Cumulative Impacts Research at EPA

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Background: Cumulative Impacts and Equity/Environmental Justice

Equity/Environmental Justice (EJ) is a priority of the Biden Administration

- President Biden signed four Executive Orders on EJ:
  - EO 13985: Advancing Racial Equity and Support for Underserved Communities Through the Federal Government
  - EO 14008: Tackling the Climate Crisis at Home and Abroad
  - EO 14091: Further Advancing Racial Equity and Support for Underserved Communities Through the Federal Government
  - EO 14096: Revitalizing Our Nation's Commitment to Environmental Justice for All
- EPA Administrator Regan issued an Agency-wide directive to better serve historically marginalized communities using cumulative impact assessment

Cumulative Impacts Research

ORD published a report framing its research on cumulative impacts

- Recommendations are informing actions within ORD to advance the state of the science
- Input was critical to developing these recommendations –
  - Listening sessions with 65 Tribes, 62 state agencies, 35 local agencies, and 9 national associations
  - Workshop with EPA Programs and Regions and community member panels
  - Science Advisory Board consultation

What are Cumulative Impacts?

Cumulative Impacts: *the totality of exposures to combinations of chemical and non-chemical stressors and their effects on health, well-being, and quality of life outcomes.*

***Cumulative Impact Assessment**: a process of evaluating both quantitative and qualitative data representing cumulative impacts to inform a decision.*

https://www.epa.gov/healthresearch/cumulative-impacts-research#Cumulative%20Impacts%20Report

Five Pillars of ORD Cumulative Impacts Research

Identify partners, policies, decisions and tools; engage partners to translate research into action; and establish trust and true partnerships with communities.

Develop fit-for-purpose approaches to characterize exposures; evaluate health disparities and well-being impacts; identify intervention points; and evaluate impacts of policies and interventions.

Support fit-for-purpose use of community-generated data; provide access to transparent data; offer training and technical support on EPA methods, guidance, and tools for cumulative impact assessment.

Integrate cumulative impact research into ORD's portfolio; address technological, workforce and culture issues; build partnerships to advance cumulative impact research and policy.

Deliver solutions that improve community health and well-being and translate approaches and results for broader contexts.

Advancing the Science
Building Knowledge and Capacity

PROMOTION THROUGH ORGANIZATIONAL CHANGE

- Regional Climate Adaptation Network
- EPA National Research Programs
- Community-Engaged Research Collaborative for Learning and Excellence

LEADING THE CONVERSATION WITH:

SOT Society of Toxicology; SETAC; ECOS; The Toxicology Forum; Association of State and Territorial Solid Waste Management Officials; SRA; International Society of Exposure Science (ISES); ERIS Environmental Research Institute of the States; NACCHO National Association of County & City Health Officials

CREATING EXTRAMURAL OPPORTUNITIES

42 Grants and $54 million in funding

- ★ Community-based research to mitigate cumulative health impacts and environmental health disparities in underserved communities
- ★ Cumulative health impacts for children in underserved rural agricultural communities in the U.S.
- ★ Cumulative health impacts at the intersection of climate change, environmental justice, and vulnerable populations/lifestages: community-based research for solutions
- ★ Centers for early lifestage vulnerabilities to environmental stressors
- ★ Contaminated sites, natural disasters, changing environmental conditions and vulnerable communities
- ★ Using a total environment framework to assess life-long health effects of chemical exposure
- ★ Integrating human health and well-being with ecosystem services

ORD's Community-Engaged Research Collaborative for Learning and the Environment (CERCLE)

ORD, with EPA Region 2, is establishing a community-engaged research collaborative in Edison, New Jersey. CERCLE will:

- Build **long-lasting, trusting relationships** with overburdened communities
- Connect community challenges with EPA science
- Support **joint research studies** in and with communities, helping translate results into community actions
- Conduct **STEM** engagements with community youth
- **Share results widely** to build the scientific community's capacity to work directly with communities

Advancing the Science
Building Knowledge and Capacity

ADVANCING THE SCIENCE

Building new knowledge and capacities

Intramural Research

- Characterizing Health Impacts
- Vulnerabilities and Exposure
- Mitigation Options and Solutions to Reduce Cumulative Impacts
- Resources to Support Decisions
- Program Evaluation

NATIONAL ACADEMIES Sciences Engineering Medicine

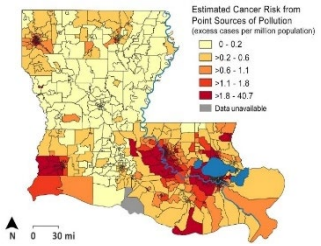
SCIENCE ADVISORY BOARD
A Federal Advisory Committee to the U.S. Environmental Protection Agency

Cumulative Impact Science Forum
Bringing agency practitioners and scientists together to solve decision context science challenges

TECHNICAL SUPPORT

Bringing the science to decision-makers

Louisiana CIA



HIA Training for Region 5

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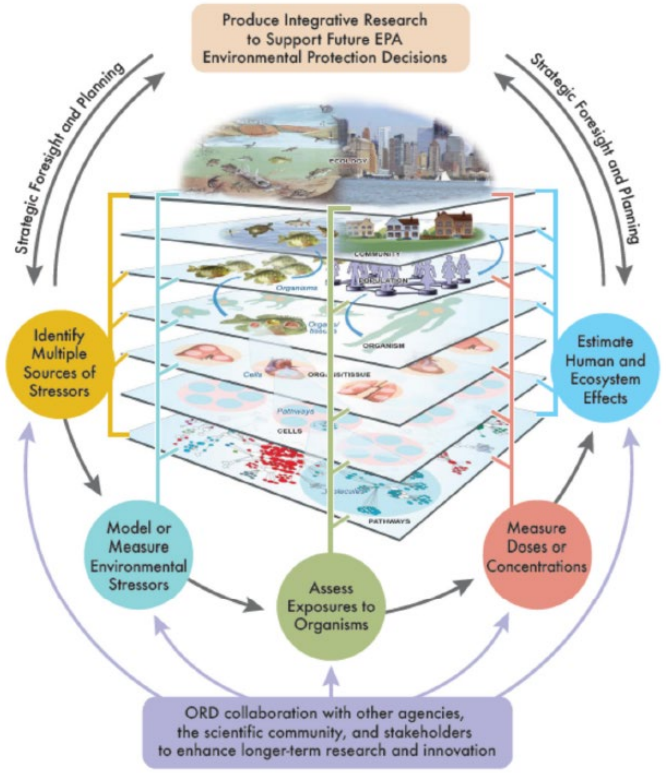


ORD utilizes systems approach to integrate the full range of available data from public health, physical, natural, and social sciences, toxicology, engineering, and ecosystems research to support communities.

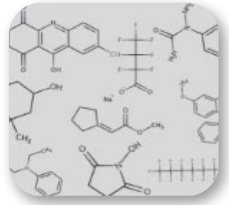
Figure from: NASEM, 2023, https://nap.nationalacademies.org/read/26602/chapter/1

140+ Environmental Justice and Cumulative Impacts Projects

- **Vulnerabilities and Exposure**
  Research to identify sources, assess and monitor exposures, and understanding vulnerabilities to chemical stressors in the air, water, and land; non-chemical stressors, including social determinants of health; and a changing climate that may exacerbate the total burden experienced by communities.

- **Characterize Health and Ecosystem Impacts**
  Research to understand and estimate the health and ecosystem effects of exposure to multiple chemical and non-chemical stressors with the ability to promote equity benefits for clean air, water, land, and ecosystem services.

- **Mitigation Options and Solutions**
  Research to bolster the scientific basis for actions to improve community health and well-being, and to select, implement, and evaluate such actions. This includes, for example, research to effectively engage with communities to identify solutions and options to mitigate exposure to pollutants, remediate contaminated sites, restore sites to productive use, and revitalize communities.



- **Resources to Support Decisions**
  Development of tools, models, and datasets ranging from site-specific to national scale that can be used by EPA and communities to identify, characterize, and solve environmental problems where they are most acute, in and with communities that are most at risk and least resilient.

Advancing the Science
Building Knowledge and Capacity

Vulnerabilities and Exposure

- Effects of Historical Redlining on Climate and Health
- Next Generation Emissions Measurement (NGEM) for Fugitive and Area sources and Fenceline Monitoring
- Use of wrist bands to measure personal exposure to air toxics in individuals residing in advantaged and disadvantaged neighborhoods
- Examination of sleep disruption as a biological basis for the adverse cardiovascular effects of rising temperature and air pollution

Characterize Health and Ecosystem Impacts

- Characterizing the effects of chronic stress on susceptibility to adverse health impacts of air pollution in disadvantaged communities using inflammation and epigenetic biomarkers
- Identifying the role of non-chemical stressors on chronic disease and behavioral outcomes and subsequent environmental resiliency
- Characterizing cumulative health impacts of deprivation and environmental pollution using biomarker-based indices of allostatic load, chronic inflammation, autoimmunity, and biological aging

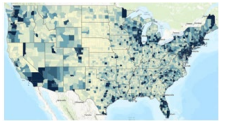
Mitigation Options and Solutions

- Assessing built, natural, and social vulnerabilities and the impacts of climate change near contaminated land and waste sites for building equitable climate adaptation and mitigation strategies
- Design for community resilience and equity
- Develop and evaluate effective and low-cost treatment technologies for small, disadvantaged, and vulnerable systems, particularly for contaminants undergoing regulatory development

Resources to Support Decisions

Equitable Resilience Builder

Eco-Health Browser



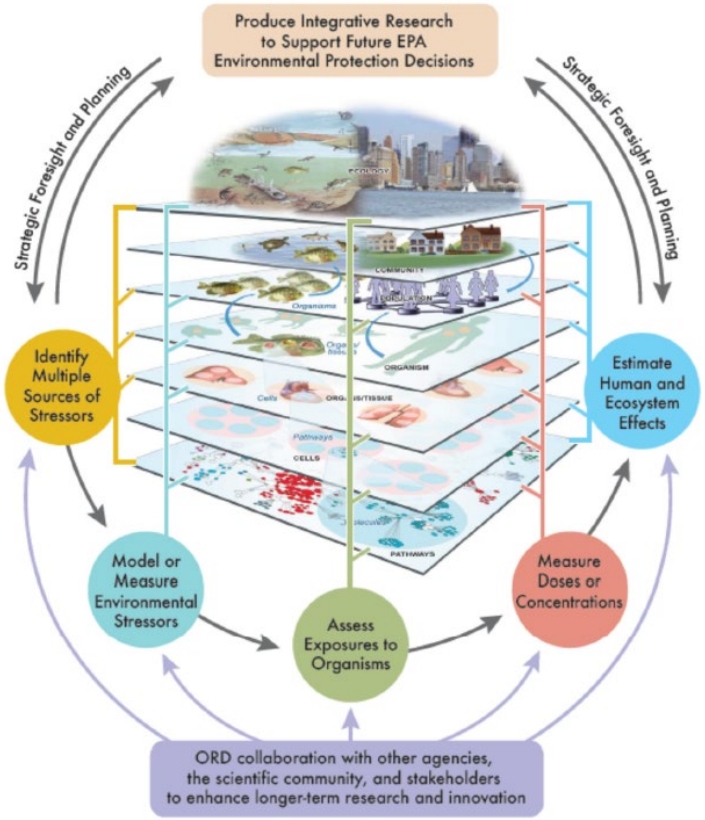
UST Finder

EnviroAtlas

Environmental Quality Index

Bloomwatch

Cross-Cutting Priority Research



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Air Quality Research Representing ORD National Programs

- Exposure to Mixtures of Hazardous Air Pollutants: Challenges and Implications for Epidemiologic and Risk Assessment Applications
- Examination of sleep disruption as a biological basis for the adverse cardiovascular effects of rising temperature and air pollution
- Characterizing the effects of chronic stress on susceptibility to adverse health impacts of air pollution in disadvantaged communities using inflammation and epigenetic biomarkers
- Examining how air pollutant exposures across early life effect cardiopulmonary and metabolic health outcomes
- Are observed associations between air pollution and human health modified by psychosocial factors/non-chemical stressors?
- Cumulative sub-chronic effects of elevated ambient temperature, and air pollution in animal models representing socioeconomic vulnerabilities
- Quantifying impacts of air pollution sources on air quality in nearby communities using data analysis and visualization tools
- Characterizing cumulative health impacts of deprivation and environmental pollution using biomarker-based indices of allostatic load, chronic inflammation, autoimmunity, and biological aging
- Linking in vitro and in vivo exposure markers and airway physiology for high priority airborne chemicals
- Improving TracMyAir Model Functionality for Individual and Community Air Pollution Exposure Characterization
- The Fight for Progress in Communities with Environmental Justice Concerns: How Do We Know if Air Pollution Mitigation Efforts are Improving Health?
- Assessing the impacts of changing environmental conditions on air quality and human health

Figure from: NASEM, 2023, https://nap.nationalacademies.org/read/26602/chapter/1

ORD: Strategic Approach to Research & Technical Support

- Cumulative Impacts Research: Recommendations for ORD
- Technical support to carry out cumulative impact assessments
- Building internal and external capacity
- Primary research
- Scientific leadership

Thank You

Contact Information

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