARY

In March 2012, the U.S. Environmental Protection Agency (EPA) issued a charge to the National Environmental Justice Advisory Council (NEJAC) seeking advice on the EPA's Office of Research and Development (ORD) research programs and the scientific foundation required to address and prevent environmental inequities. In response to the EPA's charge, the NEJAC established a Research Work Group, which engaged in frequent collaborative discussions from May 2012 through September 2013. This report is a result of that collaborative effort among multiple stakeholders that aims to further the Agency's priorities of "Making a Visible Difference in Communities across the Country" and "Working Towards a Sustainable Future."

This report presents the NEJAC's responses to the Agency's Charge Questions. The responses are organized by Charge Question theme and grouped under general topic areas. Findings are provided to support each Recommendation or set of Recommendations, along with suggestions for Implementation. To reaffirm and build upon previous work related to the different topics, the responses to each Charge Question, if appropriate, provide relevant past recommendations to the EPA Administrator from the NEJAC, from the National Academy of Sciences, and from other EPA science and research advisory committees. As the work group members discussed and developed each response to the Charge Questions, they sought to ensure that the EPA's definition of environmental justice was integrated:

"Environmental Justice is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. EPA has this goal for all communities and persons across this Nation. It will be achieved when everyone enjoys the same degree of protection from environmental and health hazards and equal access to the decision-making process to have a healthy environment in which to live, learn, and work."

The Charge Question themes and response summaries are provided below. Chapter 1 provides the full text for each of the Charge Questions.

- 1. Critical Opportunities for Addressing Environmental Inequities**
EPA should incorporate a multi-, inter- and trans-disciplinary approach in its research agenda to advance environmental justice and information sharing across disciplines and programs. EPA should prioritize an environmental justice research agenda informed by engagement and dialogue with vulnerable communities. An environmental justice agenda should be assessed to determine whether the Agency is protecting environmental justice communities from harm. Also, the EPA should leverage its relationships and partnerships with other agencies and institutions that may not be currently focused on addressing environmental justice but are involved in community engagement and issues of community-level sustainability. These can be opportunities for the EPA to collaborate with these entities, share its expertise and resources, and generate co-knowledge, as well as for these entities to provide insight to the EPA.
- 2. Community-Inclusive, Meaningful and Continuous Participatory Processes**
EPA should share a "living list" of the Agency's research projects that includes community components with environmental justice stakeholders and the public. The Agency also should use proven community-based models of equitable participation (such as community-based participatory research [CBPR]) to authentically engage communities in defining its research agendas. EPA should support and provide funds for extramural projects that involve such community-engaged research, build capacity in the community and promote sustainable public engagement. The Agency should continue offering "plain language" webinars and similar outreach to convey to the public information related to its research agenda, research context and how results are used to influence policy decisions. EPA should also help educate and train

the next generation of scientists and engineers in environmental justice issues.

3. Customizing ORD Tools and Other Outputs to be Effective for Local Decision Makers, Impacted Communities and Other Stakeholders

The Agency should customize its research outputs by engaging stakeholders early in the planning process as well as during the evaluation of their effectiveness. EPA should improve its data collection and sharing to increase assessment of health disparities and other burdens of pollution “on the ground” and allow for comparisons in vulnerable communities over time. The Agency should continue serving as a convener of stakeholders to encourage collaboration and identify and clarify research questions needed to address environmental inequities. Furthermore, the EPA should offer opportunities for environmental justice scholars and interns from academia and nongovernmental organizations (NGOs) to work alongside the EPA’s scientists, and allow the Agency’s researchers to take on temporary assignments with research institutions, NGOs and community-based organizations focusing on environmental justice research issues.

4. Criteria for Independently Assessing the Impact of ORD’s Research

EPA should develop and use criteria to independently assess the impact of its research on environmental justice communities. Criteria for this assessment should include the effectiveness of its partnerships with stakeholders – such as academia, businesses, NGOs, tribal¹ governments and organizations, federal, state and local government agencies and community leaders – and the success of its process in engaging communities in its research. In its evaluation of the effectiveness of tools and outputs, the EPA should incorporate a determination of whether and how community leaders, local governments and business leaders have used the tools in decision-making and enforcement efforts. EPA should further ensure that its research outputs connect to beneficial outcomes for environmental justice communities. EPA should consider the use of independent evaluators when conducting the assessments.

5. Critical Agency Skills Needed to Address Environmental Justice

An understanding of environmental justice, such as environmental exposures and impacts on environmental justice communities, and how to conduct community-engaged research (for example, CBPR) are critical skills for the EPA’s research scientists. The Agency should provide the necessary training, mentoring and ongoing support to enhance the capacity of its researchers to conduct community-engaged research and involve external stakeholders – such as university researchers, businesses, NGOs, tribal governments and organizations, federal, state and local government agencies and community leaders – in the development and implementation of such trainings. In addition, the EPA should supplement its staff with sociologists and other social and behavioral scientists to add critical skills that include but are not limited to the ability to design studies that address the complexities of environmental justice, assess data, conduct evaluations, articulate results, demonstrate cultural competency, investigate the relationships between complex factors such as the physical environment and health, and understand the impact of research on urban policy and planning.

As a follow up to this effort, the NEJAC requests a meeting between the EPA, members of the NEJAC and members of the NEJAC Research Work Group to discuss the recommendations presented in this document. This meeting should occur within two months following submittal of this report to the EPA Administrator. As part of the agenda, ORD and the NEJAC could work together to identify short- and long-term goals and set priorities among the recommendations. The NEJAC also requests an official response from the EPA on this report within four months of the meeting.

¹ **Tribal:** Pertains to American Indians, Alaskan Natives, Native Hawaiians and other indigenous peoples.

CHAPTER 1: Introduction

EPA's Charge to the NEJAC²

“Opportunities to Investigate Environmental Health Disparities through the EPA Office of Research and Development’s Newly Organized, Sustainability-Driven Research Programs (March 2012)”

In early 2010, the [then] EPA Administrator, Lisa Jackson announced seven priorities for the Agency, one being “Expanding the Conversation on Environmentalism and Working for Environmental Justice.” Three important steps followed: EPA’s Science of Disproportionate Impacts Analysis Symposium in March 2010, an Environmental Justice Regulatory Analysis Technical Workshop in June, 2010, and the development of Plan EJ 2014--a roadmap that will help EPA integrate environmental justice into the Agency’s programs, policies, and activities. Within Plan EJ 2014, the Office of Research and Development (ORD) is leading the Science Implementation Plan, for which the stated goal is that within five years,

“ . . . EPA will substantially support and conduct research that employs participatory principles and integrates social and physical sciences aimed at understanding and illuminating solutions to environmental and health inequalities among low income, minority, indigenous, underserved and overburdened populations and communities in the US.”

Themes in the Science Implementation Plan were drawn from key recommendations put forth at the aforementioned Symposium and in a subsequent letter from an ad hoc group of environmental justice leaders. These themes speak directly to ORD’s work as the scientific research arm of EPA to provide the solid underpinnings of science and technology for the Agency. For example, it was recommended that EPA:

- Create and institute a new scientific research approach to develop more holistic understanding of environment and health.
- Develop a plan to ensure incorporation of the concept of vulnerability,³ particularly its social and cultural aspects in the Agency’s research agendas.
- Integrate perspectives from decision makers such as community residents, community leaders, community-based nongovernmental organizations (NGOs) and community health and environmental quality advocates in the development of EPA’s scientific research agendas as well as in data collection, conduct of exposure/risk assessments and risk management decisions.
- Build capacities and skills among EPA/ORD staff and scientists to conduct research and other science related activities in equal partnership with impacted communities.

² From EPA. 2012. “Opportunities to Investigate Environmental Health Disparities through the EPA Office of Research and Development’s Newly Organized, Sustainability-Driven Research Programs: Charge.” March. (EPA’s charge to the NEJAC.)

³ **Vulnerability.** EPA defines vulnerability as the differences in risk that result from intrinsic (internal) differences in susceptibility and social (external) stress factors such as low socioeconomic status, lack of community resources and access to health care, education, poverty, race and geography. Vulnerability also can be defined as the diminished capacity of an individual or community to anticipate, cope with, resist and recover from the effects of a natural or man-made hazard.

Concurrent with these developments has been a new “Path Forward” articulated for ORD by its prior Assistant Administrator (AA), Dr. Paul Anastas, and fully supported by the new Acting AA, Lek Kadeli. The Path Forward has laid a philosophical foundation for a structural change of ORD’s fundamental research programs. The foundation has been set in “sustainability” as “true north,” where sustainability is generally defined as meeting the needs of the present without compromising the ability of future generations to meet their needs. Seeking sustainable solutions requires systems thinking that analyzes options for balancing and optimizing economic, environmental and societal objectives for the benefit of current and future generations. The structural change has been a realignment of ORD’s research programs into six areas:

- Air, Climate and Energy
- Chemical Safety for Sustainability
- Sustainable and Healthy Communities
- Safe and Sustainable Water Resources
- Human Health Risk Assessment
- Homeland Security Research

The first four of these research areas are newly integrated, trans-disciplinary programs.

Furthermore, the National Research Council (NRC) recently released a report entitled “Sustainability and the U.S. EPA.” The aim of the report was to:

- Provide an operational framework for integrating sustainability as one of the key drivers within the regulatory responsibilities of EPA.
- Address how the existing framework rooted in the risk assessment/risk management paradigm can be integrated under the sustainability framework.
- Identify the scientific and analytical tools needed to support the framework.
- Identify the expertise needed to support the framework.

The NRC Committee indicated that “The sustainability mandate to consider social and equity factors can make EPA even more sensitive than it has been to populations that are disproportionately exposed to environmental risks,” and that “Sustainability can... provide a logic and framework for considering environmental justice as part of every major decision.” However, exactly how scientific research rooted in sustainability can support environmental justice has yet to be fully understood.

The recent developments in Agency efforts with regard to environmental justice, recommendations from the Symposium, the Science Implementation Plan, and realignment of ORD’s research programs all converge on an opportunity to garner critical advice with respect to research programming and implementation. It is important at this stage to create mechanisms for public input into the ORD research agenda as it evolves, and to place environmental and health inequalities “on the table” so that they will be addressed by the EPA research enterprise.

The programs have been reviewed jointly by the Science Advisory Board (SAB) and Board of Scientific Counselors (BOSC). With regard to internal coordination among ORD researchers, the SAB/BOSC review indicated that “Directed Requests for Applications (RFAs) that require coordination or research projects across ORD research programs can provide an incentive to ensure coordination,” and furthermore that, “Cross-cutting issues that are a priority of the Administrator, such as environmental justice, should be explicitly identified, wherever appropriate, as part of such RFAs to foster coordination and advance the Administrator’s goals.”

Thus, ORD proposes that a Research Work Group be established under the National Environmental Justice Advisory Committee (NEJAC) to advise the EPA Administrator and ORD in the area of scientific research, particularly as it applies to health impacts, environmental risks and differential exposures that

directly relate to environmental justice. *The primary task of the work group will be to advise ORD on the research program implementation for all six programs.*

EPA requests advice from the NEJAC concerning ORD's research programs and the scientific foundation needed to address and prevent environmental inequities. ORD's research programs recognize that such inequities may result from varying conditions of and access to environmental resources, differential life-stages and other susceptibility factors.

EPA requests recommendations on the following questions:

- (1) What critical opportunities are there for informing actions that address and prevent environmental inequities through implementing these research programs? How can sustainability as an operational framework advance research in support of environmental justice?
- (2) How can ORD implement a community-inclusive, meaningful, and sustained participatory process in the development of EPA's scientific research agendas? In order to strengthen the relevance and quality of its research and development enterprise, how can ORD most effectively work collaboratively with communities in the execution of its research programs (for example, community-based participatory research [CBPR])?
- (3) How can the outputs of ORD's research programs be customized to interface with local decision makers and disproportionately-impacted communities? How can ORD determine whether its research products and outputs are having a demonstrated impact with respect to addressing and preventing environmental inequities?
- (4) What criteria should ORD use to assess the impact of its research with respect to environmental justice and EPA decision making?
- (5) What are the most critical skills, both technical and non-technical, that EPA's research scientists will need to address environmental justice as part of each of the six programs?

In accomplishing this charge, EPA is requesting the following deliverables in order to inform the Fiscal Year 2014 planning process for ORD.

- Within 7 months, the NEJAC should provide an advice letter that outlines preliminary recommendations regarding Questions 1 through 5.
- Within 12 months, the NEJAC should provide a final report that contains a comprehensive analysis of its findings and recommendations for all of the above questions.

The Work Group’s Deliberation Process

In response to the Agency’s charge, the NEJAC formed the Research Work Group to develop and identify potential recommendations on ORD’s research programs and the scientific foundation needed to address and prevent environmental inequities. Work group members represented public and private sector stakeholders including academia, businesses, NGOs, tribal⁴ governments and organizations, and federal and state government agencies.

Table 1 presents the original wording of each Charge Question and the work group’s clarified wording of the Charge Question that served to inform the work group members’ understanding and context of the charge. Clarifications to the Charge Questions appear in italicized font.

Table 1. Original and Clarified Wording of EPA’s Charge Questions.

Original Wording of the EPA’s Charge	Clarified Wording of the EPA’s Charge
1. What critical opportunities are there for informing actions that address and prevent environmental inequities through implementing these research programs? How can sustainability as an operational framework advance research in support of environmental justice?	1. What critical opportunities are there for informing actions that address and prevent environmental inequities through implementing these research programs (<i>such as helping ORD define its research agenda and informing decision making internal and external to ORD</i>)? How should sustainability be defined and used as an operational framework to advance research in support of environmental justice?
2. How can ORD implement a community-inclusive, meaningful, and sustained participatory process in the development of EPA’s scientific research agendas? In order to strengthen the relevance and quality of its research and development enterprise, how can ORD most effectively work collaboratively with communities in the execution of its research programs (for example, community-based participatory research)?	2. How can ORD implement a community-inclusive, meaningful and <i>continuous</i> participatory process in the development of the EPA scientific research agendas? In order to strengthen the relevance and quality of its research and development enterprise, how can ORD most effectively work collaboratively with communities in the execution of its research programs (for example, community-based participatory research)?
3. How can the outputs of ORD’s research programs be customized to interface with local decision makers and disproportionately-impacted communities? How can ORD determine whether its research products and outputs are having a demonstrated impact with respect to addressing and preventing environmental inequities?	3. How can the outputs of ORD’s research programs – <i>such as tools like Community-Focused Exposure and Risk Screening Tool (C-FERST) and reports of new discoveries</i> – be developed and customized to inform and respond to all stakeholders on how to address environmental inequities? (<i>Stakeholders include academia; businesses; NGOs; tribal governments and organizations; federal, state and local government agencies; and disproportionately-impacted communities.</i>) How can ORD determine whether its research products and outputs are having a demonstrated impact with respect to addressing and preventing environmental inequities?
4. What criteria should ORD use to assess the impact of its research with respect to environmental justice and EPA decision making?	4. No clarification needed.
5. What are the most critical skills, both technical and nontechnical, that the EPA’s research scientists will need to address environmental justice as part of each of the six programs?	5. What are the most critical <i>multidisciplinary</i> skillsets, both technical and nontechnical, that the EPA’s research scientists will need to address environmental justice as part of each of the six programs?

The remainder of this document refers only to the clarified wording of the Charge Questions that the work group used to develop these recommendations.

⁴ **Tribal:** Pertains to American Indians, Alaskan Natives, Native Hawaiians and other indigenous peoples.

Between May 2012 and September 2013, the work group conducted regularly scheduled teleconference calls. In addition, smaller subgroups participated in teleconference meetings that focused on specific issues. The members also met in person in July 2012 with EPA staff. To collect and share feedback on working drafts of the recommendations report, work group members participated in one-on-one interviews with the EPA's consultant, APEX Direct, Inc. The work group also received preliminary feedback on its efforts from the NEJAC during the Council's public meeting in July 2012, public teleconference in June 2013 and public meeting in September 2013. The work group engaged EPA ORD senior staff to obtain information and clarification of ORD's present portfolio and processes, and also invited subject matter expert guest speaker Dr. Julian Agyeman, chair of the Department of Urban and Environmental Policy and Planning at Tufts University, to provide input.

The work group members also reviewed past reports from the NEJAC and other science and research advisory committees to the EPA for prior recommendations to the EPA Administrator that are potentially relevant to the present charge. Specifically, the work group identified as "potentially relevant" several past recommendation reports by the NEJAC and reports from the National Academy of Sciences (NAS), SAB, BOSC, Children's Health Protection Advisory Committee (CHPAC) and National Advisory Council for Environmental Policy and Technology (NACEPT).

The NEJAC reports and associated EPA responses from July 1996 through March 2012, EPA science and research advisory committee reports, dated 1995 through 2012, and selected NAS studies were reviewed in the process of compiling this report. Relevant past recommendations are listed beneath each of the work group's recommendation in Chapter 2.

Structure of Document

The remainder of this report presents the NEJAC's Findings, Recommendations and suggestions for Implementation to address the Agency's Charge Questions. The responses are organized by Charge Question themes and then grouped into topic areas. The proposed response covers five themes:

1. Critical Opportunities for Addressing Environmental Inequities.
2. Community-Inclusive, Meaningful and Continuous Participatory Processes.
3. Customizing ORD Tools and Other Outputs to be Effective for Local Decision Makers, Impacted Communities and Other Stakeholders.
4. Criteria for Independently Assessing the Impact of ORD's Research.
5. Critical Agency Skills Needed to Address Environmental Justice.

The proposed response addresses five topic areas:

- Research Needs, Gaps and Framework.
- Research Agenda Development in Collaboration with Stakeholders.
- Research Implementation, Partnership and Funding.
- Research Translation and Communication.
- Research Evaluation.

Table 2 presents a summary of the responses to the Charge Questions by topic area. Findings are provided to support each Recommendation or set of Recommendations, along with suggestions for Implementation. To conclude each response, references to relevant past recommendations to the EPA Administrator from the NEJAC, the NAS, and other EPA science and research advisory committees are provided, if available, to reaffirm previous work.

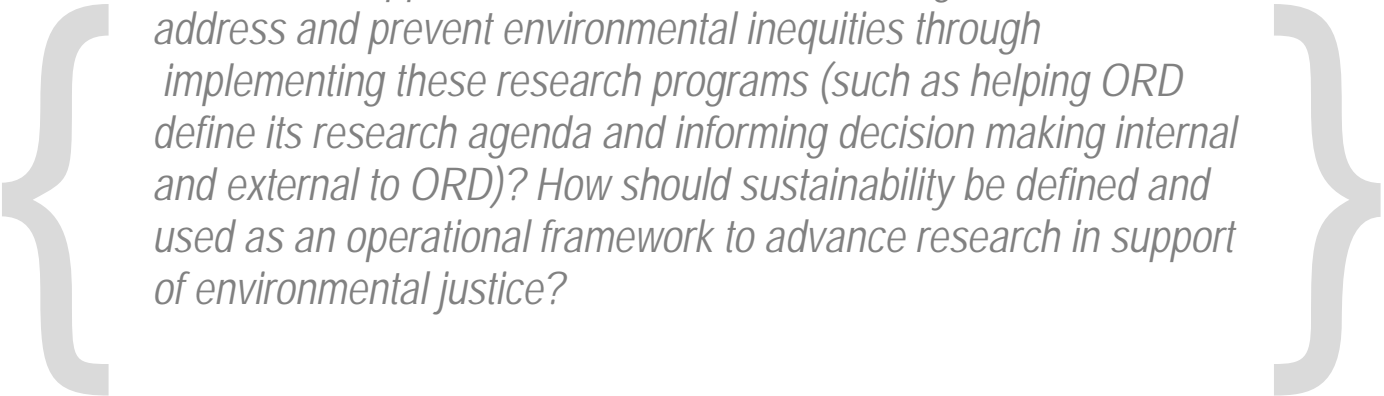
Table 2. Summary of the Responses to the Charge Questions by Topic Area.

TOPIC AREA	RESPONSE TO CHARGE QUESTION 1	RESPONSE TO CHARGE QUESTION 2	RESPONSE TO CHARGE QUESTION 3	RESPONSE TO CHARGE QUESTION 4	RESPONSE TO CHARGE QUESTION 5
RESEARCH NEEDS, GAPS AND FRAMEWORK	1-1. Incorporate Research Needs of American Indians, Alaskan Natives, Native Hawaiians and Other Indigenous Peoples		3-1. Collect Data for Evaluating Improvements in Environmental Conditions and Health Outcomes		
	1-2. Advance Research on Health Disparities				
	1-3. Conduct and Collect Data for Longitudinal Studies				
	1-4. Support Biomonitoring Research				
	1-5. Conduct Research and Collaborate to Identify and Address Air Quality "Hot Spots"				
	1-6. Conduct Research to Support Diesel Exhaust Regulations				
	1-7. Conduct Research on Potential Disproportionate Impacts of Climate Change Effects, Mitigation and Adaptation				
	1-8. Revise the EPA's Definition of Sustainability				
	1-9. Conduct Research on Incentivizing Business Performance Beyond Compliance				
	1-10. Amplify Uncertainty Analyses to Inform Risk Assessment, the Application of the Precautionary Principle and Decision Making				
	1-11. Assess New Products				
RESEARCH AGENDA DEVELOPMENT IN COLLABORATION WITH STAKEHOLDERS	1-12. Prioritize Chemicals in IRIS Process	2-1. Engage Communities in Setting the Research Agenda	3-2. Encourage Collaboration in Setting the Research Agenda		
	1-13. Investigate Potential Disproportionate Effects of Pesticide Exposure of Rural and Urban Farmworkers				
RESEARCH IMPLEMENTATION, PARTNERSHIPS AND FUNDING	1-14. Promote Health Impact Assessment Method	2-2. Incorporate Community-Engaged Research Models Into Research Program Implementation	3-5. Develop Personnel Exchanges		5-1. Increase Social Scientists on EPA Staff and as Consultants
	1-15. Adjust Extramural Research Review Process				
	1-16. Investigate Environmental Contribution to Health Disparities	2-6. Promote Environmental Justice Education and Training of the Next Generation of Scientists and Engineers			5-2. Enhance Training of ORD Scientists
	1-17. Partner to Advance Access to Health Care in Communities Experiencing Environmental Inequities				
RESEARCH TRANSLATION AND COMMUNICATION	1-18. Translate Research to Policy Makers	2-4. Communicate Community-Engaged Research			
		2-5. Increase Use of Technology to Communicate and Educate Stakeholders			
		2-6. Promote Environmental Justice Education and Training of the Next Generation of Scientists and Engineers			
RESEARCH EVALUATION	1-19. Evaluate the EPA's Integration of Environmental Justice into Decision-Making			4-1. Assess Research Outputs' Support of Environmental Justice Outcomes	5-3. Assess Effectiveness of Environmental Justice Training for Staff
				4-2. Assess Effectiveness of Stakeholder Partnerships	
				4-3. Assess Use of EPA Tools	

CHAPTER 2: Findings, Recommendations and Suggestions for Implementation

The recommendations proposed by the NEJAC Research Work Group members are organized by Charge Question and are presented below. As explained in Chapter 1, the work group's clarified wording of each Charge Question served to inform the work group members' understanding and context of the EPA's charge. The remainder of this document refers only to the clarified wording of the Charge Questions that the work group used to develop its recommendations. The recommendations were compiled based on notes taken during full work group and smaller subgroup teleconferences as well as one-on-one teleconference calls between work group members and the EPA consultant, APEX Direct, Inc. Findings that "set the stage" for the recommendations are included, followed by suggestions for implementation where available.

Charge Question 1: Critical Opportunities for Addressing Environmental Inequities



What critical opportunities are there for informing actions that address and prevent environmental inequities through implementing these research programs (such as helping ORD define its research agenda and informing decision making internal and external to ORD)? How should sustainability be defined and used as an operational framework to advance research in support of environmental justice?

Response Summary to Charge Question 1:

EPA should incorporate a multi-, inter- and trans-disciplinary approach in its research agenda to advance environmental justice and information sharing across disciplines and programs. EPA should prioritize an environmental justice research agenda informed by engagement and dialogue with vulnerable communities. An environmental justice agenda should be assessed to determine whether the Agency is protecting environmental justice communities from harm. Also, the EPA should leverage its relationships and partnerships with other agencies and institutions that may not be currently focused on addressing environmental justice but are involved in community engagement and issues of community-level sustainability. These can be opportunities for the EPA to collaborate with these entities, share its expertise and resources, and generate co-knowledge, as well as for these entities to provide insight to the EPA.

TOPIC AREA: Research Needs, Gaps and Framework

1-1. Incorporate Research Needs of American Indians, Alaskan Natives, Native Hawaiians and Other Indigenous Peoples



FINDING: American Indians, Alaskan Natives, Native Hawaiians and other indigenous peoples (or tribal⁵ stakeholders) have a unique political standing with regard to tribal sovereignty and the formal government-to-government relationship with the federal government. As a result of this standing, there is also a federal trust responsibility in which the U.S. government has charged itself with the legal and moral obligations of the highest responsibility and trust to tribal stakeholders (*Cherokee Nation v. Georgia*, 1831; *Seminole Nation v. US*, 1942). This is a legally enforceable fiduciary responsibility to protect treaty rights, lands, assets and resources.⁶

Tribal stakeholders are affected by a number of specific environmental justice issues, such as those related to environmental risks due to the toxic effects resulting from subsistence living; the longstanding condition of mining, drilling and other extraction activities on or near trust legacy pollution on tribal leased lands; lack of healthy housing; inadequate tribal resources for basic infrastructure; and others. Tribal environmental programs are strained to manage the full range of challenges they face. Tribal stakeholders also experience a wide range of health disparities that are environmentally linked. Compounding this, many tribal stakeholders must address multiple social stressors such as high rates of poverty and unemployment, historic trauma, limited health care systems and infrastructure, and limited financial resources. The remote location of many such communities poses additional challenges in building tribal environmental management capacity including, but not limited to partnerships with academic institutions, federal and state agencies, and others.

Additionally, methods, pedagogies, and practices of indigenous knowledge systems can contribute significantly to the Western systems that are the basis of governmental research and development. Efforts are required to work across cultural boundaries to include, respect and value indigenous traditional knowledge including oral traditions, tribal ecological knowledge, and cultural beliefs and practices. For example, science-based water quality standards for tribes can still accommodate culturally-valued uses of water.

RECOMMENDATIONS:

- A) EPA should reaffirm the special government-to-government relationship with tribal stakeholders, develop a set of research protocols that include rigorous traditional indigenous methods, and develop a research agenda in collaboration with tribal governments, organizations and culturally competent researchers.
- B) EPA should conduct targeted outreach to identify research needs and protocols for tribal communities. This includes working to support tribal governments in addressing environmental problems and partnering with entities such as tribal organizations, tribal-serving NGOs, and tribal colleges and universities.

⁵ **Tribal:** Pertains to American Indians, Alaskan Natives, Native Hawaiians and other indigenous peoples.

⁶ The Bureau of Indian Affairs, U.S. Department of the Interior, indicates that legally enforceable fiduciary responsibility to protect treaty rights, lands, assets and resources is based on various court rulings. Visit www.bia.gov/FAQs/index.htm.

IMPLEMENTATION: ORD could work closely with the EPA American Indian Environmental Office and support collaborative, participatory research with tribal⁷ epidemiological centers, tribal-trusted academic institutions and other federal agencies. In doing so, the EPA could develop culturally appropriate research protocols and competencies that acknowledge and incorporate indigenous traditional knowledge.

Relevant Past Recommendations:

- ***Ensuring Risk Reduction in Communities with Multiple Stressors: Environmental Justice and Cumulative Risks/Impacts (NEJAC, December 2004)***
"Establish an Agency Wide Framework for Holistic Risk-Based Environmental Decision Making and Incorporation of Tribal Traditional Lifeways in Indian Country: EPA should support the work of the EPA Indian Program Policy Council to establish a collective, multi-media Agency approach and determine what additional efforts are needed that will allow [the] EPA to adequately consider tribal traditional lifeways when conducting scientific analyses, including assessing risks; developing and implementing environmental programs and regulations; and making decisions that protect human health and the environment in Indian country. In addition, [the] EPA should identify examples of successful holistic risk assessment and collaborative problem solving efforts that abide by the Native American World View of Health and promote ecological restoration in Indian Country, and integrate the lessons from such successes into all of the Agency's policies, programs, and activities."
- ***Fish Consumption and Environmental Justice (NEJAC, November 2002)***
"Because many American Indian and Alaska Native (AIAN) communities are particularly prone to environmental harm due to their dependence on subsistence fishing, hunting, and gathering, conduct environmental research, fish consumption surveys, and monitoring, in consultation with federally recognized tribes and with the involvement of concerned tribal organizations, to determine the effects on, and ways to mitigate adverse effects on the health of AIAN communities resulting from contaminated water sources and/or the food chain."

1-2. Advance Research on Health Disparities



FINDING: There are many factors that contribute to health disparities, for example, contaminants in the soil, water or air, lack of access to quality health care and lack of access to food that is safe and nutritious. While the EPA's regulatory purview may be limited in addressing all of the factors, the EPA and other agencies can better target interventions and set standards to ensure that vulnerable populations are adequately protected by better understanding the various mechanisms and drivers of environmental stress in a community.

RECOMMENDATIONS:

- A) EPA should seek to understand all the driving factors that lead to health disparities and the relative magnitude and contribution of those stressors, particularly the environment, both alone and in combination with one another.
- B) EPA should continue to define and research how psycho-social stressors relate to environmental sensitivity and vulnerability.
- C) In its research of cumulative effects of pollution, the EPA should continue to include multiple stressors, including psycho-social stressors.
- D) In understanding the roles that different factors play in health disparities, the EPA also should communicate its research findings on the environmental contributions to health disparities so that other agencies, such as the U.S. Department of Health and Human Services (HHS) and the U.S. Department of Housing and Urban Development (HUD), can coordinate efforts to ensure that resources are better allocated toward reducing health disparities.

IMPLEMENTATION: EPA could continue to work in collaboration with the National Institute of

⁷ **Tribal:** Pertains to American Indians, Alaskan Natives, Native Hawaiians and other indigenous peoples.

Environmental Health Sciences (NIEHS) and the National Institute on Minority Health and Health Disparities (NIMHD) on joint funding opportunities, coordinated research planning, and synthesis of research findings on health disparities. In particular, the EPA could host meetings with these federal partners, particularly senior staff, to highlight research results on the environmental component of health disparities, and chart a strategy for better incorporation of environmental contributors into health disparities research.

Relevant Past Recommendations:

- ***Exposure Science for the 21st Century: A Vision and a Strategy (NAS 2012)***
“[E]xposure science needs to continue to build capacity to [a]ssess and mitigate exposures quickly in the face of emerging environmental-health threats and natural and human-caused disasters. For example, this requires expanding techniques for rapid measurement of single and multiple stressors on diverse geographic, temporal, and biologic scales. That includes developing more portable instruments and new techniques in biologic and environmental monitoring to enable faster identification of chemical, biologic, and physical stressors that are affecting humans or ecosystems.”
- ***Science and Decisions: Advancing Risk Assessment (NAS, 2009)***
“EPA should draw on other approaches, including those from ecologic risk assessment and social epidemiology, to incorporate interactions between chemical and nonchemical stressors in assessments; increase the role of biomonitoring, epidemiologic, and surveillance data in cumulative risk assessments; and develop guidelines and methods for simpler analytical tools to support cumulative risk assessment and to provide for greater involvement of stakeholders. In the short-term, EPA should develop databases and default approaches to allow for incorporation of key nonchemical stressors in cumulative risk assessments in the absence of population-specific data, considering exposure patterns, contributions to relevant background processes, and interactions with chemical stressors. In the long-term, EPA should invest in research programs related to interactions between chemical and nonchemical stressors, including epidemiologic investigations and physiologically based pharmacokinetic modeling.”
- ***Decision Making for the Environment: Social and Behavioral Science Research Priorities (NAS 2005)***
“Determining distributional impacts. Federal agencies should support concerted efforts to improve the data, methods, and analytic techniques for determining the distributional impacts of environmental policies and programs related to issues of environmental inequities and their abatement. These efforts should include research to determine the most appropriate levels of social, spatial, and temporal aggregation of measurement for environmental monitoring and indicator development and should address the following themes: defining key variables (e.g., minority population), analyzing dependence of impacts on spatial and temporal scale; developing integrated biophysical and social models that include multiple stressors, multiple exposure pathways, and social vulnerability; and improving visualization and risk communication regarding the impacts of environmental conditions and policies.”

“Decision-Relevant Science for Evidence-Based Environmental Policy: To strengthen the scientific infrastructure for evidence-based environmental policy, the federal government should pursue a research strategy that emphasizes decision relevance. The strategy should encompass four substantive research elements: (1) developing indicators for environmental quality, including pressures on the environment, environmental states, and human responses and consequences, that are designed to serve the needs of decision makers; (2) making concerted efforts to evaluate environmental policies; (3) developing better methods for identifying the trends that will determine environmental quality in the future; and (4) improving methods for determining the distributional impacts of environmental policies and programs.”

Relevant Past Recommendations (continued):

- ***Ensuring Risk Reduction in Communities with Multiple Stressors: Environmental Justice and Cumulative Risks/Impacts (NEJAC, December 2004)***

"Lay the Scientific Basis for Incorporating Vulnerability into EPA Assessment Tools, Strategic Plans, and Research Agendas: EPA should develop a plan to ensure incorporation of the concept of vulnerability, particularly its social and cultural aspects, into the Agency's strategic plans, research agendas, and decision-making processes. This should begin with an Agency effort to lay the scientific foundations for understanding vulnerability, especially its social and cultural aspects. Issues papers, workshops, case studies and other approaches should be employed in such a foundation laying effort. Additionally, the Agency should initiate and promote dialogue with key partners and stakeholders on the subject. The Agency also should include the concept in its development of screening, targeting, and prioritization methods and tools. The Agency should also direct all offices whose missions relate to policy making, program implementation, regulatory enforcement, and professional and community training, to develop strategic plans for incorporating the concept of vulnerability into their operational paradigm. One vehicle for accomplishing this is each office's Environmental Justice Action Plans. Last, [the] EPA should make it clear that although quantitative evaluation of vulnerability is precluded in almost all cases by a scarcity of scientific knowledge and understanding, this is not an excuse to ignore it. Vulnerability should be an integral part of cumulative risk assessment even it must be analyzed using qualitative measures."

- ***Environmental Justice and Community-Based Health Model Discussion (NEJAC, February 2001)***

"Include Socioeconomic and Cultural Factors in Health Assessments. EPA and other federal agencies need to examine the impact and significance of socioeconomic and cultural factors on health disparities. Then, as appropriate, include these factors in health assessment, intervention, and prevention strategies."

1-3. Conduct and Collect Data for Longitudinal Studies



FINDING: Traditional research studies, including those at the EPA, are often conducted at one point in time (for example, cross-sectional research design). Data, however, need to be collected and assessed over time for analysis of trends, correlations and variability; and from a variety of geographic resolutions ranging from regional to county to zip codes and census tracts. Data from smaller geographic units are more likely to capture neighborhood issues and allow for correlations with environmental health exposure.

RECOMMENDATIONS:

- A) EPA should conduct, fund or partner with other agencies to conduct longitudinal studies on cumulative impacts and the interface between contamination and social and economic factors, and investigate the need for future data. For example, the EPA recently initiated studies on the cumulative impacts of psycho-social stressors and environmental exposure. Longitudinal studies of topics like this would ensure that the EPA establishes data collection standards that are comparable over time and identifies the need for future data.
- B) EPA should gather data from a range of geographic resolutions ranging from regional to county to zip codes and census tracts. Examples include published academic research that use zip code and census tract scale data and the EPA's Community-Focused Exposure and Risk Screening Tool (C-FERST), which incorporates data from the zip code scale.

IMPLEMENTATION: The Robert Wood Johnson Foundation has been collecting health data throughout the country through County Health Rankings and Roadmaps: <http://www.countyhealthrankings.org/roadmaps>, while the EPA's C-FERST uses zip code data. EPA could join the partnership that includes counties, businesses, the United Way and various agencies and partners including the Centers for Disease Control and Prevention (CDC) to conduct longitudinal studies that consider various scales of spatial resolution.

1-4. Support Biomonitoring Research



FINDING: Information on the amount and type of chemicals that occur in people’s bodies across different communities and people (biomonitoring data) can provide information that can be useful to the EPA in identifying environmental justice communities that may be disproportionately exposed to these chemicals. Biomonitoring studies also have the potential to inform genetic vulnerabilities and validate concerns that people near sources or uses of chemicals have regarding potential exposures. Such studies can also identify unforeseen chemical exposures that may be occurring in different populations.

RECOMMENDATION: EPA should support additional research studies that examine biomonitoring data relative to racial, ethnic, socioeconomic and geographic data, and create a portal that tracks such critical data.

IMPLEMENTATION: EPA could also explore partnerships and collaboration opportunities with the CDC and other agencies. Additionally, biomonitoring data could feed into a screening tool to “flag” places or populations for further follow-up by the Agency.

Relevant Past Recommendation:

Human Biomonitoring for Environmental Chemicals (NAS, 2006)

- “Develop a coordinated strategy for biomarker development and population biomonitoring based on the potential for population exposure and public-health concerns.”
- “Develop biomonitoring-based epidemiologic, toxicologic, and exposure-assessment investigations and public-health surveillance to interpret the risks posed by low-level exposure to environmental chemicals. Where possible, enhance existing exposure assessment, epidemiologic, and toxicologic studies with biomonitoring to improve the interpretation of results of such studies.”
- “Advance individual, community, and population-based strategies for reporting results of biomonitoring studies.”
- “There is a need for review of the bioethical issues confronting the future of biomonitoring, including confidentiality, informed consent, reporting of results, and public-health or clinical followup.”



1-5. Conduct Research and Collaborate to Identify and Address Air Quality “Hot Spots”



FINDING: Air quality can have significant impacts on disease outcomes such as developmental delays in children, obesity and cardiovascular and other diseases. EPA should understand the relative impact of both indoor and outdoor air quality factors and triggers on health outcomes. A key challenge is that communities may not have easy access to actual data, real-time data and modeling data that can be used to identify local “hot spots.” Additionally, there may be gaps in the data.

RECOMMENDATIONS:

- A) EPA should conduct research and develop or fund the development tools that would support identifying “hot spots” so that air quality issues can be addressed and adverse health impacts can be prevented.
- B) EPA should continue to research the links between indoor and outdoor air quality and associated diseases.
- C) EPA should facilitate sustained community engagement in the process of developing solutions to address and prevent such diseases in partnership with other stakeholders, such as academia, businesses, NGOs, tribal⁸ governments and organizations, and federal, state and local government agencies.
- D) EPA should develop tools to assist states and localities in identifying “hot spots.” The Agency should also use place-based research studies that assist communities in local air quality monitoring, including helping them determine where and how to monitor, and how to use tools to identify local “hot spots.”

IMPLEMENTATION: The EPA could serve as a convener of federal agency experts, knowledgeable community members and technology developers to discuss the state of knowledge about the relative contribution of indoor and outdoor air quality to health impacts; identify research gaps; and identify ways to communicate important findings to interested stakeholders. EPA could share its research findings at public health and biomedical conferences and related venues to inform the medical community about air quality and health.

Relevant Past Recommendations:

Climate Change, the Indoor Environment, and Health (NAS, 2011)

- “The EPA and other federal agencies should join to develop or refine protocols and testing standards for evaluating emissions from materials, furnishings, and appliances used in buildings and to promote their use by standards-setting organizations and in the marketplace. Standards should include consideration of emissions over the operational life of products and the effects of changes in indoor temperature, dampness, and pests.”
- “The EPA should expand and accelerate its efforts to ensure that indoor environmental quality is protected and enhanced in building-weatherization efforts by facilitating research to identify circumstances in which mitigation and adaptation measures may cause or exacerbate adverse exposures; by reviewing and, where appropriate, changing weatherization guidance to prevent these exposures; and by establishing criteria for the certification of weatherization contractors in health-protective procedures.”
- “The EPA and other federal agencies should put into place a public-health surveillance system that uses existing environment and health survey instruments to gather information on how outdoor conditions, building characteristics, and indoor environmental conditions are affecting occupant health and on how these change over time.

⁸ **Tribal:** Pertains to American Indians, Alaskan Natives, Native Hawaiians and other indigenous peoples.

1-6. Conduct Research to Support Diesel Exhaust Regulations



FINDING: While the EPA is engaged in regulating mobile emissions, the Agency does not regulate diesel exhaust as a hazardous air pollutant (HAP). The World Health Organization, however, has ruled that diesel exhaust is a carcinogen.⁹ Furthermore, health disparities associated with diesel exhaust are associated in vulnerable communities with negative health outcomes that have persisted for generations.

RECOMMENDATION: In light of the established and growing body of evidence that supports the designation of diesel exhaust as a HAP and as a contributing factor to health disparities, the EPA should take the necessary follow-up steps including supporting further etiologic, interventional and translational research. Research should evaluate the effectiveness of prevention programs and show the savings in lives and health costs of these interventions. Research results also should identify data gaps, examine the efficacy of future prevention efforts and estimate the effect of technological advances in reducing health impacts.

IMPLEMENTATION: EPA could, for example, engage with industry and other agencies in developing less toxic diesel fuel formulations and lower emitting diesel engines, and incentives for replacing fleets more quickly and reducing bus idling as part of asthma prevention programs. This would help focus future rulemaking on moving the industry toward reductions in diesel exhaust.

Relevant Past Recommendation:

- **Reducing Air Emissions Associated With Goods Movement: Working Towards Environmental Justice (NEJAC, November 2009)**
All recommendations contained in this document are relevant to this topic.

1-7. Conduct Research on Potential Disproportionate Impacts of Climate Change Effects, Mitigation and Adaptation



FINDING: Climate change threatens human health, but its impacts do not affect communities equally. Emerging research has linked vulnerability and capacity to adapt to climate change impacts to socioeconomic and demographic characteristics (such as race, ethnicity and income level), access to social and health services, and level of education. In 2008, the EPA published *Analyses of the Effects of Global Change on Human Health and Welfare and Human Systems (Synthesis and Assessment Product [SAP] 4.6)*, which describes national and regional health impacts from climate change. Additionally, different mitigation options across a variety of sectors (such as, transportation, energy, building structures and infrastructure) can have potentially disparate effects on environmental justice communities. Efforts to mitigate and adapt to climate change present important opportunities to bolster the resilience of vulnerable communities.

⁹ International Agency for Research on Cancer, World Health Organization 2012. "IARC: Diesel Engine Exhaust Carcinogenic." June 12. http://www.iarc.fr/en/media-centre/pr/2012/pdfs/pr213_E.pdf.

RECOMMENDATIONS:

A) In order to develop strategies for reducing vulnerability to climate change impacts and prepare vulnerable communities for responding to emerging threats, the EPA should conduct research that characterizes and identifies or maps communities that are vulnerable to climate change (such as, geographic vulnerability).

B) EPA should develop tools and equity indicators that analyze and measure socioeconomic, racial or ethnic disparities associated with different adaptation and mitigation options (such as, demographic vulnerability).

C) EPA should overlay the data garnered from Recommendations A and B above to identify the most climate vulnerable communities.

IMPLEMENTATION: For climate mitigation, the EPA could develop cross-agency initiatives (for example, with the U.S. Department of Energy [DOE], the U.S. Department of Transportation and HUD) to map and assess vulnerabilities and disparate impacts that may arise from mitigation options in different sectors. With regard to the energy sector, ORD could also coordinate with the EPA's Office of International and Tribal Affairs since significant energy exploration occurs in Indian Country.

For climate change impacts and adaptation, the EPA could work with HHS to map vulnerability (based on existing social and health services available), the Department of Homeland Security's Federal Emergency Management Agency (FEMA) and the CDC to determine and plan emergency preparedness for climate events, and with CDC and the National Oceanic and Atmospheric Administration (NOAA) to use environmental public health tracking systems to map climate change events with health effects.



Relevant Past Recommendations:

- ***Climate Change, the Indoor Environment, and Health (NAS, 2011)***
 - “The Environmental Protection Agency should work with such agencies as the Centers for Disease Control and Prevention to assist state, territorial, and local health and emergency-management agencies in efforts to initiate or expand programs to identify populations at risk for health problems resulting from alterations in indoor environmental quality induced by climate change and to implement measures to prevent or lessen the problems.”
 - “The Environmental Protection Agency in coordination with the Department of Energy, the American Society of Heating, Refrigerating and Air-Conditioning Engineers, and building-code organizations should facilitate the revision and adoption of building codes that are regionally appropriate with respect to climate-change projections and that promote the health and productivity of occupants.”
 - “The Environmental Protection Agency and other public agencies and private organizations should join to develop model standards for ventilation in residential buildings and to foster updated standards for commercial buildings and schools. The standards should
 - Be based on health-related criteria.
 - Account for the effects of weatherization and of other climate change–related retrofits of existing buildings.
 - Provide design and operation criteria for mechanical ventilation systems in new construction.
 - Include consideration of ventilation system hygiene and ventilation effectiveness.
 - Address how to maintain proper ventilation throughout the life of the system.
 - Contain “fail-safe” provisions that allow for sufficient air exchange with the outdoors to sustain occupant well-being in the event of ventilation-system breakdown or an extended power outage.
 - Achieve the objectives mentioned above in an energy- and cost efficient manner.”
 - “The Environmental Protection Agency should exercise a strong level of commitment to educate the public on issues of climate change, the indoor environment, and health. Its efforts should
 - Include materials tailored to those involved in the design, construction, operation, and maintenance of buildings and to occupants of single-family and multifamily residences.
 - Consider differences in geography, building type, age, and setting (city, suburb, and rural area) and in current and possible future climate conditions.
 - Contain specific advice on actions that will reduce the effects of climate change on the indoor environment and will improve health.”
 - “The Environmental Protection Agency should spearhead an effort across the federal government to make indoor environment and health issues an integral consideration in climate change research and action plans and, more broadly, to coordinate work on the indoor environment and health.”

1-8. *Revise the EPA’s Definition of Sustainability*



FINDING: There appears to be a wide variation in how each of the six ORD research programs define “sustainability.” EPA’s current definition of sustainability focuses on impacts on the environment but not on people; and it does not explicitly incorporate a concept of justice, fairness or proportionality. Sustainability cannot be achieved in the midst of legacy pollution and without the health and well-being of people, who are connected to the environment (including the urban, rural, natural and built environment).

RECOMMENDATIONS:

- A) EPA should formally recognize and incorporate an environmental justice perspective in its definition of sustainability. More specifically, the EPA should incorporate equity, prevention and protection of human health in its definition of sustainability, along the lines of “just sustainability.”¹⁰ “[T]he need to ensure a better quality of life for all, now and into the future, in a just and equitable manner, [while] living within the limits of supporting ecosystems.” The statement, “in a just and equitable manner” distinguishes “just sustainability” from commonly used definitions.

¹⁰ “Just sustainability” as defined by Dr. Julian Agyeman, author of “Alternatives for Community and Environment: Where Justice and Sustainability Meet.”

- B) EPA should recognize that sustainability cannot exist in the midst of legacy pollution. Only after legacy issues have been addressed in an environmental justice community can sustainability be achieved in that community. Accordingly, the EPA's definition of sustainability also should reflect a consideration of legacy pollution issues.
- C) Each EPA research program should integrate environmental justice into its sustainability work, and the EPA should use its research to support the benefits of sustainability as a benchmark to assess whether environmental justice is being achieved.
- D) EPA should incorporate equity considerations in its environmental justice-related research, by ensuring that equity indicators, including but not limited to race, ethnicity and poverty metrics, become part of a broader suite of "sustainability indicators" under development by ORD.

IMPLEMENTATION: There are several possible sources for indicators that integrate equity considerations and could serve as benchmarks. Examples include those described in the NRC's 2011 report, *Sustainability and the U.S. EPA*, which also is referred to as the "Green Book"; the *Sustainability Tools for Assessing & Rating (STAR) Communities* system (see <http://www.starcommunities.org/rating-system>); the "Neighborhood Sustainability Indicators Guidebook";¹¹ as well as several published papers including "Metrics of Local Environmental Sustainability: A Case Study in Auckland, New Zealand,"¹² "Social Indicators Research and Health-related Quality of Life Research,"¹³ and "Evaluating the Environmental Justice Impacts of Transportation Improvement Projects in the US."¹⁴ EPA could also seek the advice of the NEJAC on the definition and indicators for sustainability.

Relevant Past Recommendation:

Review of ORD's New Strategic Research Directions (SAB and BOSC, October 2011)

"...as [the] EPA develops a common definition of sustainability, the resulting definition should be used consistently across ORD. To advance sustainability as a goal, the research frameworks for each program should include sustainability as part of the research vision and identify clear metrics for assessing progress toward sustainability goals...The success of ORD's new research directions, of course, will depend upon implementation."

1-9. Conduct Research on Incentivizing Business Performance Beyond Compliance



FINDING: Environmental justice communities could benefit from business behavior beyond mere compliance with environmental regulations.

RECOMMENDATION: EPA should conduct research that would identify successful ways to incentivize responsible, proactive business behavior, in order to encourage businesses to improve their environmental performance beyond meeting minimum standards.

IMPLEMENTATION: Initial research efforts could focus on finding incentives for corporate reporting on sustainability practices and promoting transparency in general business operations (especially those that relate to emissions and discharges). Anticipating that there would be a cost associated with emissions and discharges, the market would financially reward more sustainable businesses that improve their environmental performance beyond minimum standards over less sustainable and more inefficient businesses.

¹¹ Crossroads Resource Center. 1999. "Neighborhood Sustainability Indicators Guidebook." February. Produced for the Urban Ecology Coalition.

¹² Ghosh, Sumita; Vale, Robert; Vale, Brenda. 2007. "Metrics of Local Environmental Sustainability: A Case Study in Auckland, New Zealand." *Local Environment* 12:4, 355-378.

¹³ Michalos, Alex. 2004. "Social Indicators Research and Health-Related Quality of Life Research." *Social Indicators Research* 65:27-72.

¹⁴ Chakraborty, Jayajit. 2006. "Evaluating the Environmental Justice Impacts of Transportation Improvement Projects in the US." *Transportation Research Part D* 11: 315-323.

Relevant Past Recommendations:

- ***Decision Making for the Environment: Social and Behavioral Science Research Priorities (NAS 2005)***
“The Environment in Business Decision Making: Federal agencies should substantially expand support for research to understand the influence of environmental considerations in business decisions. Although business decisions are among the dominant forces in humanity’s impact on the environment, and although many of these decisions create societal commitments that are difficult if not impossible to reverse, the role of environmental considerations in business decision making has been surprisingly and seriously understudied. Several research directions are highly promising.”
- ***Ensuring Risk Reduction in Communities with Multiple Stressors: Environmental Justice and Cumulative Risks/Impacts (NEJAC, December 2004)***
“Promote Incentives for Business and Industry: EPA should develop an affirmative strategy to incentivize members of business and industry to go beyond compliance to reduce cumulative impacts in overburdened communities. Businesses and industry that reduce their proportional share of the cumulative impacts in such communities should receive appropriate rewards in the form of public recognition for their voluntary efforts and efficient permit processing that facilitates implementation of these pollution reductions. In developing this strategy, [the] EPA should first consider the recommendations made regarding such rewards in the NEJAC’s June 2003 report, “Advancing Environmental Justice Through Pollution Prevention.”
- ***Ensuring Risk Reduction in Communities with Multiple Stressors: Environmental Justice and Cumulative Risks/Impacts (NEJAC, December 2004) (continued)***
EPA should also evaluate the examples of “regulatory reinvention” projects that have been considered successful by both the impacted community and the business and industry project participants. Three criteria are fundamental to appropriate business and industry incentives: (1) the reductions in impact must go beyond regulatory compliance to tangibly improve community health and quality of life; (2) the level of incentive must be proportional to the degree of improvement and the expectation that the largest contributors to the community burden will make the greatest efforts to reduce negative impacts; and (3) the rewards are developed in the course of collaborative dialogue among impacted community members, business and industry and the regulators. In short, the business and industry incentives must be for voluntary action beyond compliance and reflect a fair acknowledgment of business or industry’s actions to reduce environmental exposure and risk, improve community health and the environment.”

1-10. Amplify Uncertainty Analyses to Inform Risk Assessment, the Application of the Precautionary Principle and Decision Making



FINDING: Science plays a critical role in the development of risk assessments and treatment of uncertainty. For example, uncertainty must be taken into account when describing vulnerabilities (such as, in children). Additionally, “greener” approaches and products are one way to reduce short- and long-term risk. In this context, environmental justice communities could benefit from (a) the application of the Precautionary Principle – the policy and regulatory framework that assumes that if the effects of a product or action is unknown or pose a reasonable threat of serious harm, then the product should not be used or the action should not be taken – to (b) risk assessment, which requires additional understanding and treatment of not only uncertainty, but also the potential for unintended consequences.

RECOMMENDATIONS:

- A) EPA should amplify its research to focus on improving its understanding of potential unintended consequences (for example, probabilistic risk assessment), and ensure that its research can inform the Agency’s assessment of the health and other potential impacts of permit and policy decisions on a community.

- B) EPA should continue to research sustainable approaches, product design and industrial processes (as detailed in the report, *Toxic Wastes and Race at Twenty [1987-2007]*) that can reduce both short- and long-term risk.

IMPLEMENTATION: EPA could undertake a technical analysis of case studies where the Precautionary Principle was applied to better understand the science that would be needed to support such decisions arising from the application of this principle.

Relevant Past Recommendations:

- ***Environmental Decisions in the Face of Uncertainty (NAS, 2013)***
 - “RECOMMENDATION 1: To better inform the public and decision makers, U.S. Environmental Protection Agency (EPA) decision documents and other communications to the public should systematically include information on what uncertainties in the health risk assessment are present and which need to be addressed; discuss how the uncertainties affect the decision at hand; and include an explicit statement that uncertainty is inherent in science, including the science that informs EPA decisions.”
 - “RECOMMENDATION 2: The U.S. Environmental Protection Agency should develop methods to systematically describe and account for uncertainties in decision-relevant factors in addition to estimates of health risks—including technological and economic factors—in its decision-making process. When influential in a decision, those new methods should be subject to peer review.”
 - “RECOMMENDATION 3: Analysts and decision makers should describe in decision documents and other public communications uncertainties in cost–benefit analyses that are conducted, even if not required by statute for decision making, and the analyses should be described at levels that are appropriate for technical experts and non-experts.”
 - “RECOMMENDATION 5: The U.S. Environmental Protection Agency should continue to work with stakeholders, particularly the general public, in efforts to identify their values and concerns in order to determine which uncertainties in other factors, along with those in the health risk assessment, should be analyzed, factored into the decision-making process, and communicated.”
 - RECOMMENDATION 6: The U.S. Environmental Protection Agency should fund or conduct methodological research on ways to measure public values. This could allow decision makers to systematically assess and better explain the role that public sentiment and other factors that are difficult to quantify play in the decision-making process.”
 - “RECOMMENDATION 7: Although some analysis and description of uncertainty is always important, how many and what types of uncertainty analyses are carried out should depend on the specific decision problem at hand. The effort to analyze specific uncertainties through probabilistic risk assessment or quantitative uncertainty analysis should be guided by the ability of those analyses to affect the environmental decision.”
 - “RECOMMENDATION 8.1: U.S. Environmental Protection Agency (EPA) senior managers should be transparent in communicating the basis of the agency’s decisions, including the extent to which uncertainty may have influenced decisions.”
 - “RECOMMENDATION 8.2: U.S. Environmental Protection Agency decision documents and communications to the public should include a discussion of which uncertainties are and are not reducible in the near term. The implications of each to policy making should be provided in other communication documents when it might be useful for readers.”
 - “RECOMMENDATION 9.1: The U.S. Environmental Protection Agency (EPA), alone or in collaboration with other relevant agencies, should fund or conduct research on communication of uncertainties for different types of decisions and to different audiences, develop a compilation of best practices, and systematically evaluate its communications.”

Relevant Past Recommendations (continued):

- **Science and Decisions: Advancing Risk Assessment (NAS, 2009)**
 - “EPA should encourage risk assessments to characterize and communicate uncertainty and variability in all key computational steps of risk assessment—for example, exposure assessment and dose-response assessment. Uncertainty and variability analysis should be planned and managed to reflect the needs for comparative evaluation of the risk management options. In the short term, EPA should adopt a “tiered” approach for selecting the level of detail to be used in the uncertainty and variability assessments, and this should be made explicit in the planning stage. To facilitate the characterization and interpretation of uncertainty and variability in risk assessments, EPA should develop guidance to determine the appropriate level of detail needed in uncertainty and variability analyses to support decision-making and should provide clear definitions and methods for identifying and addressing different sources of uncertainty and variability.”
 - “The committee recommends that EPA implement a phased-in approach to consider chemicals under a unified dose-response assessment framework that includes a systematic evaluation of background exposures and disease processes, possible vulnerable populations, and modes of action that may affect human dose-response relationships. The [reference dose] and [reference concentration] should be redefined to take into account the probability of harm. In developing test cases, the committee recommends a flexible approach in which different conceptual models can be applied in the unified approach.”

1-11. Assess New Products



FINDING: Life cycle analysis and similar sustainability tools can examine more holistically the environmental effects of new products and forms of energy generation such as solar, biomass, hydroelectric, natural gas and nuclear power. It is unclear, however, whether these tools and analyses account for legacy pollution and cumulative impacts. Thus, it is important for the EPA to better understand whether environmental justice communities experience vulnerability and susceptibility differently than other communities in the context of such analyses.

RECOMMENDATION: EPA should conduct more research on how to incorporate vulnerability and susceptibility disparities across all stages of life cycle analyses.

IMPLEMENTATION: EPA could accomplish this through targeted research projects that incorporate legacy pollution and cumulative impacts into life cycle analysis and similar tools. EPA could begin by focusing on a particular product or form of energy generation.

Relevant Past Recommendation:

Exposure Science for the 21st Century: A Vision and a Strategy (NAS 2012)

- “A Vision for Exposure Science in the 21st Century: Predict and Anticipate: Enhancing our predictive capabilities through the development of models or modeling systems will enable us to anticipate exposures and characterize exposures that had not been previously considered. For example, modeling will improve our ability to reconstruct external exposures on the basis of the increasing number of internal markers of exposures that are being collected. In addition, exposure models and controlled simulation studies will enable sustainable innovation in developing benign nanomaterials and less toxic chemical alternatives. Predictive tools will also allow us to develop exposure information on thousands of chemicals that are now in widespread use and will enable informed safety assessments of existing and new applications for these chemicals. Finally, predictive tools will allow us to forecast, prevent, and mitigate the potential effects of major societal problems, such as climate change, security threats, and urbanization. Innovative and expedient exposure-assessment approaches that strategically use diverse information such as structural properties of chemicals, non-targeted environmental surveillance, biomonitoring, and modeling and related data-integration tools are needed for the identification and quantification of relevant exposures that may pose a threat to ecosystems or human health.”

TOPIC AREA: Research Agenda Development in Collaboration with Stakeholders

1-12. Prioritize Chemicals in Integrated Risk Information System (IRIS) Process



FINDING: Environmental justice communities may have a particular interest in knowing the specific chemicals the EPA selects for an IRIS assessment.

RECOMMENDATION: EPA should incorporate environmental justice considerations when prioritizing the chemicals that it examines under the IRIS program, which evaluates information on health effects that may result from exposure to environmental contaminants.

IMPLEMENTATION: For example, the Agency could prioritize the chemicals based on a screening assessment of who is exposed and their associated demographics, noting the characteristics of vulnerable populations, the magnitude of exposure and whether there are potential cumulative risks due to interactions of chemicals with other forms of pollution that may likely accompany a particular industrial use of a chemical.

Relevant Past Recommendation:

Exposure Science for the 21st Century: A Vision and a Strategy (NAS 2012)

“[E]xposure science needs to continue to build capacity to: Engage stakeholders associated with the development, review, and use of exposure-science information, including regulatory and health agencies and groups that might be disproportionately affected by exposures—that is, engage broader audiences in ways that contribute to problem formulation, monitoring and data collection, access to data, and development of decision-making tools. Ultimately, the scientific results derived from the research will empower individuals, communities, and agencies to prevent and reduce exposures and to address environmental disparities.”

1-13. Investigate Potential Disproportionate Effects of Pesticide Exposure of Rural and Urban Farmworkers



FINDING: There are states where agriculture is the primary industry. Pesticides that are banned for residential use out of concerns for health threats are still used on farms, resulting in workers' exposure and other broader contamination. Pesticide (including herbicide) exposure to workers is also a concern in urban farming.

RECOMMENDATION: EPA should conduct research in order to identify potential disproportionate effects of pesticide exposure on workers and vulnerable communities in rural and urban areas.

IMPLEMENTATION: EPA could synthesize available research findings on worker pesticide exposures in order to identify research gaps and areas for further investigation.

TOPIC AREA: Research Implementation, Partnerships and Funding

1-14. Promote Health Impact Assessment (HIA) Method



FINDING: There is a growing body of evidence to support the benefits of HIAs, which assess policies and programs in a systematic way in terms of potential benefits and negative effects on human health. HIAs consider data from multiple cross-disciplinary research sources. EPA needs to understand and promote the value of using HIAs to evaluate its policies and programs, including the key questions HIAs should answer.

RECOMMENDATIONS:

- A) EPA should establish guidelines on how and when HIAs should be conducted, including suggested questions that should be asked, and examples of “best practices” and case studies of HIAs. “Ground truthing” – or visiting the community in person to assess actual conditions – should be part of developing HIAs.
- B) EPA should encourage the use of HIAs in developing and awarding grants.

IMPLEMENTATION: EPA could convene a work group of stakeholders (including the White House Council on Environmental Quality) and knowledgeable persons (such as, but not limited to, experts from Pew Trust and California state agencies) to develop these guidelines on how and when HIAs should be conducted, and work in partnership with the EPA regional offices to convene meetings on HIAs with local academia, business leaders, policy makers, community members, NGOs and tribal¹⁵ governments and organizations.

1-15. Adjust Extramural Research Review Process



FINDING: EPA provides grant funding to various research projects and jointly funds efforts with other agencies, such as the National Institutes of Health (NIH), particularly the NIEHS and NIMHD. It is not clear, however, whether the requests for proposals and grant review processes involve the necessary expertise to fully consider the environmental justice challenges faced by vulnerable communities in the research. EPA needs to ensure that grant review committees assess applicability of environmental justice considerations, and provide guidance and an environmental health perspective to the review process.

RECOMMENDATIONS:

- A) As part of the EPA's consideration of environmental justice in its activities (as described in Recommendation 1-3, Conduct and Collect Data for Longitudinal Studies), the Agency should, through its proposal and grant review processes, ensure that research projects funded (or co-funded) by the Agency include an emphasis on studies that further the understanding of the determinants of environmental injustice and strategies for preventing or eliminating them.
- B) EPA should provide training to grant reviewers on how to assess the extent to which environmental justice issues are being addressed.

IMPLEMENTATION: EPA could specify in the RFAs that additional points are awarded to proposals that involve community-engaged research (such as CBPR), community input and consideration of environmental justice issues. EPA could also develop guidelines for the environmental components of partnership grants and criteria for the selection of peer reviewers.

1-16. Investigate Environmental Contribution to Health Disparities



FINDING: EPA needs to communicate that there is an environmental component to health disparities in low-income and minority populations. For example, the NIH, which focuses its research to improve the health of communities, does not fully consider environmental influences on health disparities as part of its research. There is a need to reach other HHS agencies with the message regarding the environmental contribution to health disparities.

RECOMMENDATION: In recognition that environmental exposure can be mitigated or exacerbated by many factors, the EPA should not only continue to engage in research that is mindful of environmental contributors to health disparities and how the various factors are related, but also expand the conduct of its extramural research in partnership with other federal agencies aiming to reduce health disparities in vulnerable populations.

¹⁵ **Tribal:** Pertains to American Indians, Alaskan Natives, Native Hawaiians and other indigenous peoples.

IMPLEMENTATION: For example, through the EPA's participation in interagency task forces, the Agency could encourage NIH, the largest funder of research on health disparities, to further research the contribution of environmental exposures on health disparities. EPA could form similar partnerships with other HHS agencies such as the Agency for Toxic Substances and Disease Registry (ATSDR), CDC, Indian Health Service (IHS), Office of Minority Health (OMH) and the Office of the Assistant Secretary for Health. EPA could also partner with the DOE, given that goals three and four of the DOE's *Environmental Justice Five Year Implementation Plan* focus on identifying DOE activities that improve research and data collection methods related to minority, low-income and tribal¹⁶ populations with respect to human health and the environment, and integrating environmental justice in DOE's activities and processes.

Relevant Past Recommendation:

- ***Environmental Justice and Community-Based Health Model Discussion (NEJAC, February 2001)***

"Promote More Effective Interagency Collaboration and Cooperation. EPA and other federal agencies should establish more extensive formal and informal interagency mechanisms to help assure that the necessary expertise and other resources are brought to bear on eliminating health disparities and disproportionate exposures. Part of this process would better define responsibilities and available resources for dealing with specific problems and issues."

1-17. Partner to Advance Access to Health Care in Communities Experiencing Environmental Inequities



FINDING: Health status is an important factor in vulnerability and susceptibility to environmental risk. Improving access to health care is a fundamental means of improving health status and prevention, which in turn can reduce susceptibility. Communities lacking access to health care may experience environmental inequities and legacy pollution that has contributed to present health disparities.¹⁷

RECOMMENDATION: Through the EPA's participation in interagency task forces, the Agency should encourage funding opportunities for community-level health care in communities that do not have access to care and are overburdened by pollution.

IMPLEMENTATION: HHS currently is funding research on the comparative effectiveness of treatments under the Patient Protection and Affordable Care Act (PPACA), which HHS oversees. EPA could leverage this opportunity to bring the environmental perspective to this research effort, specifically, that certain communities that are vulnerable due to environmental pollutants may respond differently to treatments and intervention. EPA also could identify potential funding sources under the PPACA for researching and addressing legacy pollution and health disparities in vulnerable communities, and for educational health programs at community health centers and clinics.

¹⁶ **Tribal:** Pertains to American Indians, Alaskan Natives, Native Hawaiians and other indigenous peoples.

¹⁷ **Legacy pollution:** Chemicals that remain in the environment long after they were first introduced. Often, these chemicals were not recognized as harmful when they were originally used. Examples of legacy pollutants include PCBs and heavy metals, such as lead and mercury.

Relevant Past Recommendation:

- ***Environmental Justice and Community-Based Health Model Discussion (NEJAC, February 2001)***

"Respond to Urgent Needs of Medically Underserved Communities. EPA and other federal agencies need to further examine the most significant needs of medically underserved communities. The mechanisms established to address these concerns should be brought to bear to eliminate or reduce disparities in health care access and improving environmental health education."

TOPIC AREA: RESEARCH TRANSLATION AND COMMUNICATION

1-18. Translate Research to Policy Makers



FINDING: According to Dankwa-Mullen et al., “translational, trans-disciplinary and transformational research stands to become a paradigm-shifting mantra for research in health disparities.”¹⁸

Relevant Past Recommendation:

- ***Environmental Justice and Community-Based Health Model Discussion (NEJAC, February 2001)***

"Place Greater Emphasis on Translating Current and Future Scientific Knowledge Into Positive Action. EPA and other federal agencies may fail to act on a problem because of an inability to “prove” a causal relationship. Having said that, greater emphasis needs to be placed on translating current and future scientific knowledge into more positive action at the policy and community level (that is, what can the government do to help, even though the exact science is not readily available or known)."

RECOMMENDATION: EPA should engage in and support translational research – or research that includes a translational component in which researchers disseminate research findings to policy makers, such as local and state departments of health and environmental protection offices, and communities, academia, businesses, NGOs, tribal¹⁹ governments and organizations, and federal, state and local governments – that would facilitate relevant community-level interventions and improve agency protocols and procedures. Additionally, the EPA’s scientists with academic research grantees should convey locally useful and applicable research results to all environmental justice stakeholders.

IMPLEMENTATION: EPA could continue to implement a strategic dissemination strategy in order to convey its own research in an easy-to-understand way to stakeholders – for example, by creating and disseminating research findings in the form of fact sheets and other user-friendly formats – in addition to requiring grant applicants and awardees to do the same. EPA could develop a standard format for its researchers to present their findings to stakeholders.

¹⁸ Am J Public Health. 2010 April; 100(S1): S19–S24.

¹⁹ Tribal: Pertains to American Indians, Alaskan Natives, Native Hawaiians and other indigenous peoples.

TOPIC AREA: RESEARCH EVALUATION

1-19. Evaluate the EPA's Integration of Environmental Justice into Decision-Making



FINDING: EPA established its Office of Environmental Justice (OEJ) in the early 1990s. OEJ's mission is "to facilitate the Agency efforts to protect environment and public health in minority, low-income, tribal and other vulnerable communities by integrating environmental justice into all programs, policies and activities." It does not appear, however, that the Agency has fully institutionalized the consideration of environmental justice in all its activities to date.

RECOMMENDATIONS:

- A) EPA should conduct an internal evaluation and organizational assessment of
 - i. The extent to which ORD is integrating environmental justice into its operations.
 - ii. Whether and how ORD's research is being used in regulation and enforcement activities by other offices.
 - iii. How ORD can improve or enhance the applicability of its research.
- B) EPA should establish ways to measure identified outcomes before and after its research goals and plans are implemented.

IMPLEMENTATION: In order to assess the extent to which ORD is integrating environmental justice into its operations, the EPA could contract with independent evaluators who would develop an assessment tool that details appropriate metrics and outcomes. EPA could consult NEJAC as part of this process. Following the assessment of ORD, the EPA may consider applying a similar evaluation to its other offices.

Charge Question 2: Community-Inclusive, Meaningful and Continuous Participatory Processes

How can ORD implement a community-inclusive, meaningful, and continuous participatory process in the development of the EPA scientific research agendas? In order to strengthen the relevance and quality of its research and development enterprise, how can ORD most effectively work collaboratively with communities in the execution of its research programs (for example, community-based participatory research)?

Response Summary to Charge Question 2:

EPA should share a “living list” of the Agency’s research projects that includes community involvement components with environmental justice stakeholders and the public. The Agency also should use proven community-based models of equitable participation (such as, CBPR) to authentically engage communities in defining its research agendas. EPA should support and provide funds for extramural projects that involve community-engaged research, build capacity in the community and promote sustainable public engagement. The Agency should continue offering “plain language” webinars and similar outreach to convey to the public information related to its research agenda, research context and how results are used to influence policy decisions. EPA should also help educate and train the next generation of scientists and engineers in environmental justice issues.

TOPIC AREA: Research Agenda Development in Collaboration with Stakeholders

2-1. Engage Communities in Setting the Research Agenda



FINDING: CBPR and similar community-engaged research programs are proven approaches to meaningful public engagement. To date, however, the development of the EPA’s research agenda has not been done with systematic and sustained community engagement. The Agency needs to be clear on how it will frame and define its scientific research agenda to involve a collaborative partnership approach. Doing so will help the EPA listen to what research communities believe is important and promote better understanding of the communities’ and the EPA’s research priorities.

RECOMMENDATION: EPA should use proven community-based models of equitable participation to authentically engage communities in defining its research agendas.

IMPLEMENTATION: The NIEHS invited community-based organizations to participate in a series of strategic planning meetings to ensure that environmental justice principles were incorporated into key research areas. EPA could adopt this model. This process benefitted

NIEHS by revealing the type of research environmental justice communities were interested in and considered to be important. The discussion at the planning meetings also increased the communities' understanding of relevant research. NIEHS then presented its research agenda and priorities to its public interest partners group, which included community-based advocates, and thus obtained feedback. EPA could schedule similar meetings as an opportunity to advance the Agency's research agenda as well as to receive feedback from communities to ensure and improve environmental health protection.

Relevant Past Recommendations:

- **Public Participation in Environmental Assessment and Decision Making (NAS, 2008)**

- "Recommendation 1: Public participation should be fully incorporated into environmental assessment and decision-making processes, and it should be recognized by government agencies and other organizers of the processes as a requisite of effective action, not merely a formal procedural requirement."
- "Recommendation 2: When government agencies engage in public participation, they should do so with
 - clarity of purpose,
 - a commitment to use the process to inform their actions,
 - adequate funding and staff,
 - appropriate timing in relation to decisions,
 - a focus on implementation, and
 - a commitment to self-assessment and learning from experience."
- "Recommendation 3: Agencies undertaking a public participation process should, considering the purposes of the process, design it to address the challenges that arise from particular contexts. Process design should be guided by four principles:
 1. inclusiveness of participation,
 2. collaborative problem formulation and process design,
 3. transparency of the process, and
 4. good-faith communication."
- "Recommendation 4: Environmental assessments and decisions with substantial scientific content should be supported with collaborative, broadly based, integrated, and iterative analytic-deliberative processes, such as those described in Understanding Risk and subsequent National Research Council reports. In designing such processes, the responsible agencies can benefit from following five key principles for effectively melding scientific analysis and public participation:
 1. ensuring transparency of decision-relevant information and analysis,
 2. paying explicit attention to both facts and values,
 3. promoting explicitness about assumptions and uncertainties,
 4. including independent review of official analysis and/or engaging in a process of collaborative inquiry with interested and affected parties, and
 5. allowing for iteration to reconsider past conclusions on the basis of new information."

- **Public Participation in Environmental Assessment and Decision Making (NAS, 2008) (continued)**

- "Recommendation 5: Public participation practitioners, working with the responsible agency and the participants, should adopt a best-process regime consisting of four elements:
 1. diagnosis of the context,
 2. collaborative choice of techniques to meet difficulties expected because of the context,
 3. monitoring of the process to see how well it is working, and
 4. iteration, including changes in tools and techniques if needed to overcome difficulties.

Relevant Past Recommendations (continued):

- **Ensuring Risk Reduction in Communities with Multiple Stressors: Environmental Justice and Cumulative Risks/Impacts (NEJAC, December 2004)**

"Elevate the Importance of Community-Based Approaches: EPA should develop and implement a systematic plan to elevate the importance of community-based approaches. Such a plan begins with the recognition that the effectiveness of Agency managers and staff, particularly those with a regulatory background, would be enhanced by an understanding of the positive role that community initiative[s] can play in reaching the Agency's environmental and public health goals. This plan should be developed, therefore, around activities in communities that both result in tangible community benefits and demonstrate the success of this approach. All [the] EPA Regional and Headquarter Offices should develop and implement activities to achieve this goal. The second part of this plan should include a systematic process of research, education, training, and dialogue among Agency staff on community-based approaches to environmental protection. These activities should be intended to promote awareness and understanding of the premises, methods, and experience related community based approaches. Areas of examination should include environmental justice, community-based participatory research, collaborative problem solving, dispute resolution, and others. In addition, special meetings should be convened by offices and groups such as the Innovation Action Council, Office of Environmental Justice, Conflict Prevention and Resolution Center, Public Involvement Improvement Council, and their regional counterparts. As part of this plan, [the] EPA also should facilitate dialogue among its federal, state, tribal, and local governmental partners, business and industry, universities, professional organizations, non-profit organizations, and philanthropies about working together to promote community-based approaches. Last, the Administrator should provide vision and direction on the importance of community-based solutions in the next generation of environmental protection. Likewise, such direction should be provided by all EPA Assistant Administrators and Regional Administrators."

TOPIC AREA: Research Implementation, Partnerships and Funding

2-2. Incorporate Community-Engaged Research Models Into Research Program Implementation



FINDING: There are opportunities for the EPA to engage communities during intramural research activities, especially those that will support promulgating standards. Additionally, there are few examples of where the EPA's scientists have collaborated with an existing CBPR partnership project. A notable example is EPA's Community Action for a Renewed Environment (CARE) program, which incorporated critical local knowledge as part of problem solving. It is important for the EPA's researchers to build on the trust and partnerships that environmental justice community-based organizations have with communities. The research often conducted by the Agency is short-term, and by working with existing community-based research efforts, the EPA could build upon the trust that already exists, enhance recruitment and retention of research participants and increase the relevance of its research findings.

RECOMMENDATIONS:

- A) EPA should incorporate community-engaged research (such as, CBPR) in the Agency's research programs and jointly develop culturally appropriate "operating norms" and collaborative research principles for partnerships and research-based interactions between the Agency and communities, where feasible.
- B) EPA should determine how to collaborate with communities to carry out its studies through its intramural research program. EPA should consider CBPR as a potential approach, but also recognize that there are other ways to apply a collaborative approach besides CBPR.
- C) EPA should continue to support and fund extramural research projects that use a collaborative research approach, such as CBPR.

- D) EPA should encourage ORD researchers to reach out to offices such as the EPA's OEJ to work with environmental justice communities.

IMPLEMENTATION: EPA could explore partnering opportunities with existing CBPR projects currently “on the ground” conducting research that is relevant to the EPA’s research agenda. Additionally, ORD can take advantage of existing environmental justice expertise in other parts of the Agency to better understand and identify the environmental justice groups to engage in partnerships.

Resources the EPA could consult include: The Detroit Community-Academic Urban Research Center (<http://www.detroiturc.org>), the training website Community-Based Participatory Research: A Partnership Approach for Public Health (<http://www.cbpr-training.org>) and Community-Campus Partnerships for Health (<http://www.ccpb.info>) and their Listserv.

2-3. *Build Community Capacity through Partnerships and Technical Assistance*



FINDING: Community organizations often seek additional technical expertise and access to information in order to more effectively provide input into environmental research agendas or the decision-making process; and therefore, would benefit from additional capacity, funding and expertise.

RECOMMENDATION: EPA should provide funding or technical assistance to local community-based organizations and environmental justice groups who can use those resources to build science and technical capacity in the community and promote sustainable public engagement.

IMPLEMENTATION: For example, the EPA could provide resources to community-based organizations to conduct basic training with communities on relevant environmental and environmental justice concepts that affect them (for example, risk assessment and “Toxicology 101”).

Relevant Past Recommendation:

- ***Ensuring Risk Reduction in Communities with Multiple Stressors: Environmental Justice and Cumulative Risks/Impacts (NEJAC, December 2004)***

"Provide Resources for Community-Based Organizations: EPA should ensure that adequate resources are being made available to community-based organizations. EPA should institute new and/or increase the amount of funding available to community based organizations, following examples of past and present grant programs. Additionally, direct support of community-based organizations should be incorporated into other areas where this goal is not a priority. These funds should be complemented by more innovative ways of ensuring that information on such programs are disseminated to community based organizations. Recognizing that community-based organizations require assistance in areas of grant management, the Agency should provide training on grant management. Last, EPA should proactively work with other groups, such as philanthropies, to ensure that resources and technical assistance are provided to community-based organizations."

TOPIC AREA: Research Translation and Communication

2-4. Communicate Community-Engaged Research



FINDING: ORD's intramural and extramural programs both include projects involving communities.

RECOMMENDATION: EPA should compile a "living list" of ongoing research projects that include community involvement components that can be shared with interested stakeholders.

IMPLEMENTATION: EPA could communicate its community-engaged research on the Agency's website and inform stakeholder partners such as academia, businesses, NGOs, tribal²⁰ governments and organizations, and federal, state and local government agencies as new projects are started or completed.

Relevant Past Recommendation:

- **Ensuring Risk Reduction in Communities with Multiple Stressors: Environmental Justice and Cumulative Risks/Impacts (NEJAC, December 2004)**

"Initiate Community-Based, Collaborative, Multi-Media, Risk Reduction Pilot Projects: EPA should initiate a set of community-based, multi-media, risk reduction pilot projects in low- income, people of color, and/or tribal communities as part of a broad national community-based effort to address risks in such communities. These should be the focus of [the] EPA's bias for action in addressing cumulative risks and impacts. There should be at least one per each EPA Region, as well as attention to tribal populations. Activities should include but not be limited to community based assessment, partnership building, provision of resources, prevention/ intervention risk reduction efforts and application of the Agency's Environmental Justice Collaborative Problem-Solving Model. In addition, [the] EPA should systematically take the lessons gained from the pilot projects and integrate them into EPA programs as part of the Agency's day-to-day activities. These pilot projects should be part of a short-term and long-term research agenda on community based, multi-media, collaborative problem-solving approaches to achieve environmental justice and healthy communities. The projects, and its associated research agenda, should:

- Include community-based participatory research elements in the selection criteria.
- Consider racial, ethnic, economic, and tribal status in pilot selection.
- Provide lessons on ways to overcome programmatic and regulatory fragmentation.
- Involve other federal agencies, where appropriate.
- Document and disseminate information from projects.
- Be incorporated into Headquarters and Regional Environmental Justice Action Plans."

2-5. Increase Use of Technology to Communicate and Educate Stakeholders



FINDING: EPA has conducted useful and informative cumulative risk webinars for community members and other environmental justice stakeholders. In particular, technology is an important way to reach communities in remote areas.

RECOMMENDATION: EPA should continue using webinars and similar media to convey information to the public related to its research agenda, research context and how results are used to influence policy decisions because such methods can be more cost-effective and reach wider audiences than in-person meetings. Information conveyed in these sessions should be presented in "plain language" and accompanied by reference materials.

IMPLEMENTATION: EPA could also maintain all of its webinar recordings on a central website similar to the approach used by the NIH. To view NIH's videocasting and podcasting website, visit <https://videocast.nih.gov/default.asp>.

²⁰ **Tribal:** Pertains to American Indians, Alaskan Natives, Native Hawaiians and other indigenous peoples.

Relevant Past Recommendation:

- ***NACEPT's Review of EPA's Strategy for Improving Access to Environmental Information (NACEPT, November 2008)***

"NACEPT recommends that [the] EPA focus on how it can make [the Agency's] information more available and searchable for external search engines, such as Google and Yahoo, which is the predominant pathway the public uses to get to EPA information. As discussed at a Senate hearing last December, some public information is not actually accessible through these commercial search engines due to software design issues. By changing the format of its data, EPA could open up a lot more information to effective searches through the sites that the public routinely uses."

2-6. *Promote Environmental Justice Education and Training of the Next Generation of Scientists and Engineers*



FINDING: The First National People of Color Environmental Justice Leadership Summit held in October 1991, in Washington, D.C., resulted in the adoption of 17 "Principles of Environmental Justice," which helped shape the history of environmental justice in the U.S. and the EPA's efforts to achieve environmental justice in its policies and program activities. One of the 17 principles called for the education of "present and future generations which emphasizes social and environmental issues, based on our experience and an appreciation of our diverse cultural perspective." It will be critical to achieving beneficial outcomes in environmental justice communities for the next generation of scientists, engineers and policy makers to understand issues and challenges related to environmental inequities.

RECOMMENDATION: EPA should ensure that environmental justice principles are part of its training and fellowship programs in order to promote a better educated talent pool to address its workforce needs.

IMPLEMENTATION: EPA could target fellowship program opportunities for undergraduate students, graduate students and post-doctoral graduates in environmental justice-related areas.

Charge Question 3:

Customizing ORD Tools and Other Outputs to be Effective for Local Decision Makers, Impacted Communities and Other Stakeholders

How can the outputs of ORD's research programs – such as tools like C-FERST and reports of new discoveries – be developed and customized to inform and respond to all stakeholders on how to address environmental inequities? (Stakeholders include academia; businesses; NGOs; tribal governments and organizations; federal, state and local government agencies; and disproportionately-impacted communities.) How can ORD determine whether its research products and outputs are having a demonstrated impact with respect to addressing and preventing environmental inequities?

Response Summary to Charge Question 3:

The Agency should customize its research outputs by engaging stakeholders early in the planning process as well as during evaluation of their effectiveness. EPA should improve its data collection and sharing to increase assessment of health disparities and other burdens of pollution “on the ground” and allow for comparisons in vulnerable communities over time. The Agency should continue serving as a convener of stakeholders to encourage collaboration and identify and clarify research questions needed to address environmental inequities. Furthermore, the EPA should offer opportunities for environmental justice scholars and interns from academia and NGOs to work alongside the EPA’s scientists, and allow the Agency’s researchers to take on temporary assignments with research institutions, NGOs and community-based organizations focusing on environmental justice research issues.

TOPIC AREA: Research Needs, Gaps and Framework

3-1. Collect Data for Evaluating Improvements in Environmental Conditions and Health Outcomes



FINDING: Key challenges associated with evaluating the effectiveness of the EPA’s efforts to achieve environmental justice have included difficulties in appropriately identifying communities with environmental justice concerns and working with screening tools that only allow for cross-sectional analysis and do not lend themselves to examining changes over time. Information in the screening tools should be at a finer geographic resolution to better identify and locate environmental justice communities. Additionally, there is a need for collecting and analyzing data longitudinally to better assess whether environmental and health conditions are improving or getting worse over time, whether environmental disparities are decreasing or increasing, whether there will be links between current environmental conditions and future health outcomes, and the

magnitude and proportion of those links.

RECOMMENDATION: In order to better understand the role and magnitude that environmental factors have on health disparities, the EPA should improve its data collection and sharing, and development of screening tools to increase assessment of environmental and health disparities and allow for comparison of environmental and health disparities over time (for example, improvements in air quality). EPA also should develop methods and gather data to assess "on the ground" whether improvements in environmental and health conditions in vulnerable communities actually are being achieved over time, and the proportionate relationships between them.

IMPLEMENTATION: Examples of assessment criteria could include measures of health improvements "on the ground" and the relative differential exposures to certain groups of chemicals or across certain populations in a given geographic area. These "ground-truthing" assessments of environmental and health disparities could be made (1) in specific impacted communities that have been identified by screening tools and (2) across the nation overall. Furthermore, the screening tools could be sensitive and flexible enough to capture changes within a single year. The CARE program, for example, offers ways to identify the necessary data to assess changes over time. It will be important for the EPA to develop the necessary state and local relationships needed to link its tools to health tracking efforts at a local level.

TOPIC AREA: Research Agenda Development in Collaboration with Stakeholders

3-2. Encourage Collaboration in Setting the Research Agenda



FINDING: EPA currently offers workshops and seminars to bring stakeholders together and facilitate the communication of consistent messages to the public on critical environmental issues.

RECOMMENDATION: EPA should continue serving as a convener of stakeholders to encourage collaboration among various entities – including academia, businesses, NGOs, tribal²¹ governments and organizations, federal, state and local government agencies, community members and other groups who work in vulnerable communities – in order to identify and clarify research questions needed to address environmental inequities. EPA should use its influence to bring together individuals and agencies that may not already be at the table and jointly develop approaches and answers to pressing environmental questions.

IMPLEMENTATION: EPA could expand its grantee meetings to include a broader stakeholder group in the context of this recommendation to discuss emerging methods and issues.

²¹ **Tribal:** Pertains to American Indians, Alaskan Natives, Native Hawaiians and other indigenous peoples.

Relevant Past Recommendation:

- ***Ensuring Risk Reduction in Communities with Multiple Stressors: Environmental Justice and Cumulative Risks/Impacts (NEJAC, December 2004)***

"Conduct Scientific and Stakeholder Dialogues in Ways that Enhance Scientific Understanding and Collaborative Problem-Solving Ability: EPA should convene, support, and promote a series of workshops, focus groups, stakeholder meetings, scientific symposia, conferences, and other dialogues to promote greater understanding and consensus around the concepts in this report. Such dialogues are critical to ensuring a sound scientific foundations as well as multi-stakeholder understanding. They are critical to building strategic partnerships—in the private and public sectors and in communities—for the collaborative undertakings called for by this report. In particular, they are critical to bringing diverse perspectives together, and holding them together through periods of experimentation and learning. Such dialogues can be useful catalysts for the long- term building of collaborative problem-solving capacity in the form of strong institutions, shared understandings and perspectives, and leadership and vision."

3-3. *Identify and Engage Relevant Stakeholders*



FINDING: EPA staff needs to be aware of the existing relationship between local decision makers and impacted communities, two distinctly separate constituencies that are often disconnected and may share divergent views. Efforts to obtain local input on projects that include local decision makers but do not include established, respected voices of impacted communities, however, can preclude valuable contributions and detract from research and project outcomes. Likewise, excluding local decision makers can reduce chances of acceptance, adoption and use of ORD tools and products and, accordingly, markedly hinder dissemination and use of findings of locally-relevant research.

RECOMMENDATION: When developing, testing and disseminating environmental justice tools and other products and when conducting environmental justice-related research at the local level, the EPA should carefully identify appropriate stakeholders that can legitimately represent perspectives of local decision makers and impacted communities and help ensure broad stakeholder participation. EPA should conduct effective outreach and ensure adequate community involvement in various phases of the Agency's projects.

IMPLEMENTATION: EPA could form project community steering groups on a case-by-case basis. These could be comprised of researchers who work directly with specific environmental justice communities, community leaders, and representatives from other stakeholder groups such as academia, businesses, NGOs, tribal²² governments and organizations, and federal, state and local government agencies. EPA also could conduct community and stakeholder assessments to identify appropriate community representatives and look to NGOs working on environmental justice issues to represent and reach out to their communities for input.

3-4. *Engage Stakeholders in the Development of Research Products and Tools*



FINDING: Community-engaged partnerships are critical to the translational aspect of research, and communicating how research can be used to inform policy and practice. Partnering and sharing findings with existing academic and community-based organizations that are involved in research in areas similar to ones on ORD's research agenda are important continuing aspects of ORD's programs. Changes at the community level are the "litmus test" to verify whether improvements are indeed occurring. This approach would ensure that community input is considered in the planning, execution and assessment of Agency research tools. It also would help the EPA build credibility in the communities.

²² **Tribal:** Pertains to American Indians, Alaskan Natives, Native Hawaiians and other indigenous peoples.

RECOMMENDATION: EPA should customize its research outputs by engaging in the early planning stages with stakeholders (including academia, businesses, NGOs, tribal²³ governments and organizations, federal, state and local government agencies, and disproportionately-impacted communities) to obtain their input during the development and evaluation of each output or product from its research programs. The research products and outputs should be associated with those plans that have been outlined with community input, and their effectiveness should be evaluated with the involvement of stakeholders.

IMPLEMENTATION: EPA could organize regional “round tables” where stakeholders come together to discuss scientific findings to inform the EPA on how to develop more protective environmental health measures. Potentially useful resources include the National Center for Advancing Translational Sciences and the Clinical and Translational Science Awards websites (for example, see <http://www.ncats.nih.gov/research/reengineering/tox21/tox21.html>). EPA regional listening sessions may also serve as another mechanism that could be better used, as long as outputs and responses are appropriately disseminated to stakeholders afterwards.

TOPIC AREA: Research Implementation, Partnerships and Funding

3-5. Develop Personnel Exchanges



FINDING: EPA currently offers an Intergovernmental Personnel Assignment (IPA) program, which allows for an “exchange” of personnel between agencies.

RECOMMENDATION: EPA should continue offering such programs and consider an environmental justice scholarship or internship program that would allow rotating environmental justice scholars to take a sabbatical from their usual research to work alongside EPA scientists. Such programs would help establish a bridge between the EPA and the academic community, and between the EPA and NGOs on environmental justice research projects. Additionally, EPA scientists should take IPA assignments with research institutions, NGOs and community-based organizations focusing on environmental justice research issues.

IMPLEMENTATION: EPA could consider assignments to local government where capacity on environmental health is needed. Fellowship programs where outside expertise is hosted by the EPA temporarily could serve as an example or model for the Agency.

²³ **Tribal:** Pertains to American Indians, Alaskan Natives, Native Hawaiians and other indigenous peoples.

Charge Question 4:

Criteria for Independently Assessing the Impact of ORD Research

What criteria should ORD use to assess the impact of its research with respect to environmental justice and the EPA decision making?

Response Summary to Charge Question 4:

EPA should develop and use criteria to independently assess the impact of its research on environmental justice communities. Criteria for this assessment should include the effectiveness of its partnerships with stakeholders – such as academia, businesses, NGOs, tribal²⁴ governments and organizations, and federal, state and local government agencies and community leaders – and the success of its process in engaging communities in its research. In its evaluation of the effectiveness of tools and outputs, the EPA should incorporate a determination of whether and how community leaders, local governments and business leaders have used the tools in decision-making and enforcement efforts. EPA should further ensure that its research outputs connect to beneficial outcomes for environmental justice communities. EPA should consider the use of independent evaluators when conducting the assessments.

TOPIC AREA: Research Evaluation

4-1. Assess Research Outputs' Support of Environmental Justice Outcomes



FINDING: While much of the EPA's work is at the "output" stage, environmental health disparities are problematic at the "outcome" stage. Currently, the EPA has little information on how to judge whether its research investment has achieved positive outcomes in environmental justice communities.

RECOMMENDATION: EPA should further ensure that its research outputs connect to beneficial outcomes for environmental justice communities. EPA should incorporate a formal third-party evaluation to assess the range of possible effects (for example, health, behavioral, decision-making, environmental and economic) of ORD research outputs and programs on environmental justice communities and on the environmental performance of emitters and dischargers as they may relate to environmental justice communities.

²⁴ **Tribal:** Pertains to American Indians, Alaskan Natives, Native Hawaiians and other indigenous peoples.

IMPLEMENTATION: EPA could convene a work group of internal staff and external partners from affected communities to define a broad suite of metrics and criteria that could be used to assess the degree to which the EPA’s research enterprise has supported beneficial environmental justice outcomes. The overall evaluation could be achieved by the BOSC, which evaluates ORD’s work. The evaluation could involve the collection of quantitative and qualitative data, such as “checkbox”-type formats, and it also could involve focus groups and interviews with community members and other relevant stakeholders. EPA could also make use of logic models and a broad-based, comprehensive strategic planning process that will better link research outputs to environmental justice outcomes.



Relevant Past Recommendations:

- **Science for Environmental Protection: The Road Ahead (NAS, 2012)**
 - “Creating a process to set priorities for improving the quality of EPA’s scientific endeavors. The process should recognize the inevitably limited resources while clearly articulating the level of resources required for EPA to continue to ensure the future health and safety of humans and ecosystems.”
 - “The committee recommends that EPA invest substantial effort to generate broader, deeper, and sustained support for long-term monitoring of key indicators of environmental quality and performance.”
- **Decision Making for the Environment: Social and Behavioral Science Research Priorities (NAS 2005)**
 - “Improving Environmental Decision Processes: Federal agencies should support a program of research in the decision sciences addressed to improving the analytical tools and deliberative processes necessary for good environmental decision making.”
 - “Environmental Policy Evaluation: Federal agencies should support a concerted research effort to evaluate the effectiveness of environmental policies established by public and private actors at the international, national, state, and local levels. This research would apply techniques of evaluation research that have been used primarily to assess the effectiveness of social welfare policies to the domain of environmental protection. It would examine the outcomes of environmental regulations and other environmental policies in terms of effectiveness, efficiency, fairness, and public acceptability and strengthen methods and capacity for determining the results of environmental policies.”
 - “Improving Environmental Forecasting: Federal environmental agencies should undertake an assortment of research initiatives to collect, appraise, develop, and extend analytic activities related to forecasting in order to improve environmental understanding and decision making. As with the development of indicators, forecasting efforts should focus from the start on the human setting of environmental decision making, should encompass human influences on the environment as well as biophysical processes, and should be directed at decision-relevant outcomes, including environmental, health, and socioeconomic outcomes and the distribution of these outcomes across segments of the population. We specifically recommend support for efforts to identify best practices in forecasting, for continuing environmental modeling forums patterned on the Energy Modeling Forum at Stanford University, and for improving ways to describe uncertainties in forecasts.”
- **Toward Integrated Environmental Decision-Making Recommendations (SAB, August 2000)**

“EPA, by itself and in concert with others, should develop a system of ‘report cards’ to organize and disseminate information on the status of ecological and human health and the quality of life in order to assess the effectiveness of its environmental decisions and to guide future environmental management.”

4-2. Assess Effectiveness of Stakeholder Partnerships



FINDING: Effective collaborative partnerships among multiple parties are necessary to successfully addressing environmental justice concerns in communities.

RECOMMENDATION: EPA should assess the success of its research on environmental justice-related decision making by examining the effectiveness of partnerships and the process of engaging communities in research. EPA should develop criteria to evaluate whether it has facilitated interactions among key environmental justice and other stakeholders – such as academia, businesses, NGOs, tribal²⁵ governments and organizations, federal, state and local government agencies, and community leaders – in setting its research agenda and evaluating its

²⁵ **Tribal:** Pertains to American Indians, Alaskan Natives, Native Hawaiians and other indigenous peoples.

programs and efforts.

IMPLEMENTATION: EPA could reference NIEHS' Partnerships for Environmental Public Health Evaluation Metrics Manual on evaluating environmental public health programs (including partnerships and process). EPA could appoint an evaluator and review the NIEHS manual found at <http://www.niehs.nih.gov/research/supported/dert/sphb/programs/peph/metrics/index.cfm>.

4-3. *Assess Use of EPA Tools*



FINDING: It is important for the EPA to understand not just who uses its tools and outputs, but why and how. This kind of information can assist the EPA in better tailoring its tool development toward uses that impact decision making to the benefit of environmental justice communities.

RECOMMENDATION: In its evaluation of the effectiveness of its tools and outputs, the EPA should incorporate a determination of whether community leaders, local governments and business leaders have used the tools in decision-making and enforcement efforts, and how they have done so.

IMPLEMENTATION: EPA could develop an online survey tool that would help identify users of the EPA's tools and outputs, how the tools and outputs were used and how decision-making processes were impacted.

Relevant Past Recommendation:

Science for Environmental Protection: The Road Ahead (NAS, 2012)

"The committee recommends that EPA improve its ability to track systematically, to influence, and in some cases to engage in collaboration with research being done by others in the United States and internationally. The committee suggests the following mechanisms for approaching the recommendation above:

- Identify knowledge that can inform and support the agency's current regulatory agenda.
- Institute strategies to connect that knowledge to those in the agency who most need it to carry out the agency's mission.
- Inform other federal and nonfederal research programs about the science base that the agency currently needs or believes that it will need to execute its mission. Seek early identification of new and emerging environmental problems with which the agency may have to deal."

Charge Question 5:

Critical Agency Skills Needed to Address Environmental Justice

What are the most critical multidisciplinary skillsets, both technical and non-technical, that the EPA research scientists will need to address environmental justice as part of each of the six programs?

Response Summary to Charge Question 5:

An understanding of environmental justice, such as environmental exposures and impacts on environmental justice communities, and how to conduct community-engaged research (for example, CBPR) are critical skills for the EPA's research scientists. The Agency should provide the necessary training, mentoring and ongoing support to enhance the capacity of its researchers to conduct community-engaged research and involve external stakeholders – such as university researchers, businesses, NGOs, tribal²⁶ governments and organizations, federal, state and local government agencies, and community leaders – in the development and implementation of such trainings. In addition, the EPA should supplement its staff with sociologists and other social and behavioral scientists to add critical skills that include but are not limited to the ability to design studies that address the complexities of environmental justice, assess data, conduct evaluations, articulate results, demonstrate cultural competency, investigate the relationships between complex factors such as the physical environment and health, and understand the impact of research on urban policy and planning.

TOPIC AREA: Research Implementation, Partnerships and Funding

5-1. Increase Social Scientists on EPA's Staff and as Consultants



FINDING: Social science and community development work are inherently interdisciplinary. Competency in working with communities and community-engaged research requires an understanding of community structure, diversity, representation, culture and affected parties. Additionally, the social determinants of health have been recognized as critical mitigating factors. EPA could benefit from more dynamic thinking, which recognizes the interplay across disciplines and issues. These skills are crucial in applied research but are underrepresented in ORD and throughout the Agency.

²⁶ **Tribal:** Pertains to American Indians, Alaskan Natives, Native Hawaiians and other indigenous peoples.

RECOMMENDATION: EPA should hire sociologists and other social scientists, particularly in the public health field, with experience in research, conflict resolution and cultural competency at the community level. These individuals should also represent the various cultures of the communities in which the Agency serves. Disciplines represented could include, but are not limited to, land use planners, economists, geographers, demographers, political scientists and psychologists. Social scientists could add critical skills in many areas such as, designing studies that address the complexities in environmental justice, assessing data, conducting evaluations, articulating results and looking across the relationships between complex factors, such as the physical environment, health and urban policy planning.

IMPLEMENTATION: In order to advance interdisciplinary interactions, the EPA could engage social scientists as independently contracted consultants on research projects. EPA also could encourage the inclusion of appropriate social scientist expertise on ORD-specific federal advisory committees, task forces, work groups and peer review panels. In its extramural RFAs, the EPA also could require the inclusion of such expertise on research grants proposals.



Relevant Past Recommendations:

- ***Environmental Decisions in the Face of Uncertainty (NAS, 2013)***
 - “RECOMMENDATION 9.2: As part of an initiative evaluating uncertainties in public sentiment and communication, U.S. Environmental Protection Agency senior managers should assess agency expertise in the social and behavioral sciences (for example, communication, decision analysis, and economics) and ensure it is adequate to implement the recommendations in this report.”
- ***Science for Environmental Protection: The Road Ahead (NAS, 2012)***

“EPA [should] strengthen its capability to pursue the scientific information and tools that will be needed to meet current and future challenges by... strengthening its scientific capacity. This can be accomplished by continuing to cultivate knowledge and expertise within the agency generally, by hiring more behavioral and decision scientists, and by drawing on scientific research and expertise from outside the agency.”
- ***Review of ORD's New Strategic Research Directions (SAB and BOSC, October 2011)***
 - “The SAB and BOSC also underscore that all the systems of interest to EPA include human behavior. Research on relevant aspects of human behavior is crucial to understanding the systems and implementing solutions or programs that follow from them.”
 - “Increased emphasis on social, behavioral and decision sciences within ORD is needed for the new research programs to be successful. The SAB and BOSC recommend that ORD take specific steps to enhance its expertise and research in these areas.”
- ***Ensuring Risk Reduction in Communities with Multiple Stressors: Environmental Justice and Cumulative Risks/Impacts (NEJAC, December 2004)***

“Strengthen EPA’s Social Science Capacity and Community Expertise: EPA should develop and implement a plan for short- and long-term development of intramural and extramural expertise in the social sciences, community-based work, and collaborative problem-solving. As part of this effort, the Agency should conduct a study to identify ways that such expertise can best be utilized and integrated into the Agency’s programs. Part of this study should identify larger trends in environmental protection challenges that elevate the importance of sociology in environmental decision-making and problem-solving. In addition, the study should identify ways to systematically develop the skills of in-house scientists and program personnel in social science areas and community assessment, not the least of which is requiring that program personnel and scientists spend time in communities to understand the real life context of the communities’ environmental challenges. EPA also should encourage and support the development of community expertise and social science capacity within its governmental partners, business and industry, universities and the environmental protection field in general. Last, to focus broad based attention on the imperative to overcome the present structural limitations of the environmental protection field and its makeup, the Administrator should issue a policy statement to elevate the importance of sociology and the social sciences in environmental protection and collaborative problem-solving. One goal of such a policy is to ensure an environmental protection work force that has a built-in bias for action.

5-2. Enhance Training of ORD Scientists



FINDING: EPA researchers do not always have the knowledge and expertise to conduct collaborative research in partnership with communities.

RECOMMENDATIONS:

- A) EPA should ensure that experience in community-engaged research (such as CBPR) and the study of environmental health disparities comprise the skillset of its research staff and its stakeholder partners. Specifically, incorporating traditional indigenous methods and protocols on research issues of tribal²⁷ stakeholders and communities should be included as well. More specifically, the EPA should equip ORD scientists with the skills necessary to consult with community members on:

²⁷ **Tribal:** Pertains to American Indians, Alaskan Natives, Native Hawaiians and other indigenous peoples.

- i. Important and relevant research questions and problems that need to be addressed.
 - ii. How the research methodology should be framed.
 - iii. Data that may be available in the community.
- B) EPA should provide training, mentoring and ongoing support to enhance the capacity of its researchers to conduct community-engaged research (for example, CBPR), including how to develop collaborative research partnerships, how to jointly develop research questions, and how community members should be involved in data collection, interpretation and dissemination of study findings.

IMPLEMENTATION: EPA could encourage ORD staff to attend courses in CBPR (which would include teams of academic researchers and community partners) provided by experts around the country, or contract with them to provide on-site training.



Relevant Past Recommendations:

- ***Environmental Justice and Community-Based Health Model Discussion (NEJAC, February 2001)***
"Promote Better Understanding of "Community-Based Participatory Research Models. EPA and other federal agencies need to better understand the approach and usefulness of "community-based participatory research models" and the importance of including prevention and intervention components in these projects."
- ***Science and Decisions: Advancing Risk Assessment (NAS, 2009)***
"EPA should initiate a senior-level strategic re-examination of its risk-related structures and processes to ensure that it has the institutional capacity to implement the committee's recommendations for improving the conduct and utility of risk assessment for meeting the 21st century environmental challenges. EPA should develop a capacity building plan that includes budget estimates required for implementing the committee's recommendations, including transitioning to and effectively implementing the framework for risk-based decision-making."
- ***Science for Environmental Protection: The Road Ahead (NAS, 2012)***
 - "EPA [should] strengthen its capability to pursue the scientific information and tools that will be needed to meet current and future challenges by...substantially enhancing the responsibilities of a person in an agency-wide science leadership position to ensure that the highest-quality science is developed, evaluated, and applied systematically throughout the agency's programs. The person in that position should have sufficient authority and staff resources to improve the integration and coordination of science across the agency. If this enhanced leadership position is to be successful, strengthened leadership is needed throughout the agency and the improved use of science at EPA will need to be carried out by staff at all levels."
 - "The committee recommends that EPA add staff who have training in behavioral and decision sciences and find ways to enhance the existing staff capabilities in these fields."
- ***Exposure Science for the 21st Century: A Vision and a Strategy (NAS 2012)***
"Enabling Resources...the committee considers that the following are needed: Short-term training and certification programs in exposure science for midcareer scientists in related fields."

TOPIC AREA: Research Evaluation

5-3. Assess Effectiveness of Environmental Justice Training for Research Staff



FINDING: EPA currently is involved in developing an online Agency-wide environmental justice training course to increase its staff's understanding of the history, challenges and desires of vulnerable communities, how equity fits into their respective disciplines and the role of sustainability in environmental justice.

RECOMMENDATION: In the follow up to the training, the EPA should identify how lessons learned might apply to the development of research questions, methodologies, and dissemination and implementation of research. EPA should involve collaboration and input from external stakeholders – such as university researchers, businesses, NGOs, tribal²⁸ governments and organizations, federal, state and local government agencies, and community leaders – as the Agency develops the training to verify the information presented and enhance the credibility of the training.

IMPLEMENTATION: After the training, the EPA, with the assistance of external stakeholders, could evaluate what its staff learned and what follow up would be useful. This evaluation could include an assessment of how research staffs' considerations and questions have changed as a result of the training, and how they might meaningfully engage community members and community-based organizations. Then ORD could create a work group to address any follow-up issues, including additional training or initiating discussions based on case studies that highlight projects of interest to different constituencies.

²⁸ **Tribal:** Pertains to American Indians, Alaskan Natives, Native Hawaiians and other indigenous peoples.

CHAPTER 3: CONCLUSIONS AND NEXT STEPS

The NEJAC appreciates the opportunity to provide feedback and advice on how environmental justice considerations should be integrated into the EPA's research agenda. This report furthers the Agency's priorities of "Making a Visible Difference in Communities across the Country" and "Working Towards a Sustainable Future" by developing findings and recommendations to address and prevent environmental inequalities that may be addressed within ORD's research programs. The report is a result of a collaborative effort to answer the Charge Questions presented by the EPA in March 2012. The responses presented speak directly to ORD's work as the scientific research arm of the EPA to provide the solid underpinnings of science and technology for the Agency. Additionally, it furthers the Agency's efforts to address the key recommendations identified from the *EPA's Science of Disproportionate Impacts Analysis Symposium* and documented in a letter to the EPA from various environmental justice leaders.

For over a year, the work group members framed the Charge Questions into themes that included:

- Critical opportunities for addressing environmental inequities.
- Community-inclusive, meaningful and continuous participatory processes.
- Customizing ORD tools and other outputs to be effective for local decision makers, impacted communities and other stakeholders.
- Criteria for independently assessing the impact of ORD's research.
- Critical agency skills needed to address environmental justice.

A common thread through each theme is the necessity on the part of ORD to meaningfully engage community members and community-based organizations in all stages of the EPA's research and development enterprise.

NEXT STEPS

As a follow up to this effort, the NEJAC requests a meeting with the EPA to discuss the recommendations presented in this document, as well as an official response from the EPA on this report. The following timeline is proposed for these requested follow up activities:

- ✓ Within two months following submittal of this report to the EPA Administrator, hold a meeting with the EPA to include members of the NEJAC Research Work Group. As part of the agenda, ORD and the NEJAC could work together to identify short- and long-term goals and set priorities among the recommendations.
- ✓ Within four months of the aforementioned meeting, receive an official response from the EPA on this recommendations report.



APPENDIX

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APPENDIX

Glossary of Terms

Board of Scientific Counselors (BOSC):

Provides advice, information and recommendations to the U.S. Environmental Protection Agency (EPA) Office of Research and Redevelopment (ORD) on technical and management issues for the office's research programs. The BOSC has served as a discretionary federal advisory committee since May 28, 1996. For more information on the EPA's BOSC, visit <http://www.epa.gov/osp/bosc/>.

Building capacity:

Capacity building refers to an ongoing process to increase the skills, infrastructure and resources of individuals, organizations and communities. Community-based organizations may often seek additional technical expertise and access to information in order to keep up with change and more effectively engage in decision-making processes that affect their lives and communities.

Carcinogen:

Any substance that produces cancer. Tobacco smoke is an example of a carcinogen.

Children's Health Protection Advisory Committee (CHPAC):

Comprised of researchers, academics, health care providers, environmentalists, state and tribal government employees and members of the public, this federal advisory act committee advises the EPA on regulations, research and communication issues related to environmental health effects in children. For more information on CHPAC, visit http://yosemite.epa.gov/ochp/ochpweb.nsf/content/whatwe_advisory.htm.

Community-based participatory research (CBPR):

An applied collaborative approach that enables community residents to actively engage in the full range of research. The research process moves from conception to design to conduct to analysis to interpretation and finally, to conclusions. Community members and researchers form equal partnerships to combine knowledge and action to improve the community's health and environment.

Cumulative impacts:

The concept of cumulative impacts takes into account all activities and their combined effect over time. The combination of these effects and any resulting environmental or health degradation are the focus of cumulative impact analysis. The cumulative impacts of an action takes into account the overall impact the action has on resources, the environment or human health, regardless of who is the taking the action.

Cumulative risk:

A cumulative risk refers to the accumulation of stressors or exposures that, combined, can cause adverse effects on people and the environment. These collective threats can begin with a single exposure source and carry through all relevant routes over time, resulting in a number of stressors, including biological, chemical and physical.

Environment:

The built, social, political, natural and economic conditions in which people live, work, play and learn.

Environmental justice:

EPA defines environmental justice as, "The fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies."

Epidemiological centers:

Centers established to study patterns, causes and the effects of health and disease in a specific population. The studies identify risk factors for disease and targets for preventive medicine.

Etiologic research:

Research that focuses on the causes and origins of diseases.

Exposure:

Occurs when a community or individual comes into contact with a pollutant or hazardous waste.

Extramural research:

Research conducted outside of an organization. For example, when the EPA awards grants to outside organizations to conduct research, or contracts to outside organizations to conduct research on behalf of the Agency.

Federal Advisory Committee Act (FACA):

The U.S. Congress passed this law to ensure that advice by advisory committees to the federal government is objective and accessible to the public. FACA sets forth rules to establish, operate, oversee and terminate committees. Federal advisory committees are usually comprised of subject-matter experts from a range of disciplines (academia, community, industry and state and local government). For more information on FACA, visit <http://www.gsa.gov/portal/content/100916>.

Federal trust responsibility:

A legal obligation on the part of the U.S. government to protect tribal treaty rights, lands, assets and resources as well as a responsibility to carry out the requirements of federal law with respect to American Indian and Alaska Native tribes and villages.

Hazardous air pollutant (HAP):

Pollutants in the air that cause, or may cause, cancer or other serious health effects or adverse environmental effects. Most air toxics do not occur naturally in the environment, they come from anthropogenic sources. For more information on HAPs, visit <http://www.epa.gov/ttnatw01/pollsour.html>.

Health disparities:

A particular type of health difference that adversely affects one group more than others. Typically, such disparities are found in communities that experience greater challenges to health based on their race, ethnicity or socioeconomic status.

Health impact assessment:

A tool used to review planning and policy proposals to make recommendations to improve the health outcomes of those proposals. The assessment is a combination of procedures and methods used to evaluate the potential and often unintended effects of a proposed project on a community's health, and can also be used to determine how those effects are distributed across the community.

Hot spot:

A term commonly used to refer to an area with a concentrated amount of contamination. A "hot spot" exists if a site or area presents a risk to human health or the environment and if the contamination is highly concentrated, highly mobile or cannot be easily contained.

Intergovernmental Personnel Assignment (IPA):

The Intergovernmental Personnel Act Mobility Program provides for the temporary assignment of staff between federal, tribal, state and local government agencies as well as colleges, universities and federally-funded research centers. The program provides the mechanism for the assignments to take place. For more information on IPAs, visit

<http://www.opm.gov/policy-data-oversight/hiring-authorities/intergovernment-personnel-act/#url=Overview>.

Integrated Risk Information System (IRIS):

IRIS represents the EPA's human health assessment program, which evaluates information on health effects that may result from exposure to environmental contaminants. For more information on IRIS, visit <http://www.epa.gov/IRIS/>.

Interventional research:

A type of research that involves providing medicine or other interventions to participants to allow observation of resulting effects. Treated participants are compared to participants who do not receive the treatment to measure the participants' health changes.

Intramural research:

Research conducted within an organization. For example, research the EPA conducts using its own staff.

Legacy pollution:

Chemicals that remain in the environment long after they were first introduced. Often, these chemicals were not recognized as harmful when they were originally used. Examples of legacy pollutants include PCBs and heavy metals, such as lead and mercury.

Life-cycle analysis:

Also known as life-cycle assessment and cradle-to-grave analysis, this technique assesses environmental effects associated with all stages of a product's life, from raw material to disposal or recycling.

Logic model:

Also known as logical framework, theory of change or program matrix, this model serves as a tool to evaluate the effectiveness of a program. Logic models often use graphics to show the relationship between the resources, activities, outputs and outcomes of a program. The primary purpose of developing a logic model is to assess "if-then" (causal) relationships between the program objectives. For example, if certain resources are available for a program, then the activities can be implemented.

Longitudinal study:

A study that involves repeated observations of the same variables over long periods of time to find a connection between those variables. Longitudinal studies involving people, for example, would observe certain factors among the same group of people over time and, therefore, any differences observed in those people (compared to others during the same time) would less likely be attributed solely to cultural or racial differences across generations. In medicine, these studies are used to discover clues about certain diseases.

Mobile emissions:

Any air pollution emitted by cars, buses, airplanes, trains, boats, trucks and other engines and equipment that can be moved from one location to another. Many of these pollutants contribute to poor air quality and can have negative effects on human health. Mobile emissions are regulated differently than stationary sources because of their large number and ability to move.

National Academy of Sciences (NAS):

According to its website, the NAS is a nonprofit society of distinguished scholars that provides “independent, objective advice to the nation on matters related to science and technology.” For more information on the NAS, visit <http://www.nasonline.org/>.

National Council for Environmental Policy and Technology (NACEPT):

Created by the EPA in 1988, the NACEPT provides advice to the EPA Administrator on a broad range of environmental policy, technology and management issues. NACEPT members represent academia, business and industry, community and environmental advocacy groups, environmental justice organizations, and professional groups as well as tribal, state and local governments. For more information on NACEPT, visit <http://www.epa.gov/ocem/nacept/index.html>.

The Path Forward:

Articulated for ORD by Dr. Paul Anastas, former Assistant Administrator, and fully supported by the Acting Assistant Administrator, Mr. Lek Kadelic, *The Path Forward* laid an operational framework for ORD based on six principles: “sustainability” as “true north,” solution-oriented, timeliness, responsiveness, relevance and integrity. A defining aspect of *The Path Forward* was a realignment of ORD’s research programs into six areas: Air, Climate and Energy; Chemical Safety for Sustainability; Sustainable and Healthy Communities; Safe and Sustainable Water Resources; Human Health Risk Assessment; and Homeland Security Research. To read *The Path Forward* in its entirety, visit <http://www.epa.gov/ORD/htm/anastas/path-forward.htm>.

Patient Protection and Affordable Care Act (PPACA):

Signed into law in 2010, the PPACA aims to increase the quality and affordability of health insurance, lower the number of people who currently do not have health insurance and reduce the costs of health care. For more information on PPACA, visit <https://www.healthcare.gov>.

Plan EJ 2014:

Published in July 2011, this plan is the EPA’s roadmap for integrating environmental justice into the Agency’s programs, policies and activities. To view a copy of *Plan EJ 2014* and other related information, visit <http://www.epa.gov/environmentaljustice/plan-ej/>.

Precautionary principle:

A tool used by decision makers to determine if an action or policy has the potential to cause harm to communities or the environment. If sound scientific information does not exist that the action or policy is harmful, then the obligation that it will not cause harm is the responsibility of those implementing the policy or action. The spirit of the principle indicates a social responsibility to protect communities and the environment from potential harm when science indicates a possible risk.

Requests for Applications (RFA):

Government agencies or NGOs often issue a notice that funding is available through grants. These notices are often accompanied by requests for interested parties to submit applications for the funds.

Research and development enterprise:

An organization’s framework that sets forth the principles, policies and responsibilities for planning, monitoring, evaluating and reporting on research and development activities. For example, *The Path Forward* (defined above) is a part of ORD’s enterprise.

Risk assessment:

Risk assessment tools are used to determine the extent of health and ecological risks from contaminants that might be present in the environment. EPA considers risk to be “the chance of harmful effects to human health or to ecological systems resulting from exposure” to any physical, chemical or biological substance. The information collected from an assessment helps the EPA to decide on how

best to protect a community's health and the environment. For more information on risk assessment, visit http://www.epa.gov/risk_assessment/basicinformation.htm#arisk.

Risk management:

The process of evaluating, given the known potential risks, how to minimize the impacts of those risks. In EPA's case, the emphasis is on minimizing impacts and protecting human health and the environment in particular. Actions taken by the Agency at particular sites or areas throughout the country are based on results from risk assessments and other information.

For more information on the EPA's risk management efforts, visit http://www.epa.gov/risk_assessment/basicinformation.htm#arisk.

Science Advisory Board (SAB):

Established to conduct peer reviews and provide advice to the EPA, the SAB provides information to help the Agency make decisions using sound science. For more information on the SAB, visit <http://www2.epa.gov/aboutepa/about-science-advisory-board-sab-and-sab-staff-office>.

Science Implementation Plan:

As part of *Plan EJ 2014*, ORD is leading the *Science Implementation Plan*, which states the Agency's five-year goal, ". . . EPA will substantially support and conduct research that employs participatory principles and integrates social and physical sciences aimed at understanding and illuminating solutions to environmental and health inequalities among low income, minority, indigenous, underserved and overburdened populations and communities in the US." To read the *Science Implementation Plan*, visit <http://www.epa.gov/environmentaljustice/resources/policy/plan-ej-2014/plan-ej-science-2011-09.pdf>.

Social stressors:

Factors or situations that people encounter in daily life, such as relationship or family demands, that can have an effect on their mental and physical well-being. A person experiences stress when they do not have the ability or resources to cope when confronted with an external demand, or when they perceive or fear they do not have the ability or resources.

Susceptibility:

Differences in risk that result from sensitivity and exposure to contaminants or toxins. For example, the level of exposure that might cause a toxic response can vary from one person to the next depending on factors such as genetic differences, medical conditions and where a person lives.

Sustainability:

According to the EPA, "Sustainability is based on a simple principle: Everything that we need for our survival and well-being depends, either directly or indirectly, on our natural environment. Sustainability creates and maintains the conditions under which humans and nature can exist in productive harmony, that permit fulfilling the social, economic and other requirements of present and future generations." For more information on the EPA's sustainability efforts, visit <http://www.epa.gov/sustainability/>.

Transformation research:

Also referred to as transformative research, this research is driven by ideas that have the potential to dramatically change the current understanding of an important existing scientific or engineering concept.

Translational research:

Scientific research that helps make findings useful for everyday applications that improve human health and well-being.

Tribal government-to-government relationship:

The federal government considers each tribal government a distinct entity with sovereign powers. On April 29, 1994, President Clinton reaffirmed several responsibilities of federal agencies with Executive Order 13175. The executive order stated that each federal agency must ensure that the agency operates within a government-to-government relationship with federally-recognized tribes. In addition, agencies should consult with tribal governments, to the greatest extent possible and permitted by law, before taking actions that affect tribal lands, resources and people.

Tribal sovereignty:

“Sovereignty” is the authority that a government draws on to govern. In the U.S., sovereignty is considered to be inherent and existed in tribes before the U.S. government was established. Tribes have independent sovereignty in the U.S.

Tribal stakeholders:

Pertains to American Indians, Alaskan Natives, Native Hawaiians and other indigenous peoples.

Vulnerability:

EPA defines vulnerability as the differences in risk that result from intrinsic (internal) differences in susceptibility and social (external) stress factors such as low socioeconomic status, lack of community resources and access to health care, education, poverty, race and geography. Vulnerability also can be defined as the diminished capacity of an individual or community to anticipate, cope with, resist and recover from the effects of a natural or man-made hazard.

Vulnerable communities:

Defined broadly, vulnerable communities can be defined as those comprising individuals or groups who are disproportionately susceptible to environmental or health impacts; or those whose circumstances present barriers to obtaining or understanding information or accessing resources during and after decisions are made that impact their health and environment.