



INTERIM FRAMEWORK FOR ADVANCING CONSIDERATION OF CUMULATIVE IMPACTS

November 2024



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Preface

This interim, or draft, Framework for Advancing Consideration of Cumulative Impacts is intended to provide the U.S. Environmental Protection Agency's (EPA's) programs with a foundation of information and resources that can support developing and implementing approaches to incorporate analysis and consideration of cumulative impacts into their work, with the goal of achieving results that improve health and quality of life in America's communities. It is created as a resource primarily for EPA staff and decision-makers. In this framework, the EPA recognizes cumulative impacts as the totality of exposures to combinations of chemical and nonchemical stressors and their effects on health and quality-of-life outcomes. While cumulative impacts include the totality of exposures and their effects on health and quality of life, consideration of cumulative impacts does not require identifying, measuring, and quantifying all exposures and effects. Rather, the consideration of cumulative impacts as appropriate and consistent with applicable law can be tailored to focus on exposures and effects of greatest relevance to a specific decision to be made (i.e., decision context). In addition, even when a stand-alone cumulative impacts assessment is not conducted, components of such analysis can be combined with or integrated into other approaches, depending on the relevant statutory or regulatory context. Examples of cumulative impacts analysis and assessment¹ and the development of training and methods for consideration of cumulative impacts in environmental decision-making are discussed in the final sections of this document.

¹ For the purposes of this document, *consideration* and *analysis* of cumulative impacts denote incorporation of evaluation of cumulative impacts into existing processes or other analyses. *Assessment* denotes a more formally structured cumulative impacts assessment.

Disclaimers

1. This document is intended for the sole use of EPA employees and decision-makers. It is not intended to, and does not, create any right or benefit, substantive or procedural, enforceable at law or in equity, against the Agency, its officers or employees, or any other person. To the extent there is any inconsistency between this document and any statutes, regulations, or guidance, the latter take precedence. The EPA retains discretion to use or deviate from this document as appropriate.
2. This document does not address when it is relevant or consistent with law to use a cumulative impacts approach. EPA program staff should consult with the Office of General Counsel or relevant Office of Regional Counsel on legal considerations. Policy decisions about undertaking particular actions are the responsibility of the Agency's programs, which consider a wide range of decision-making factors, including legal authorities, time, and resource constraints, as they look to advance environmental protection for all.
3. Pursuant to a permanent injunction issued by the U.S. District Court for the Western District of Louisiana on August 22, 2024, EPA will not impose or enforce any disparate-impact or cumulative-impact-analysis requirements under Title VI against any entity in the State of Louisiana.²

² <https://www.epa.gov/external-civil-rights/notice-compliance-permanent-injunction-louisiana-v-epa-et-al>

Introduction

Place matters. Environmental public health research has shown that the cumulative impacts of longstanding place-based inequalities in exposures to environmental hazards are significant, with health disparities linked to these inequalities (e.g., Banzhaf et al., 2019; EPA 2021b; Juarez et al., 2014; Lee, 2021; Mohai et al., 2009; Morello-Frosch et al., 2011; Solomon et al., 2016) (Figure 1). The U.S. Environmental Protection Agency's (EPA's) application of risk-based methods of environmental protection have greatly improved and maintained air, water, and soil quality and reduced chemical exposures as measured with national indicators (EPA 2023e, 2024b). The benefits of risk-based environmental protection have not been distributed equally, however, such that the cumulative impacts of environmental pollution on environmental public health and quality of life are disproportionately borne in some places by some population groups and communities (e.g., Colmer & Voorheis, 2021; EPA 2024c; Gochfeld & Burger, 2011). Moreover, the science shows that exposure and vulnerability to climate change is also not distributed equally, worsening these inequities (Hayden et al., 2023). Therefore, addressing cumulative impacts is key to achieving the EPA's mission of protecting human health and the environment for all (EPA 2022a, 2024c).

The EPA refers to cumulative impacts as the totality of exposures to combinations of chemical and nonchemical stressors and their effects on health and quality-of-life outcomes (EPA 2022a; Tulse et al., 2024). Cumulative impacts analysis considers exposures to environmental (chemical and nonchemical) stressors at each stage of a person's life, which include both contemporary exposures to multiple stressors and exposures throughout a person's lifetime, which are referred to as the total environmental burden. This burden is influenced by the distribution or concentration of stressors in a location and encompasses both direct and indirect effects, such as lack of environmental benefits, on people through impacts on resources and the environment. Cumulative impacts can be considered in the context of individuals, geographically defined communities, or definable population groups or lifestages, for which increased vulnerability or susceptibility may be attributable to differences in intrinsic factors (e.g., age, genetic conditions) or extrinsic factors over a person's lifetime (e.g., socioeconomic status, stress, nutrition, lifestyle, workplace, geography, other social determinants of health, previous or ongoing exposure to multiple chemicals). These factors interact closely and can be difficult to differentiate.

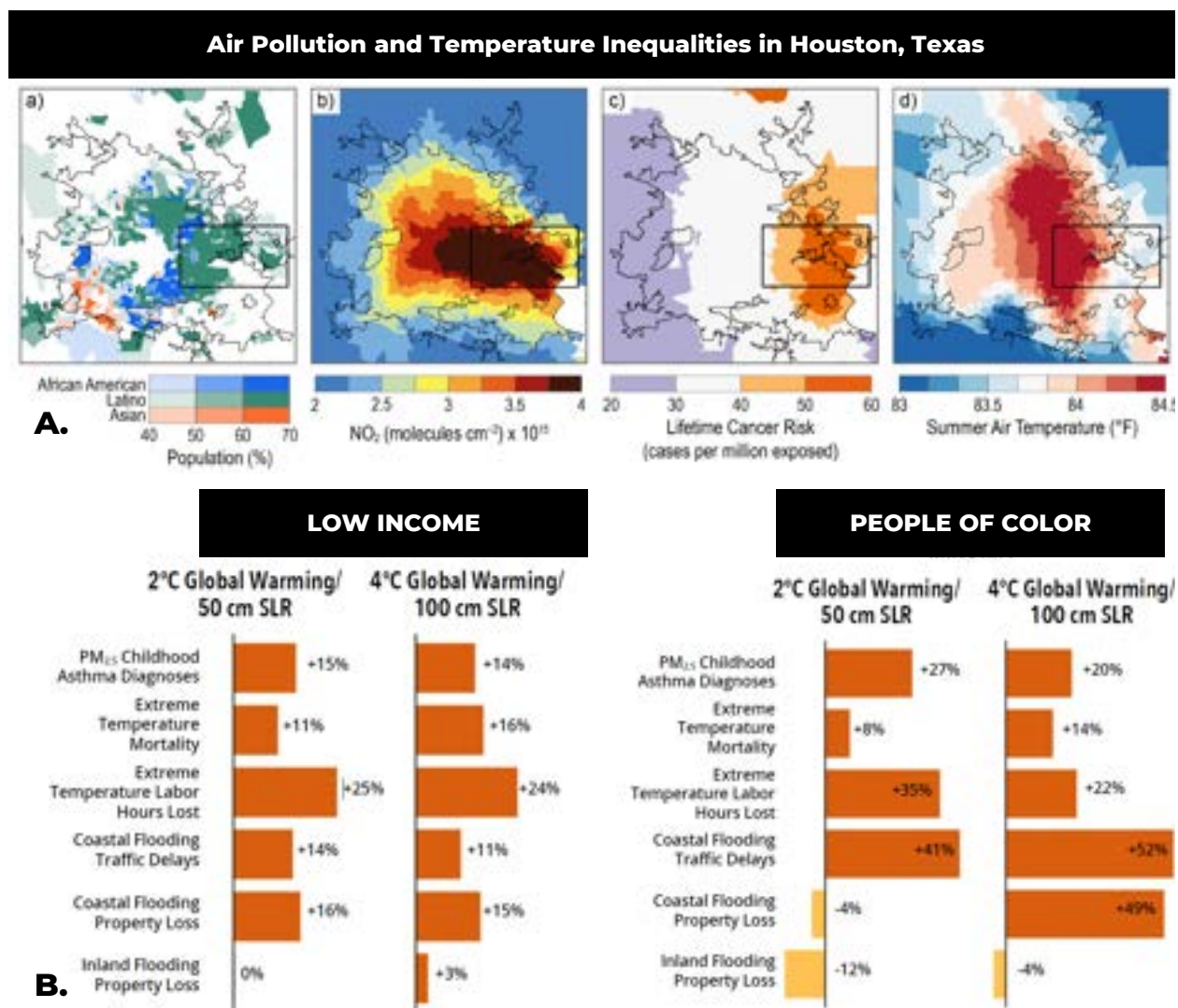


Figure 1. Place-based cumulative impacts include disproportionate exposures to environmental hazards, increased health risks and impacts, and adverse effects on quality of life.

A) Houston's Ship Channel region (outlined as black rectangle) is a patchwork of chemical refineries, freeways, homes, and playgrounds. Air pollution levels along this busy industrial waterway connecting downtown Houston to Galveston Bay are among the highest in the city (urbanized area of Houston outlined in black). Communities living at the fence line of the petrochemical industry face ongoing vulnerabilities, such as dual exposure to air pollution and heat, and endangerment from damages to petrochemical facilities caused by stronger hurricanes (West et al., 2023). This figure shows that neighborhoods surrounding the urbanized Ship Channel, which are primarily African American and Latino, are exposed to high levels of multiple environmental stressors. (a) For each neighborhood, the largest racial or ethnic group is shown: African American (blue), Latino (green), and Asian (orange). Relative to the rest of the city, this area of Houston experiences higher-than-average levels of (b) nitrogen dioxide (NO₂, in 2019), (c) lifetime cancer risks associated with chronic air pollution exposure (in 2018), and (d) elevated summer (June–August) air temperatures (in 2020). Variability in time and at very fine spatial scales might not be captured here. Figure copied with permission from Fifth National Climate Assessment (West et al., 2023).

B) People with low incomes and people of color are more likely to suffer higher impacts on health and quality of life to health because of the cumulative impacts of global warming and sea level rise compared to reference populations, i.e.,

higher income. These impacts include increased asthma, mortality caused by extreme temperatures, and work hours lost because of extreme temperatures and time in traffic caused by flooding, especially under climate change scenarios with greater increase in mean temperature and greater sea level rise (EPA 2021b).

The National Environmental Justice Advisory Council (NEJAC) (2004) points out that “vulnerability recognizes that disadvantaged, underserved, and overburdened communities come to the table with preexisting deficits of both a physical and social nature that make the effects of environmental pollution more, and in some cases unacceptably, burdensome.” Analysis of cumulative impacts helps to characterize the potential state of vulnerability, susceptibility, and/or resilience of a community. As the EPA continues to expand and improve its environmental analyses to better address cumulative impacts, the Agency will need to consider how best to balance the full scope of what could be assessed with the level of analysis appropriate to a given decision context. This scope includes consideration of available data and information, time, resources, established scientific processes and procedures, and the statutory context.

Cumulative impacts experienced at the community scale generally result from the presence of multiple stressors and the absence of or limited access to critical benefits that are the products of intersecting decisions made at all levels of government and society over time. These decisions may have intended and unintended consequences that can either improve or detract from community health, quality of life, and capacity for resilience. Adverse consequences include exposures to environmental contaminants or hazards (e.g., air pollution, hazardous waste, water pollutants, chemicals in commerce, climate change impacts), social stressors (e.g., historical redlining, poverty), and limited access to environmental benefits (e.g., tree canopy, clean drinking water) and other resources (e.g., access to health care, nutritious food, safe housing) necessary for a healthy, robust life. Detrimental impacts on human health and quality of life often fall most heavily on communities that have borne the brunt of historic and ongoing poverty, discrimination, and inequity.

The EPA has developed this framework to provide EPA staff and decision-makers in its programs with a foundation for developing and implementing approaches to incorporating analysis and consideration of cumulative impacts into their work, with the goal of enhancing health, environmental protection, and quality of life in America’s communities.³ With this framework, EPA hopes to improve protection of human health and prevent future harm by identifying, analyzing, and addressing cumulative impacts.

For EPA programs and regions, this document is a shared reference point as they determine when and how to analyze and consider cumulative impacts. **This framework does not provide detailed instructions on how to consider cumulative impacts in specific**

³ See Disclaimer 1.

contexts, nor does it set the expectation that cumulative impacts will be considered in every decision. The EPA will incorporate cumulative impacts into its processes and programs, as appropriate, feasible,⁴ and consistent with applicable law, in ways that reflect context-specific needs.

The EPA recognizes that at the time of this writing, approaches for applying cumulative impacts analysis for place-based, geographically specific actions are further developed than are approaches for considering cumulative impacts in national rulemaking. The EPA anticipates that ongoing efforts to address cumulative impacts will be focused on the local scale with the goal of further development to the national scale over time. The EPA's expanding knowledge and practice will evolve through an ongoing process of collaborative learning across the Agency and with communities and external partners, iterative growth, scientific research, program evaluation, and continuous development of new practices and applications. This process involves scientific progress, appropriate exercise of the EPA's legal authorities, and organizational change. In this spirit, this framework describes goals, principles, and initial guidance to help the EPA develop a consistent set of community-focused approaches that incorporate consideration of cumulative impacts into EPA decisions.

Cumulative impacts analysis may inform a range of federal activities, as appropriate and consistent with federal law ([EOP 2023b](#)). For EPA, this range includes standard setting, permitting, rulemaking, cleanup, emergency response, funding, planning, state, territorial, and Tribal program oversight, and other decision-making, and initiating administrative or judicial action in situations for which there is actual—or potential for—imminent and substantial endangerment ([EOP 2023b](#)). As noted earlier, this framework does not set the expectation that cumulative impacts will be considered in every EPA decision. These decision contexts are addressed more fully below in the description of the cumulative impacts assessment process.

The EPA recognizes the need for flexibility in approaches because 1) cumulative impacts analysis may inform EPA actions and decisions in whole or in part using existing and evolving data, tools, models, and approaches, to the extent appropriate and practicable ; 2) decision-making contexts vary; and 3) decisions are made under time, budget, available information, statutory or other legal constraints that require workable, practical approaches. This need for flexibility is reflected in the idea that consideration of cumulative impacts should be “fit-for-purpose,” the concept that assessments and associated products should be suitable and useful for their intended purpose(s) (EPA [2014](#), [2016b](#)).

⁴ These feasibility considerations include court-ordered deadlines, a lack of resources, gaps in scientific and analytic methodologies, lead time, and the scope of decisions.

Why Is the EPA Working on Cumulative Impacts?

Since its founding, the EPA has been guided by three principles established by William Ruckelshaus, EPA's first administrator: follow the science, follow the law, and be transparent. Under the leadership of Administrator Michael Regan, the Agency adopted a fourth foundational principle: advance justice and equity (EPA 2021a). In alignment with this principle, the [Agency's FY 2022–2026 Strategic Plan](#) (EPA 2022b) declares that the “EPA must make significant and urgent progress in fundamentally grounding its work in addressing disproportionality, which includes understanding of and reacting to issues of cumulative impacts and cumulative risks, and rapidly advance its ability to conduct analyses that identify disproportionate impacts.” [Executive Order 14096](#), “Revitalizing Our Nation’s Commitment to Environmental Justice for All,” calls on agencies, as appropriate and consistent with applicable law to advance environmental justice by addressing “disproportionate and adverse human health and environmental effects and hazards, including ... cumulative impacts of environmental and other burdens.” As part of advancing its mission, EPA set developing and implementing a cumulative impacts framework as an Agency Priority Goal and committed to it in its [Equity Action Plans](#) (EPA 2024c). This framework informs efforts to work to operationalize cumulative impacts analysis and action in EPA’s programs, consistent with applicable legal requirements.

These strategic goals for addressing cumulative impacts reflect substantial scientific evidence that pollution, socioeconomic disadvantage, lack of greenspace and other environmental benefits, and health susceptibility and vulnerability tend to be clustered spatially in recurrent, persistent, and systematic patterns (e.g., Bullard et al., 2008; Chakraborty, 2001; Chakraborty & Maantay, 2011; Chakraborty et al., 2011; Lerner, 2012; Morello-Frosch & Jesdale, 2006; Morello-Frosch et al., 2011; O'Neill et al., 2003; OEHHA 2010; UCC 1987). Science shows that the connections between spatial concentrations of environmental burdens and benefits, their distribution in society, and the resulting health disparities continue over generations (Colmer et al., 2020; Colmer & Voorheis, 2021; Lamoreaux, 2021). Research shows that many communities of color, low-income communities, Tribal communities, and rural communities face disproportionate environmental exposure, burdens, and cumulative impacts. For example, the long-lasting adverse impacts of racial discrimination in housing loans and other related practices on air quality, provision of ecosystem services (natural benefits), urban heat islands, and public health conditions demonstrate that historical, structural drivers of inequality are associated with current environmental conditions and health disparities in many communities (Hoffman et al., 2020; Lane et al., 2022; Richardson et al., 2020; Swope et al., 2022).

Additional evidence shows that humans embody, biologically, the material and social world in which we live (Krieger, 2005). The environment can have positive and negative impacts on health. Poor health conditions can be reflected in allostatic load, defined as the cumulative

harm to our bodies that may result from chronic stress exposure and accompanying long-term shifts in biological mechanisms that keep our bodies functioning normally (e.g., Logan & Barksdale, 2008). For example, exposure to traffic-related air pollutants or social stressors can lead to changes in factors that control (epigenetic) gene expression consistent with accelerated aging (Martin et al., 2022; Martin et al., 2021; Ward-Caviness et al., 2020a; Ward-Caviness et al., 2020b). A related concept called weathering is the cumulative biological impact of being chronically exposed to, and having to cope with, socially structured stressors. Weathering has been investigated as an explanation for racial disparities in health (Geronimus et al., 2015) and has been associated with preterm birth, low birth weight, infant mortality, hypertension, and stroke (reviewed in Forde et al., 2019). Research also points to health-promoting impacts of providing environmental benefits through improvements in quality of the built and natural environment and social determinants of health (e.g., DHHS 2022b; Egorov et al., 2020; Egorov et al., 2017; Martin et al., 2022; Martin et al., 2021). Consideration of interactions between people and their social, built, and natural environments is consistent with a systems-based One Health approach (NASEM 2023). We note that the One Health approach is also consistent with the use of Indigenous Knowledge in considering cumulative impacts. Indigenous Knowledge is often grounded in social, spiritual, cultural, and natural systems that are frequently intertwined and inseparable, offering a holistic perspective (EOP 2022).

The EPA is committing to help address the problem of cumulative impacts that federal advisory councils, [EPA Tribal Partnership Groups](#), and communities have brought to its attention for decades (e.g., EPA 2006; 2021c; NEJAC 2004; 2014; WHEJAC 2021). Addressing cumulative impacts also acknowledges the role of government in policies and practices that have resulted in the inequitable distribution of environmental burdens (Bailey et al., 2017; Payne-Sturges et al., 2021). Communities live with the outcomes of many intersecting decisions. When these decisions are made without considering the lived experience and the totality of impacts communities face, they can perpetuate or exacerbate the disproportionate concentration of environmental burdens and the lack of environmental benefits in communities with environmental justice concerns.

Key Goals

This framework document describes goals and principles that provide a shared point of reference for EPA when considering cumulative impacts in EPA decisions. Incorporating analysis and consideration of cumulative impacts into decisions, when appropriate, empowers the EPA to:

- More fully and accurately characterize the realities communities face.
- Pinpoint the levers of decision-making and identify opportunities for interventions that improve health and quality of life while advancing equity.

- Increase meaningful engagement, improve transparency, and center actions on improving health and environmental conditions in communities.

Analysis and consideration of cumulative impacts will contribute to decisions and actions by the EPA to advance the following long-term goals:

- Communities are safe, healthy, and thriving.
- All people are protected from disproportionate and adverse environmental human health and environmental effects and hazards, including cumulative impacts of environmental and other burdens.
- No community bears a disproportionate share of adverse environmental and public health impacts (EPA 2024c).

Cumulative Impacts: Principles and Process

This section describes grounding principles to guide the EPA's cumulative impacts work and fundamental data and approaches that can be used in varying decision contexts.

EPA Principles for Considering Cumulative Impacts

- 1. Center cumulative impacts work on improving human health, quality of life, and the environment in all communities.** In alignment with the EPA's mission, cumulative impacts work should be guided by the timely pursuit of improved environmental conditions in the places people live, play, work, learn, grow, gather (e.g., places of worship), and engage in cultural and subsistence practices.
- 2. Focus on the disproportionate and adverse burden of cumulative impacts.** People and communities should be protected from multiple disproportionate and adverse environmental hazards, human health impacts, and quality of life effects from environmental harms, including those related to cumulative impacts and climate change. Whenever possible, decisions informed by cumulative impacts work should aim to advance environmental justice goals to reduce existing impacts in overburdened and other communities with environmental justice concerns, enhance access to environmental benefits, and, in so doing, create pathways to health, quality of life, equity, resilience, and sustainability. Cumulative impacts work should also aim to prevent exacerbation of existing impacts and foster sustained, community-focused coordination across multiple decisions to reduce disproportionate and adverse burdens.
- 3. Apply a fit-for-purpose approach to assessing and addressing cumulative impacts.** How cumulative impacts are analyzed and considered should align with the specific requirements of the decision or action it is intended to inform. The data, tools, and approaches used should also be informed by the needs and priorities of affected communities or vulnerable population groups and/or lifestages, while meeting the requirements of Agency statutory authorities and processes.
- 4. Engage communities and incorporate their lived experience.** Meaningful engagement of people⁵ in the decisions and actions that affect their lives is a core pillar of environmental justice. Communicating early, broadly, and continually with affected communities and listening to community lived experience are key to learning from community members and acknowledging the knowledge held by people in each community. Identifying and incorporating consideration of environmental stressors and

⁵ Meaningful involvement also denotes meaningful access for those with limited English proficiency and equal access for persons with disabilities, consistent with the EPA's commitment to nondiscrimination in its permitting programs.

social determinants of health into decisions, when appropriate, should reflect communities' histories, lived experience, and realities, including information on cultural and historic practices and places, subsistence practices, traditional cultural properties, Indigenous Knowledge,⁶ and sacred⁷ and religious sites.

5. **Use available data and information to make decisions and take action.** This means acting with a sense of urgency on cumulative impacts issues affecting communities using available qualitative and quantitative data, community and traditional environmental knowledge, models, methods, and practices appropriate to the decision context. The EPA should look for opportunities within its existing legal and statutory authorities to act on evidence of cumulative impacts issues affecting individual communities or the nation as a whole.
6. **Operationalize and integrate ways to consider and address cumulative impacts.** The EPA has committed⁸ to advancing the analysis and consideration of cumulative impacts throughout its programs, as appropriate, and works to advance a whole-of-government approach. The EPA will seek opportunities to catalyze working across scales of government, with communities, and with other partners to reaffirm the importance of all parties working together to reduce cumulative impacts. This effort depends on building capacity with a focus on measuring progress and continuous learning.

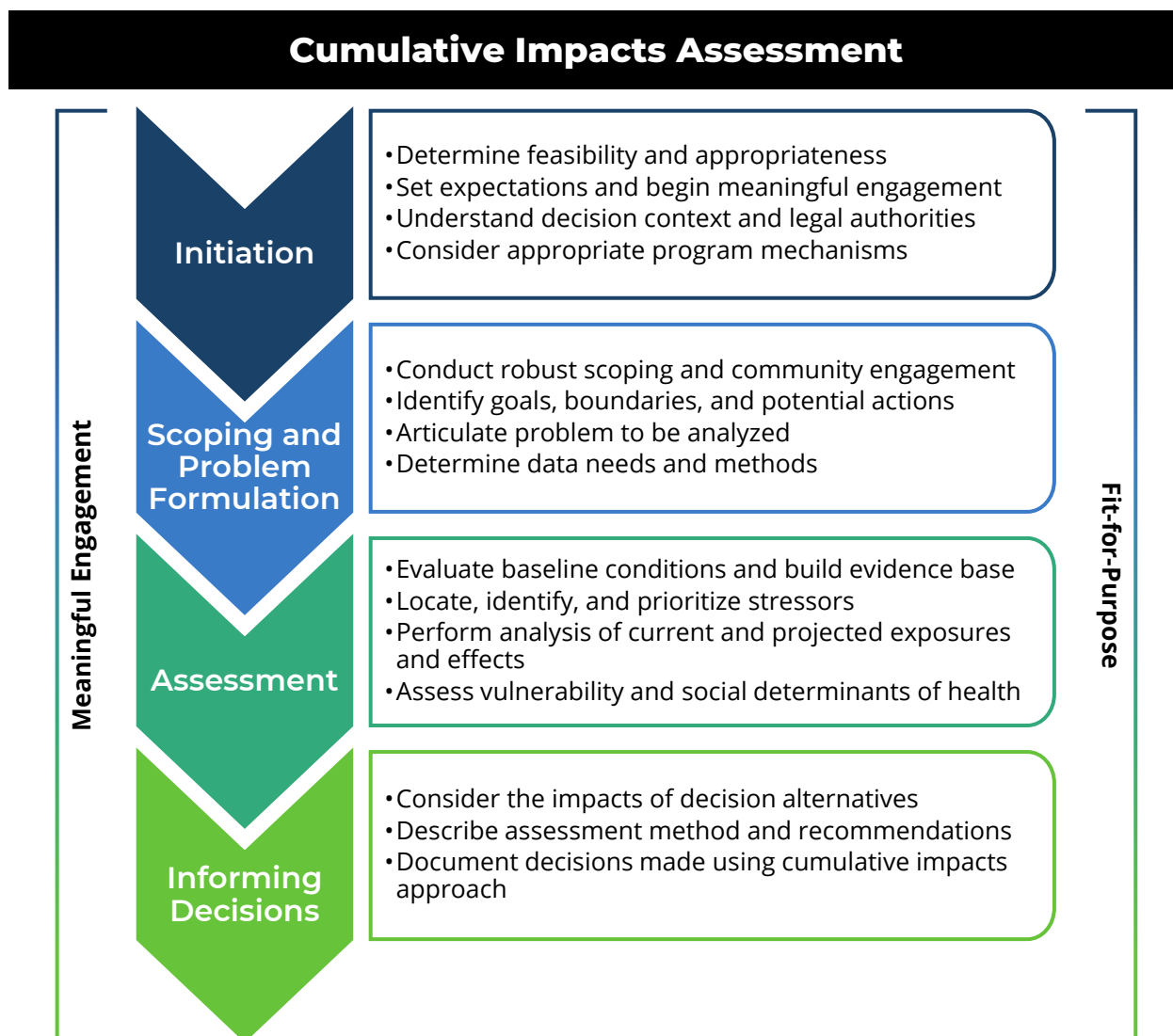
Processes for Considering Cumulative Impacts

A variety of possible approaches are available to assess and address cumulative impacts tailored to the decision or action at hand. The schematic presented here (Figure 2) is a guide to critical phases when cumulative impacts principles can be incorporated into program-specific and cross-program, community-focused processes. This conceptual model is designed to be general and adaptable to a variety of regulatory and nonregulatory contexts. It is deliberate in cultivating meaningful public and community involvement throughout the work, as appropriate, and emphasizes the use of fit-for-purpose approaches to cumulative impacts assessments to inform EPA decisions.

⁶ See <https://www.whitehouse.gov/wp-content/uploads/2022/12/OSTP-CEQ-IK-Guidance.pdf>.

⁷ See <https://www.doi.gov/sites/doi.gov/files/mou-interagency-coordination-and-collaboration-for-the-protection-of-indigenous-sacred-sites-11-16-2021.pdf>.

⁸ The EPA has committed to this principle in its Equity Action Plans (EPA 2024c) and in the EPA 2022–2026 Strategic Plan (EPA 2022b).



Addressing cumulative impacts is key to EPA achieving its mission of protecting human health and the environment

Figure 2. Proposed general structure for cumulative impacts assessment.

Cumulative impacts assessment is a structured but flexible process for evaluating quantitative and qualitative data to inform decisions that benefit communities. The EPA is developing approaches for cumulative impacts analysis and assessment that incorporate opportunities for meaningful engagement, as appropriate, to facilitate centering the process on community lived experience and concerns and fit-for-purpose practices, acknowledging the context specificity of considering cumulative impacts in environmental decision-making.

Cumulative impacts assessment—the process of evaluating both quantitative and qualitative data that characterize cumulative impacts to inform a decision or set of decisions—requires a systematic approach to characterize the combined effects from exposures to both chemical and nonchemical stressors over time across the affected population group or community. It evaluates how stressors from the built, natural, and social environments affect groups of people in both positive and negative ways (EPA 2022a).

While the definition of cumulative impacts includes the totality of exposures and their effects on health and quality of life, cumulative impacts assessment does not require identifying, measuring, and quantifying all exposures and effects. Rather, cumulative impacts assessments can be tailored to focus on exposures and effects of greatest relevance to the decision context. In addition, even when a separate cumulative impacts assessment is not conducted, its components can be combined with or integrated into other approaches.

Meaningful Community Engagement

Meaningful community engagement—guided by principles of integrity, inclusiveness, dialogue, influence, and accountability—is beneficial throughout the process to empower, engage, and acknowledge the lived experience of community members (EPA 2023a). Just as there are various approaches for analyzing cumulative impacts, there are context-dependent fit-for-purpose approaches to community engagement. Depending on the decision context, community members can provide needed data on historical or concurrent local conditions using appropriate interested party and public-engagement practices. An engaged community can provide local knowledge of health and existing conditions; identify areas of concern and issues of interest that might not be readily apparent to those outside the community; offer contextual/cultural perceptions and experiences; and assist in identifying and refining the scope of the assessment and its ultimate recommendations. For example, Tribes and Indigenous peoples may also choose to share observational and experiential knowledge with the EPA to be incorporated into existing risk models and scenarios, which include examples such as monitoring fish populations, managing wildlife, cleaning up oil spill sites, and collecting and analyzing ecological data. Approaches used to analyze cumulative impacts can use community engagement in developing a specific tool or method without necessarily engaging communities in applying the tool for decision-making (see Appendix B, Cumulative Impacts Implementation at the EPA and Elsewhere).

Community involvement and meaningful engagement are essential for building capacity and fostering trust in the process and its outcome. The level of public involvement varies with the decision context but generally involves higher levels of engagement and more formal approaches to collaboration for place-based decisions as one moves away from information provision or exchange toward activities designed to empower stakeholders. Community involvement can inform an analysis of cumulative impacts by helping to:

- Prioritize stressors and promote environmental health.
- Co-produce evidence and participatory science, especially geographically specific data or information.
- Meet data quality guidelines.
- Interpret the causal nexus of exposure and impacts of a regulated stressor.
- Highlight pathways of exposure that affect health status.
- Identify other social determinants of health indicators, such as access to health care.
- Determine the relationship between key determinants, including policy choices.

When engaging with federally recognized Tribes, the EPA uses the [Tribal Consultation](#) process to provide an opportunity for meaningful dialogue and input when EPA actions or decisions may affect them. In addition, the Agency's network of [Tribal Partnership Groups](#) facilitates the exchange of technical information and communication between Tribes and EPA. For example, the National EPA-Tribal Science Council works to integrate and increase Tribal involvement in the EPA's scientific activities, while the National Tribal Toxics Council provides Tribal input on issues related to toxic chemicals and pollution prevention.

Cumulative impacts assessment at the EPA shares methodological features with risk assessment and cumulative risk assessment (EPA 2023d; NEJAC 2004; 2014; NJDEP 2009; OEHHA 2010). All are stepwise processes that include initiating an action, planning and scoping, formulating a problem, assessing, and producing evidence-based recommendations for the decision(s) at hand. All include the fit-for-purpose concept and support selection and implementation of the appropriate level of assessment for a given impact or risk. Each approach may employ a variety of methods to provide information to decision-makers about health outcomes associated with exposures to multiple chemical and nonchemical stressors.

Methods used are not exclusive to an assessment approach and can be used across different approaches. Determining which approaches and analytical methods to use in cumulative impacts assessment depends on factors such as statutory requirements, the scope of an assessment, types of data needed and available, and applicability for the evaluation and needs of the decision-maker. Such determinations should be made with the aim of applying the best available science and information, given the decision context, and should adhere to Agency scientific processes and data quality requirements. Approaches can be used in combination. Assessors need to exercise judgment in determining when to use cumulative risk assessment, cumulative impacts assessment, or another approach for evaluating exposures to multiple stressors for a specific purpose.

Figure 3 illustrates that consideration of cumulative impacts in analysis or assessment includes stressors that are not considered in the EPA's traditional risk assessment paradigm. These include the environmental stressors and environmental health impacts that are already being experienced by individuals and communities. In cumulative impacts analysis, the multiple, disproportionate environmental and climate hazards experienced by overburdened communities, their interaction with and contribution to existing community and structural stressors, and adverse impacts on health and quality of life of individuals living in those communities are considered together as factors to be included in environmental decision-making. This figure also shows that cumulative impacts assessment can employ key components of traditional risk assessment in combination with or as an input to cumulative impacts assessment (Fox et al., 2017).

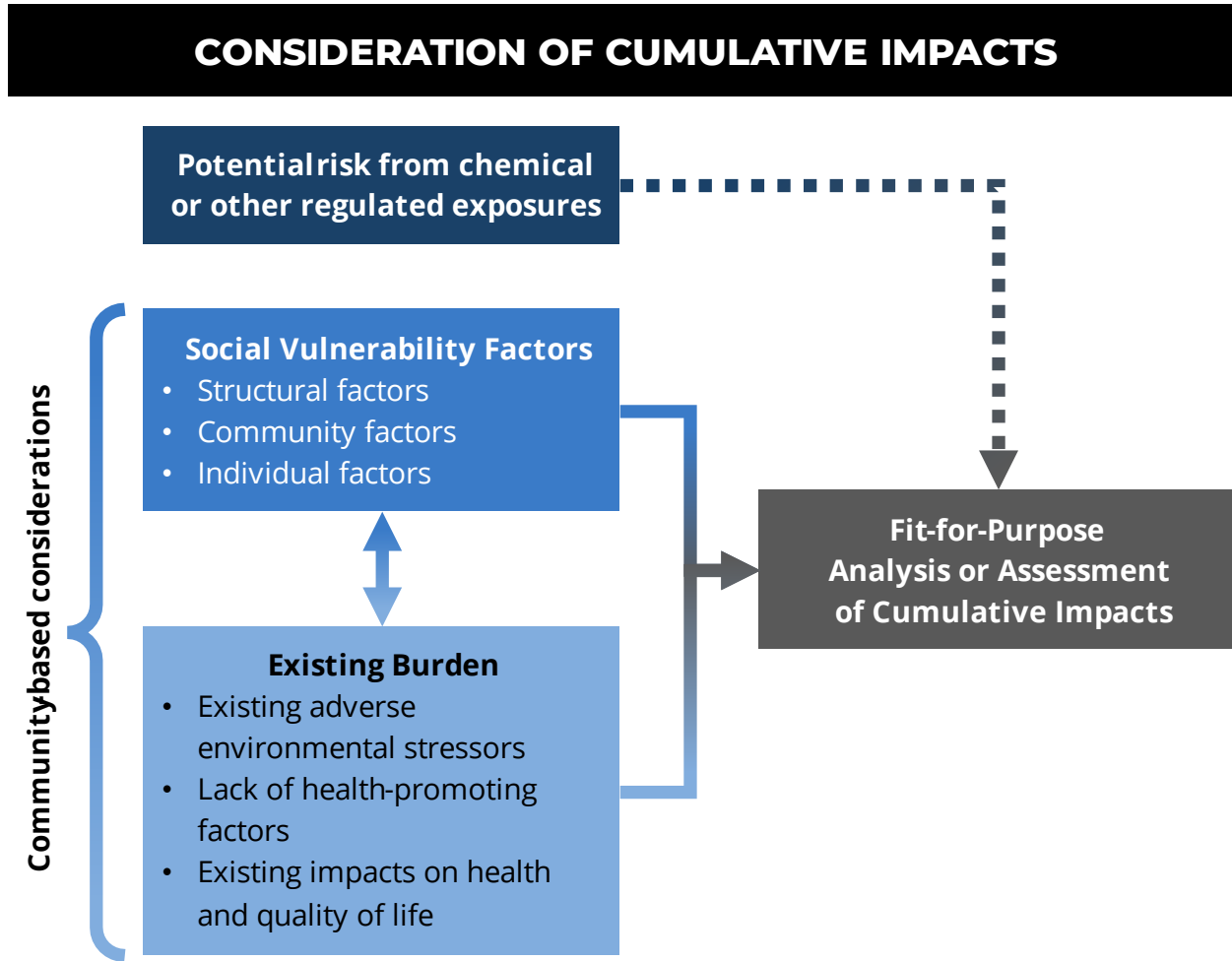


Figure 3. Consideration of cumulative impacts.

The cumulative impacts paradigm incorporates the existing burden of social vulnerability and environmental stressors experienced by communities—defined broadly as individuals, geographically defined communities, or definable population groups or lifestyles—into environmental decision-making. Cumulative impacts assessment can include risk from chemical or other regulated exposures as determined by traditional or cumulative risk assessment in combination with or as an input to cumulative impacts assessment.

Initiation

Initiation, at the start of a decision-making process, involves a preliminary evaluation of the relevant factors in the decision context (Figure 2). These factors include applicable legal authorities, available resources and time, history, baseline conditions, and input from initial engagement with regulatory partners and the community (when such input is available and appropriate to the decision-making process).

Multiple agency or community factors may influence when to consider cumulative impacts and whether it is feasible (see footnote 3) or appropriate to carry out a cumulative impacts analyses or assessment to support environmental decision-making. For example, NEJAC (2004) noted that “a common understanding by all parties of multiple stressors as the starting point for a dialogue is key to beginning the iterative process of building the confidence, trust, and capacity within the impacted community...” Further, EPA’s 2022–2026 Strategic Plan recognizes:

Communities that have multiple industrial and energy facilities and are saturated with legacy pollution want to see EPA realign its enforcement in a way that provides action, accountability, and guidance for taking cumulative impacts and risks into account, even if they cannot be measured with precision. Permitting and rulemaking have typically not reflected the reality of overburdened communities, which means that it is often easier to site an eighth facility in a community that already has seven than in a community that has none.

Factors that may initiate analysis of cumulative impacts include conditions that trigger an environmental justice analysis; community-identified human health, ecological, and vulnerability concerns; anticipated changes in the community or environment related to permitting or other activities; colocation of multiple (or a high density of) pollution-emitting facilities or other pollution sources; evidence of existing increased or elevated prevalence of human illness or perception of such increases in a community; or measured or perceived elevations in pollutant concentrations. The scope of the analysis or assessment can include characterizing existing community burdens and changes in these burdens associated with a proposed action.

Decision context is defined by both specific decisions and the broad set of multiple decisions and authorities needed to address disproportionate adverse impacts that have accumulated over time as a result of earlier decisions (EPA 2022a). The consideration of cumulative impacts can be tailored to match the needs of a range of specific decisions from place-based to national in scope. Decisions vary depending on the unit of government making the decision, each with its own legal authorities and jurisdiction, on the purpose of the decision, and on other organizations that may be involved. Most decisions are made in the context of programs that routinely carry out specific types of actions as part of the democratic process at that level of government, guided by policies and procedures.

Program functions generally available to multiple units of government for environmental and public health protection include:

1. Rulemaking, ordinances, and standard setting
2. Permitting and licensing
3. Environmental monitoring
4. Financial assistance
5. Technical assistance and education
6. Compliance assurance and enforcement
7. Scientific research and technology development
8. Land use and zoning
9. Community action planning /collaborative problem-solving (CEEJH 2020; EPA 2008)
10. Site assessment and remedy selection for contaminated lands

Legal authorities across units of government and programs overlap in various ways across this broad set of multiple decisions. When relevant and appropriate, cumulative impacts approaches should be used to support explicit consideration of how the impacts of multiple decisions and their intended and unintended consequences over time intersect to produce cumulative impacts on community health and quality of life. Meaningful engagement with communities can enrich the decision context with lived experience and collaborative problem-solving.

Scoping and Problem Formulation

Scoping involves identification, characterization, and prioritization of the issues of concern. Problem formulation involves articulating the research or analysis questions, and determining which data and analytical methods will be used to answer the questions. This stage typically includes establishing the specific goals, boundaries, and actions for the assessment informed by the decision context. These actions may involve: identifying and prioritizing health impacts and stressors that will be assessed; identifying data needs, datasets, and sources; determining geographical and temporal boundaries; selecting analytical methods and tools; initiating community involvement, as appropriate; planning for public review of the cumulative impacts assessment when appropriate; and considering steps, such as peer review, in conformance with well-established processes and procedures related to information quality and in accordance with scientific integrity principles.⁹ Scoping and problem formulation also include defining decision alternatives that will be evaluated against available evidence in the assessment phase.

⁹ See EPA Peer Review: <https://www.epa.gov/scientific-leadership/peer-review>; Information Quality Guidelines: <https://www.epa.gov/quality/information-quality-guidelines-igqs>; Science Integrity Policy: <https://www.epa.gov/scientific-integrity/epas-scientific-integrity-policy>.

Cumulative impacts assessment can be considered, during these phases, to fulfill EPA objectives for just treatment and meaningful involvement of all people regardless of income, race, color, national origin, or disability in Agency decision-making.¹⁰

It is not always feasible or appropriate to conduct a stand-alone cumulative impacts assessment. In the rulemaking context, for example, cumulative impacts can, as appropriate, also be considered as part of the environmental justice analysis, as described in the EPA's draft Revision of *Technical Guidance for Assessing Environmental Justice in Regulatory Analysis* (EPA 2023d). For example, when characterizing differences in exposures and health risks in the baseline and for the policy options under consideration, it is important to consider the role of cumulative exposure to multiple environmental and other stressors already affecting communities or interacting with potential changes under the policy action. Consistent with the EPA's Technical Guidance, this consideration can take the form of a preliminary analysis to understand the potential for cumulative impacts concerns followed by more in-depth analysis or assessment when warranted.

Assessment

The assessment phase comprises building an evidence base and performing analysis to project how particular decision alternatives are likely to impact exposures and effects on health, well-being, and quality of life, defined in the problem formulation step and fit for the purpose of the decision(s) identified in that step.¹¹ Evidence for cumulative impacts assessment can include quantitative, semiquantitative, and qualitative data and information that are relevant to the decision context for assessing intrinsic and extrinsic factors that reflect vulnerability and interactions with the built, natural, and social environments. This evidence includes data on exposure to multiple chemical and nonchemical stressors, community health burden and health risk, population and lifestage vulnerability and environmental quality, among others (Solomon et al., 2016). Evidence may support or refute exposures and effects. In some cases, it may be necessary to acknowledge a lack of

¹⁰ Note that EPA does not consider race, color, national origin, or sex when making decisions regarding the distribution of government benefits and burdens.

¹¹ This section on assessment describes the full extent of what could be included in a cumulative impacts assessment. Consistent with the fit-for-purpose concept and the action-oriented purpose of cumulative impacts assessment to inform specific decisions, not every element described here may be included in every cumulative impacts assessment.

consensus in gathered evidence. When possible and applicable, the analysis should transparently assess competing information by characterizing the strength of the evidence using best practices for the relevant field, along with identifying uncertainties.

A cumulative impacts assessment should systematically assess the baseline conditions and potential consequences of a proposed decision (e.g., a proposed rule, permit, community action) before making a final decision. The baseline assessment can be used to build a conceptual or pathway model for the assessment for different exposure or solution scenarios, yielding options or recommendations informed by those scenarios.

In a cumulative impacts assessment, the EPA should identify and prioritize stressors affecting people and the environment. Analyses may include consideration of social determinants of health (EOP 2023c), including Tribal lifeways, cultural, and subsistence practices, which may be pertinent exposure-response modifiers (see text box). It may also be helpful to evaluate individual and combined effects of important stressors to determine whether one or more stressors are predominant in any adverse health or well-being outcomes, and whether there are combined effects of important stressors (Sexton, 2015). Additional research into interactions among stressors and interactions of exposure changes with baseline levels will help to strengthen such evaluation.

Exposure scenarios for Tribal and Indigenous populations differ from the general population exposure scenarios in that subsistence lifeways and diets are relevant, outdoor activities are prevalent, and traditional and cultural activities are frequent. Unique Tribal practices may expose Tribal and Indigenous populations to higher concentrations of contaminants through natural resources that could differ substantially from exposures from the general population

Social Determinants of Health



Nonchemical stressors include social determinants of health (e.g., economic stability, education access and quality, healthcare access; neighborhood and built social and community context). People do not experience these social determinants of health equally. Moreover, they are often associated with each other and with exposure to chemical stressors (DHHS 2022a). Social determinants of health account for about 50% of variation in health outcomes and are a major driver of health disparities (DHHS 2022c). Environmental health research has found that a host of health outcomes, including obesity, general cognitive ability, attention deficit hyperactivity disorder, and childhood externalizing behaviors, are associated with exposure to chemical stressors and social determinants of health (Lichtveld et al., 2018; Nilsen et al., 2020a; Nilsen et al., 2020b; Nilsen & Tolve, 2020; Ruiz et al., 2016).

experiences. In addition, some Tribal and Indigenous populations live in areas with limited infrastructures with higher exposures (EPA 2019). Indigenous Knowledge can provide accurate information, valuable insights, and effective practices that complement practices and knowledge derived from other approaches to exposure assessment. Examples of resources that are relevant to Tribal exposure scenarios are listed in Appendix A.

Assessment of baseline conditions and current and projected exposures and effects on health and quality of life should be optimized for informing the decision(s) at hand, consistent with the fit-for-purpose principle. Data and analysis could include:

- Combined impacts across multiple chemical and nonchemical stressors, including climactic and natural hazard stressors
- Multiple exposure pathways across media
- Community vulnerability, sensitivity, adaptability, and resilience
- Cultural and subsistence practices and behaviors
- Ecological characteristics and assessment points
- Exposures to stressors in the relevant past and future, especially during vulnerable lifestages
- Identifying priority adverse and health-promoting effects and outcomes of interest
- Distribution of environmental burdens and benefits
- Individual variability and behaviors
- Health and well-being benefits and mitigating factors
- Uncertainty and variability associated with data and information

The environmental public health literature supplies ample evidence that disproportionate and cumulative impacts of exposure to stressors can result in health disparities, including adverse outcomes such as asthma, cardiovascular disease, poor birth outcomes, cancer, and diabetes (Bailey et al., 2017; EPA 2016a; 2016b; Morello-Frosch et al., 2011; OEHHA 2010), and that climate change is likely to exacerbate this health burden (Huntjens & Nachbar, 2015; Li et al., 2021). Individual-level health data are often difficult to obtain because of privacy laws but are sometimes available at coarser spatial scales. In addition, nationally consistent indicator level data are available through tools such as ATSDR's Environmental Justice Index (estimated prevalence of asthma, cancer, high blood pressure, diabetes, poor mental health) (CDC & ATSDR 2022a, 2022b). The EPA's [EJScreen](#) includes data on low life expectancy, heart disease, asthma, and cancer. [The Climate and Economic Justice Screening Tool](#) (CEJST) draws from the U.S. Census [American Community Survey](#), the Center for Disease Control [Places](#) data, and other publicly accessible data sources to develop environmental, climate and socio-economic indicators of burden relevant to identifying disadvantaged communities. State and local health data (e.g., on elevated blood lead levels) may be available through collaboration with public health officials across scales of government. Self-reported health has been used in community participatory approaches. In addition, Tribes and Indigenous

communities may have special expertise with respect to environmental and community impacts.

In cumulative impacts assessment, individual, community, population, or lifestage group vulnerability and health effects of concern can be incorporated into a conceptual model describing the relationships between stressors and adverse effects on health and well-being (Sexton, 2015). Vulnerability can be due to intrinsic factors (McHale et al., 2018), such as age, existing health or genetic conditions, or extrinsic factors, such as socioeconomic vulnerability, structural drivers of inequality, including structural racism (Bailey et al., 2017; Payne-Sturges et al., 2021), climate change, access to health care, or food deserts (Solomon et al., 2016).

Informing Decisions

Environmental decision-making using a cumulative impacts approach will ideally consider the impacts of decisions on creating conditions that improve health, quality of life, and well-being. Considerations may include:

- How will the different decision choices affect cumulative impacts?
- What are the pathways by which the prioritized exposures/effects would be affected by different decision choices?
- How does each decision choice affect the regulated exposure/effects?
- How does each decision choice affect health outcomes?
- How does each decision choice change the exposures and health effects among those with greatest exposure and health burdens of cumulative impacts?
- How are vulnerable populations or groups impacted by each decision choice?

Documentation of decisions for which analysis and consideration of cumulative impacts was significant should include a description of the analysis or assessment methods used, details appropriate to the methods of analysis or assessment, and recommendations making the selected methods, analysis, and rationale are transparent to all interested parties.

Cumulative Impacts Implementation at the EPA

The EPA, other government agencies, and interested parties at the Tribal, territorial, state, and local levels have integrated the principles of cumulative impacts into their processes (Table 1). In this section and the one that follows, Moving Forward, we provide examples of actions that the EPA has taken or has initiated at the time of writing this document.

Appendix B includes narratives that illustrate the EPA and others' actions that apply the principles of cumulative impacts under various statutory and regulatory authorities. Although these early efforts might not consider the full range of chemical and nonchemical stressors or might not have been carried out as formal cumulative impacts assessments, they nonetheless include multiple sources of pollution and, in some cases, multiple pathways of exposure or consideration of social determinants of health in planning and regulatory decisions to consider and address disproportionately impacted communities. The EPA will update this appendix regularly with additional examples of cumulative impacts pilot projects, case studies, and other actions in the electronic version of this document.

Developing Science and Tools to Support Cumulative Impacts

[Cumulative Impacts Research: Recommendations for EPA's Office of Research and Development](#) (ORD) (EPA 2022a) focuses on recommendations to enhance EPA research that will support the EPA's implementation of cumulative impacts. Public comment and external scientific expert input on the report was received via a consultation with the EPA's Science Advisory Board. The EPA also gathered input from Tribal, state, and local government through listening sessions, including enhanced Tribal engagement implemented prior to Tribal consultation¹² (see Appendix A of EPA 2022a). This report includes the EPA's working definition of cumulative impacts, an overview of the science underpinning cumulative impacts, recommendations on how the EPA ORD can continue to facilitate research in this emergent and interdisciplinary field, and an overview of gaps and barriers that still exist in assessing and addressing cumulative impacts.

¹² The EPA received feedback from 65 Tribes on cumulative impacts assessment through early engagement prior to Tribal consultation on ORD's FY23–FY26 Strategic Research Action Plans (EPA 2023h).

Table 1. Examples of Methods for Assessing Cumulative Impacts¹³

| Method | Single Scoring | Matrix Approaches | Community-based Approaches | Epidemiological/Toxicological/Exposure Modeling Approaches |
|----------------------------|--|--|--|---|
| Description | Single scoring approaches combine values for environmental and social vulnerability indicators into a single score used for screening level assessment and categorization. | Matrix approaches evaluate environmental burdens and social vulnerability characteristics independently and apply separate thresholds or criteria to each to inform a regulatory or nonregulatory decision used for screening level assessment and categorization. | Health impact assessment and other structured processes used to develop community action plans or identify how a project, policy, or program might influence health, and produce recommendations to enhance the health benefits of the project/policy/program and to mitigate potential harms. | Data analyses using epidemiological and toxicological data, exposure assessment and modeling, and site data to characterize the factors affecting risk and vulnerability or susceptibility of populations and population groups, including people at different lifestages. These analyses can include methods to characterize mixtures, including aggregate and cumulative exposures. |
| Examples | CalEnviroScreen ; MiEJScreen ; MDE EJ Screening Tool ; Chicago EJ Index ; Washington Environmental Health Disparities Map ATSDR EJ Index | New Jersey Method ; Massachusetts Method ; CEQ CEJST | Health Impact Assessment Environmental Justice Collaborative Problem solving Program Environmental Benefits Districts Green Impact Zones Green Zones | Identification of modifying factors in risk characterization documents such as the Integrated Science Assessments Community-level exposomics Epigenetic approaches to identifying and analyzing the impacts of chemical and nonchemical exposures (e.g., Martin et al., 2022). |
| Common Applications | <ul style="list-style-type: none"> Inform decisions on siting, permitting, enforcement, and infrastructure improvements | <ul style="list-style-type: none"> NJ: To decide whether to pose conditions on or deny permits for new sources MA: Air quality permitting CEQ: To identify communities that qualify for funding | <ul style="list-style-type: none"> Community participatory place-based approaches for solutions-based planning to transform or revitalize communities Identify how a project, policy, or program might influence health | <ul style="list-style-type: none"> Risk assessment Cumulative risk assessment |

¹³ Mention of existing methods produced outside of EPA does not constitute endorsement or recommendation for use.

Community-scale Cumulative Impacts Assessment and Action Planning

Region 5 Community Action Roadmap (EPA 2023g). *This guidance supports community-engaged codesign of community action plans to identify, prioritize, and address multiple stressors and cumulative impacts.*

EPA Region 5 developed the “Community Action Roadmap” (CAR) as a systematic, collaborative approach to assess and address cumulative impacts. The CAR is made up of a series of phases benchmarked to the HIA model that integrates best practices established under the Environmental Justice Collaborative Problem-Solving Model (EPA 2008). These phases are tailored to support consistent, effective internal coordination of EPA’s cross-program, community-focused planning, along with meaningful community engagement at each phase. The CAR establishes a place-based focus on the distribution and concentration of risks and other impacts, along with opportunities to invest in overburdened communities; builds in routine, authentic engagement with communities and their lived experiences; and facilitates joint planning and coordination with governmental and nongovernmental partners, with a bias for action. Region 5 prepared an SOP to provide its personnel with a step-by-step process for applying the roadmap; the region is in the early stages of implementing this SOP.

Cuyahoga Community Action Plan. Communities in Cuyahoga County, Ohio, raised concerns to the EPA about disproportionate and cumulative impacts resulting from racial, economic, and environmental disparities and social injustices related to education, employment, housing, and human health. In response, Region 5 applied the CAR process to identify (a) the needs and concerns of these communities through collaborative engagement with the community, community-based organizations, and state and local governments; and (b) actions that will address these impacts while building sustainable capacity to advance environmental justice and equity.

In the screening phase, community advocates and leaders raised lead exposure concerns related to the explosion of a lead smelter in Bedford, Ohio. The EPA completed a preliminary assessment of the area using EJScreen and began delivering lead awareness outreach to childcare facilities and schools within a 5-mile radius of the accident. In the scoping phase, the EPA characterized baseline conditions and “ground-truthed” this information with community partners to identify three focus areas of concern: 1) lead hazards and exposure 2) Black maternal health and mortality, and 3) air quality issues and asthma prevalence. In the assessment phase, the EPA worked with community partners to refine the scoping analysis of baseline conditions by adding local resources that conveyed a more holistic view of the disproportionate impacts endured by the community and identifying potential activities and collaborators to address these impacts. In the decisions and actions phase of

this assessment, the EPA and partners co-designed and committed to a set of recommended actions to mitigate negative outcomes and enhance beneficial outcomes for communities within Cuyahoga County, Ohio. These actions focused on both the community residents as well as community leaders and advocates with an emphasis on building capacity and resiliency. In the reporting phase, the EPA created and shared a draft community action plan with partners and is currently establishing a management strategy that will capture commitments for regular reporting.

The CAR has incorporated [Health Impact Assessment](#) into its process. The EPA has [applied HIA to facilitate community action planning](#) that addresses multiple regulatory and nonregulatory issues of concern to communities. HIA is a structured, community-engaged approach that systematically considers the full range of potential impacts of a proposed policy, plan, program, or action on health determinants, health status, and health equity. HIA provides a set of steps that can be applied to implement a transparent, inclusive, cumulative impacts assessment. HIA minimum elements and practice standards are consistent with the principles described above and allow for a full range of data derived from science, historical sources, economic analysis, and other areas to be brought to bear on multiple outcomes of interest (EPA 2023c).

Southwest Rockford Revitalization Rapid HIA (Rockford, Illinois) for Brownfields Development. *This example of a fit-for-purpose, community-engaged process informed decision-making on actions to enhance community public health and restore environmentally impacted sites (EPA 2022c).*

The City of Rockford, Illinois, was seeking to revitalize its South Main Corridor Area. The city received technical assistance from the EPA Office of Brownfields and Land Revitalization (OBLR) to design a Neighborhood Revitalization Strategy. A rapid HIA, an abbreviated form of HIA, was undertaken by the EPA ORD in partnership with OBLR, with input from EPA Region 5, the City of Rockford, and a Land Revitalization Technical Assistance Contractor.

A mixed-methods approach was used in the HIA, including qualitative and quantitative data analysis, geographic information system (GIS) mapping, scientific literature review, and analysis of interested party input from multiple efforts that have taken place in the area. The HIA examined the evidence and proposed revitalization concepts for the South Main Corridor Area and their possible positive and negative public health impacts, with an emphasis on mental health and social determinants of health.

The HIA examined six determinants of health: housing, neighborhood and built environment, parks and greenspace, crime and safety, employment and economy, and social and cultural well-being. The assessment characterized the existing conditions in the study

area related to these determinants of health and showed how neighborhood revitalization could potentially impact these health determinants and, ultimately, human health. The HIA recommended over 80 strategies to maximize the potential health benefits and mitigate the potential adverse health impacts of neighborhood revitalization in the South Main Corridor. These recommendations reflect two overarching themes: 1) involving and engaging the community in the planning, implementation, and monitoring of neighborhood revitalization in the study area; and 2) addressing the community's needs and advancing equity through revitalization.

Moving Forward

Identifying, assessing, and addressing cumulative impacts is central to achieving better human health and environmental protection and improving the performance of the EPA's mission: to deliver protection to all communities by following the law, following the science, working transparently, and keeping justice and equity at the center of our work. The EPA's [FY 2022–2026 EPA Strategic Plan](#), the EPA's [2024–2027 Climate Adaptation Plan](#), the EPA's [FY 2022 Equity Action Plan](#) and [FY 2023 Equity Action Plan](#), and [Executive Order \(EO\) 14096](#) have strengthened and provided opportunities for EPA to reaffirm its mandate for assessing and addressing cumulative impacts.

The EPA is building on significant experience at the Agency and across the country as communities, municipalities, states, Tribes, and federal programs devise methods and employ fit-for-purpose approaches consistent with existing information and data availability to analyze and consider cumulative impacts in actions or decisions that directly affect peoples' lives. In addition to the examples highlighted in the previous section and in Appendix B, efforts are underway across the EPA to better understand and begin to consider cumulative impacts in our programs.

EPA Cumulative Impacts Work Underway

As this framework is issued, the EPA, alongside state, Tribal, territorial, and local governments, is already learning about cumulative impacts and beginning to incorporate cumulative impacts approaches in their work. EPA activities underway include:

- **Leadership structure:** The EPA formed a chartered work group with representatives from all headquarters and regional offices to advance this work and related internal communications and identified executive champions to lead and guide it.
- **Performance measures:** The EPA has developed performance measures per its commitment in the EPA Office of the Inspector General's 2023 report, "[The EPA Needs to Further Refine and Implement Guidance to Address Cumulative Impacts and Disproportionate Health Effects Across Environmental Programs](#)" (EPA OIG 2023).
- **Cumulative impacts research projects:** The EPA has over 90 intramural and 30 extramural research projects underway that focus on cumulative impacts. This research builds on more than a decade of working on community-focused science, including discussions with Tribes to explore different cumulative impacts methods (Torso et al., 2023). The EPA has proactively engaged the National Academies of Science, Engineering, and Medicine to develop a foundational report, *State-of-the-Science and the Future of Cumulative Impact Assessment* (NASSEM 2024), to bolster analysis and consideration of cumulative impacts in Agency processes for years to come.

- **On-the-ground cumulative impacts analyses:** The EPA has a range of on-the-ground activities, such as those in Chelsea, Massachusetts, North Richmond, California, and Cleveland/Cuyahoga County, Ohio, which are creating opportunities for the EPA to advance consideration of cumulative impacts through collaboration.

These activities reflect a range of approaches rather than a single tool, which is expected, given the evolving nature of this work and the fit-for-purpose principle. The development of cumulative impacts performance measures will provide additional context for this work as it proceeds.

What's Next?

The EPA will continue to build its capacity to analyze and consider cumulative impacts and to advance the state of the science and the practice. Key next steps include:

- Engaging our partners and co-regulators through outreach, listening sessions, public comment, and consultation
- Consulting with expert bodies for advice (e.g., National Environmental Justice Advisory Council, Local Government Advisory Council, Tribal Science Council, National Tribal Toxics Council, the EPA's Science Advisory Board, National Academies of Science, Engineering, and Medicine)
- Fostering the practice in a cost-effective manner focusing initially on place-based analysis and decision contexts

Further actions to build capacity are underway in the following areas:

- **Training:** The EPA is developing comprehensive training programs designed to boost staff fluency and proficiency in cumulative impacts. The training modules will range from foundational to advanced levels, providing staff with approaches and tools needed to operationalize cumulative impacts across various programs. EPA national program offices and regions are invited to step forward to pilot this crucial training initiative.
- **Funding:** The EPA has committed to funding the development and implementation of community action to identify, assess, and address multiple, disproportionate, and/or cumulative impacts affecting communities through its [Environmental Justice Granting and Collaborative Agreement](#) programs. The EPA has also funded over \$50 million in Science to Achieve Results (STAR) grants to build academic-community partnerships to advance consideration of cumulative impacts in actions affecting communities (<https://www.epa.gov/healthresearch/cumulative-impacts-research>).
- **Tools and protocols:** The EPA is investing in science to support the practice of cumulative impacts analysis and assessment. It is developing innovative geospatial and data integration tools to aid in the effective implementation of cumulative impacts across programs. These tools will expand and enhance the EPA's ability to characterize and

address the burdens facing communities comprehensively. The EPA is also developing protocols to enhance the capacity of governments and groups at all scales to develop action plans to identify, characterize, and address cumulative impacts affecting communities.

- **Convening whole-of-government solutions:** The EPA plays an important role as the convenor for the whole-of-government and community approaches. The Agency is taking steps to convene leading experts to advance the boundaries of science and best practices in policy and implementation of cumulative impacts.

Continuous Improvement

To support cumulative impacts analysis and assessment becoming a standard business practice across its programs, as appropriate under applicable legal requirements, the EPA aims to catalyze a cycle of continuous improvement whereby each cumulative impacts application informs the improved development of the next (Figure 4). This logic model includes short-term goals set on actions to build capacity, intermediate goals set on actions to build experience, and long-term goals set on improving public health outcomes and equity. This cycle is driven by organizational change to incorporate consideration of cumulative impacts into Agency processes. Drivers of change include continuous learning from scientific research and by documenting and evaluating results of the EPA's and others' experiences with cumulative impacts analysis and assessment. Drivers also include engagement of communities, Tribes, and other interested parties, recognizing that who is part of the process often determines what is done. Implementing analysis and consideration of cumulative impacts may also benefit from further tool development to make available needed data, community engagement tools, analytical tools, and processes to fuel rapid and parsimonious fit-for-purpose assessments and decisions.

To operationalize cumulative impacts, the EPA will learn while doing, in conjunction with community-based organizations, governmental partners at all levels, academia, and other interested parties. The substantial work on cumulative impacts already taking place at the EPA and elsewhere has been brought about by the realization of the urgent need to address longstanding issues affecting communities. This framework provides a foundation for systematically transforming this learning into procedures, tools, policies, guidance, and practice. The cumulative impacts challenge—along with associated issues such as environmental justice and climate change—will demand new approaches for accomplishing the EPA's mission of protecting the nation's environment and public health. Among these will be greater collaboration, shared leadership, joint planning, and cogeneration of knowledge and expertise. In that light, this framework encourages greater coordination and cross-fertilization of promising practices internally among the EPA's programs and regions, and invites partnership, joint problem-solving, and collective learning externally with overburdened communities, coregulators, researchers, business and industry, and others.

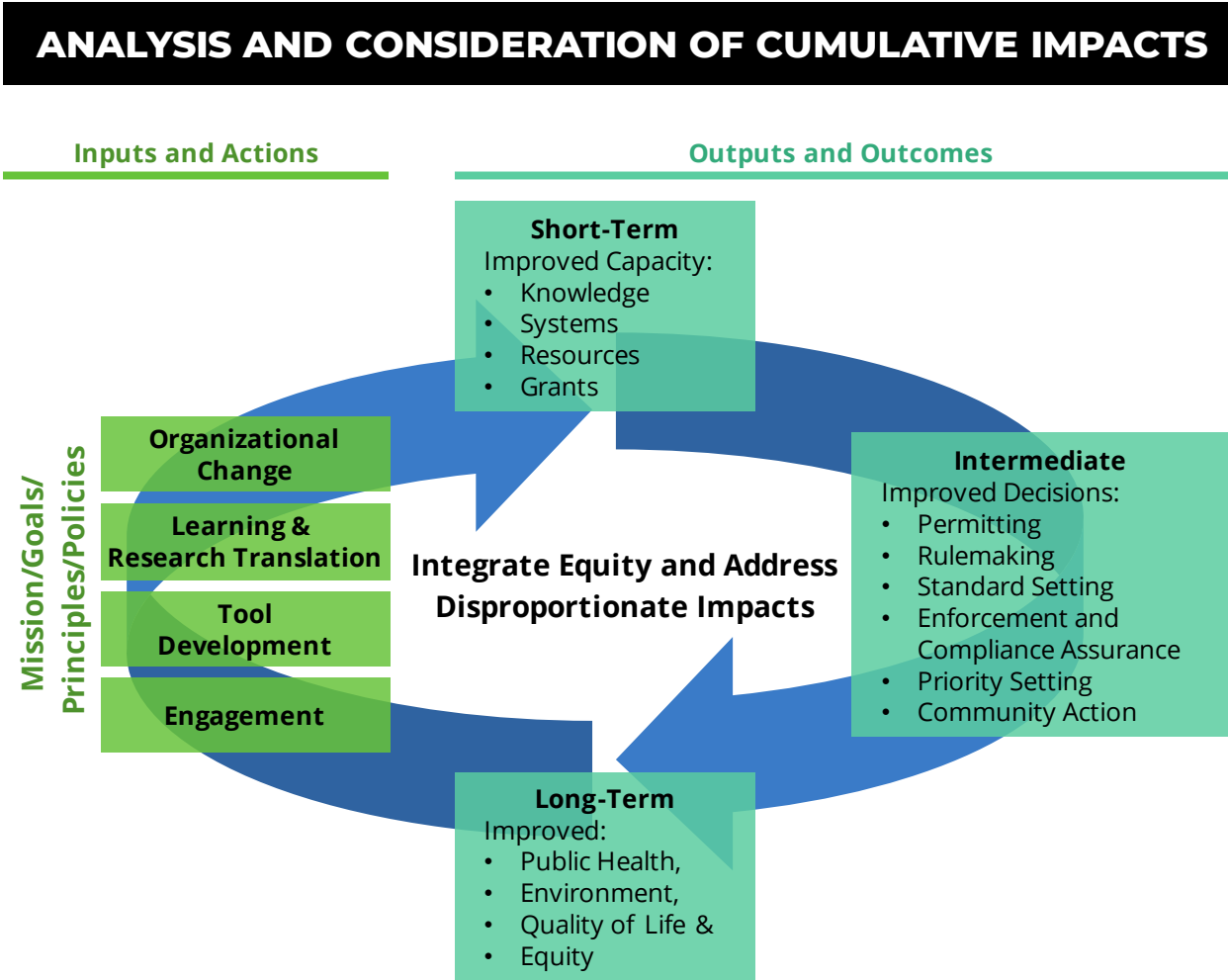


Figure 4. Logic Model for moving forward on analysis and consideration of cumulative impacts.

Logic model describing a continuous learning cycle for operationalizing analysis and consideration of cumulative impacts at the EPA. Near-term actions are focused on building capacity for analysis and consideration of cumulative impacts with training inside the EPA and through grants and other mechanisms outside of the EPA; intermediate term actions are focused on implementing analysis and consideration of cumulative impacts in the wide range of Agency decisions, with the goal of producing beneficial outcomes to communities.

Glossary¹⁴

Built environment: The manmade surroundings that provide the setting for human activity.

Chemical stressor: Exogenous environmental compounds that can change or damage living organisms or ecosystems and are released into the environment by waste, emissions, pesticide use, or use of consumer products.

Cumulative impacts:¹⁵ The totality of exposures to combinations of chemical and nonchemical stressors and their effects on the environment, health, well-being, and quality of life outcomes (EPA 2022a).

Cumulative impacts assessment:¹⁵ The process of accounting for cumulative impacts in the context of problem identification and decision-making (EPA 2023b). Cumulative impacts assessments consider exposures to both chemical and nonchemical stressors at each life stage throughout the life course and apply to individuals, geographically defined groups, or definable population groups (Tulve et al., 2024).

Cumulative risk assessment: An analysis, characterization, and possible quantification of the combined risks to human health or the environment from multiple agents or stressors (both chemical and nonchemical).

Disproportionate: Differences in impacts or risks that may merit EPA action (EPA 2023b). A finding of disproportionate impacts is neither necessary nor sufficient for the EPA to address adverse differential impacts.

¹⁴ This Glossary was created for this Interim Framework to Advance Consideration of Cumulative Impacts document. EPA recognizes that definitions continue to evolve and may be updated.

¹⁵ This definition applies to this framework document. Under the Clean Air Act, dating back to the 1990s, “cumulative impact analysis” has been used as a term of art in a way that is distinct from how it is used here. Specifically, “cumulative impact analysis” is noted in section 9.2.3 to 40 CFR Part 51, Appendix W of the EPA’s Prevention of Significant Deterioration (PSD) regulations. In air permitting, “cumulative impact analysis” as used in section 9.2.3. is an EPA recommendation, and the applicable state or local permitting authority has some discretion in how to evaluate the permit application. This guidance is summarized in the 2018 Legal Memorandum regarding application of significant impact levels (SILs) for modeling demonstrations, for which there is case law in interpreting the Clean Air Act’s language of “cause or contribute” to a violation of a national ambient air quality standard (NAAQS) or PSD increment. Furthermore, the “full impact analysis” is listed in the 1990 New Source Review Workshop Manual Draft (EPA 1990, pages C.24–C.25, C.51), which is still commonly referenced and used as guidance.

Environmental justice: The just treatment and meaningful involvement of all people, regardless of income, race, color, national origin, Tribal affiliation, or disability in Agency decision-making and other federal activities that affect human health and the environment so that people:

- Are fully protected from disproportionate and adverse human health and environmental effects (including risks) and hazards, including those related to climate change, the cumulative impacts of environmental and other burdens, and the legacy of racism or other structural or systemic barriers; and
- Have equitable access to a healthy, sustainable, and resilient environment in which to live, play, work, learn, grow, worship, and engage in cultural and subsistence practices (EPA 2024e).

Equity: The consistent and systematic treatment of all individuals in a fair, just, and impartial manner, including individuals who belong to communities that often have been denied such treatment, such as Black, Latino, Indigenous and Native American, Asian American, Native Hawaiian, and Pacific Islander people and other people of color; members of religious minorities; women and girls; LGBTQI+ people; people with disabilities; people who live in rural areas, including mobile populations and migrant farmworkers; people who live in United States territories; people otherwise adversely affected by persistent poverty or inequality; and individuals who belong to multiple such communities (EOP 2023a; 2023b).

Extrinsic factors: Factors or conditions acquired over a person's lifetime (e.g., socioeconomic status, disease status, stress, nutrition, lifestyle, workplace, geography, previous or ongoing exposure to multiple chemicals) that may contribute to increased vulnerability (EPA 2023b).

Fit-for-purpose: The concept that assessments, including cumulative impacts assessments, and associated products should be suitable and useful for their intended purpose(s), particularly for informing choices among options for intervention or change.

Health: A state of complete physical, mental, and social well-being and not merely the absence of disease and infirmity (WHO 1946).

Human well-being: The degree to which an individual, family, or community can be characterized as being healthy, happy, and prosperous. The environment and ecosystem services are considered critical underpinnings of human well-being (EPA 2022a).

Indigenous Knowledge: A body of observations, oral and written knowledge, innovations, practices, and beliefs developed by Tribes and Indigenous peoples through interaction and experience with the environment. It is applied to phenomena across biological, physical, social, cultural, and spiritual systems (EOP 2022).

Intrinsic factors: Biological conditions or factors that cannot be altered (e.g., age, genetic conditions) that contribute to increased vulnerability (EPA 2023b).

Meaningful engagement:

- Providing timely opportunities for members of the public to share information or concerns and participate in decision-making processes;
- Fully considering public input provided as part of decision-making processes;
- Seeking out and encouraging the involvement of persons and communities potentially affected by federal activities by:
 - Ensuring that agencies offer or provide information on a federal activity in a manner that provides meaningful access to individuals with limited English proficiency and is accessible to individuals with disabilities;
 - Providing notice of and engaging in outreach to communities or groups of people who are potentially affected and who are not regular participants in federal decision-making; and
 - Addressing, to the extent practical and appropriate, other barriers to participation that individuals may face; and
- Providing technical assistance, tools, and resources to assist in facilitating meaningful and informed public participation, whenever practicable and appropriate (EPA 2024e).

Natural environment: All living and nonliving things where they naturally occur on Earth (Tulve et al., 2016).

Nonchemical stressor: A stressor not attributed to chemical exposure, which could include biological or physical factors, social determinants of health, and activities that directly or indirectly adversely affect health or increase vulnerability to chemical stressors. The term is often used to refer to psychological, social, and economic stressors that might also act as an exposure-response modifier to other stressors. It can also refer to climactic stress (EPA 2023b).

Overburdened: Used to describe population groups or communities that potentially experience disproportionate environmental harms and risks that are due to greater exposure and vulnerability to environmental hazards, lack of opportunity for public participation, or other factors.

Quality of life: Individuals' perceptions of their position in life in the context of the culture and value systems in which they live, and in relation to their goals, expectations, standards, and concerns (WHO, as reported in Estoque et al., 2019).

Risk management: In the context of human health, a decision-making process that accounts for political, social, economic, and engineering implications together with risk-

related information to develop, analyze, and compare management options and select the appropriate managerial response to a potential chronic health hazard (EPA 2023b).

Social determinants of health: The conditions in the environments where people are born, live, learn, work, play, worship, and age that affect a wide range of health, functioning, and quality-of-life outcomes and risks (DHHS 2022a).

Social environment: Social interactions and factors such as the economy, community, home, school/daycare, demographics, safety, and welfare (EPA 2022a).

Stressor: Any physical, chemical, social, or biological entity that can induce a positive or negative change in present and future health, well-being, and quality of life (Tulve et al., 2016).

Susceptibility: Increased likelihood of an adverse effect, often discussed in terms of relationship to a factor that can be used to describe a population group (e.g., life stage, demographic feature, or genetic characteristic). In this document, the term refers to an individual's responsiveness to exposure (EPA 2023b).

Underserved communities: Populations and geographic communities that share the particular characteristic of having been systematically denied the opportunity to participate fully in aspects of economic, social, and civic life, as defined in Executive Orders 13985, 14020, and 14091 (EOP 2021a, 2021b, 2023a).

Vulnerability: Differences in intrinsic and extrinsic factors over one's lifetime that increase the likelihood and/or consequences of being exposed to environmental stressor(s) (EPA 2023b).

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Appendix A. Tools and Reports for Evaluating Tribal Exposures

- **EPA Guidance for Conducting Fish Consumption Survey** – Characterizes Tribal subsistence fish consumption practices and rates, including estimates of heritage or historical fish consumption for the development of ambient water quality criteria.
https://www.epa.gov/sites/default/files/2017-01/documents/fc_survey_guidance.pdf
- **EPA's Expo Box: Tools by Lifestages and Populations** – Highly Exposed or Other Susceptible Population Groups – Includes tools for Tribal and other populations that might experience greater exposure to environmental contaminants.
<https://www.epa.gov/expobox/exposure-assessment-tools-lifestages-and-populations-highly-exposed-or-other-susceptible>
- **A Decade of Tribal Environmental Health Research: Results and Impacts from EPA's Extramural Grants and Fellowship Programs** – Summarizes information collected through EPA's STAR (Science to Achieve Results) grant program that informs or improves health outcomes.
<https://www.epa.gov/sites/default/files/2015-09/documents/tribal-results-impacts.pdf>
- **Wabanaki Traditional Cultural Lifeways Exposure Scenario** – Informs Agency assessors on cultural lifeways and their application to risk assessments.
<https://www.epa.gov/sites/default/files/2015-08/documents/ditca.pdf>
- **Traditional Tribal Subsistence Exposure Scenario and Risk Assessment Guidance Manual** (Harper et al., 2007) – Provides a framework the grantee develops for evaluating risk in Indian country.
https://health.oregonstate.edu/sites/health.oregonstate.edu/files/research/pdf/tribal-grant/exposure_scenario_and_risk_guidance_manual_v2.pdf
- **Understanding Tribal Exposures to Toxics Report** (National Tribal Toxics Council, 2015) – Recommendations from an EPA Tribal Partnership Group to consider Tribal exposure in risk assessment across the EPA.
https://nttc.sfo3.cdn.digitaloceanspaces.com/Docs/NTTC-Understanding_Tribal_Exposures_to_Toxics-2015-06-19.pdf

Appendix B. Cumulative Impacts Implementation at the EPA and Elsewhere

This appendix contains examples of methods, tools, and decisions that directly address cumulative impacts or that incorporate the principles for considering cumulative impacts in environmental decision-making. These examples provide contexts in which cumulative impacts principles have been used. The italicized text provides explanation for each example.

Cumulative Impacts Methods Generated by State and Municipal Agencies

The EPA is supportive of the efforts of states and municipalities as they develop approaches for considering cumulative impacts. As of July 2023, 22 states have developed or are in the process of developing legislation, mapping tools (examples provided in Table 1), and guidance documents to incorporate cumulative impacts analysis into decision-making (Tulve et al., 2024). Many municipalities have incorporated or are considering incorporating cumulative impacts analysis into decisions that affect planning and are enacting bans, health codes, and targeted and general reviews (Coleman, 2021). The development of state and local legislation and tools generally incorporates the principles discussed in the main body of this report, including developing these resources in consultation with the public, focusing on recognizing disproportionate burdens and identifying vulnerable groups or locations within the large population and geographic extent covered, developing methods that are appropriate to the decisions being made, and using tools to rapidly move forward on actions to reduce disproportionate and cumulative impacts. The EPA seeks to learn from these state and local efforts, notably those for which approaches have been developed through a process of shared leadership, codesign, and authentic engagement with communities.

Tools developed by states and municipalities, such as [CalEnviroScreen](#), are examples of methods that combine the values of a set of geographically specific indicators that measure environmental burdens, physical vulnerability (sensitive populations), and social vulnerability into a single score to provide a picture of disproportionate and cumulative pollution burdens and vulnerabilities in communities. These tools have been used as input to a variety of policy and resource-allocation decisions. An alternative to combining social vulnerability and environmental indicators into a single score is to keep them separate, using the former to establish whether a community should be designated as overburdened, and the latter to evaluate whether a community is disproportionately impacted in comparison with other defined locations, or would be exposed to cumulative health risks beyond a regulatory threshold. These are the approaches that New Jersey has adopted in its Environmental Justice Law and Environmental Justice Mapping, Assessment, and Protection

(EJMAP) analysis and mapping tool, and that Massachusetts has adopted in its Cumulative Impact Analysis in Air Quality Permitting regulations (EEA 2021; NJDEP 2024).

Site-based or Community-scale Cumulative Impacts Assessment and Action Planning

Cumulative impacts assessments can inform site-based or facility-focused decisions and local community action planning, including regulatory and nonregulatory decision-making.

Permitting

Region 8 Underground Injection Control (UIC) Program Aquifer Exemption Request. *The analysis applied to this aquifer exemption request describes historic inequities, past and existing health and environmental burdens in surrounding communities, multimedia and cumulative impacts from the related large oil and gas development project; and the potential exacerbation of environmental, health, and climate change impacts in overburdened communities and with respect to Indigenous Peoples, as relevant factors in EPA's decision to maintain the existing statutory protections for current and potential future sources of drinking water.*

In April 2024, the Region 8 UIC Program issued a decision, supported by a Climate, Environmental Justice and Tribal Interest Analysis, denying an aquifer exemption (AE) request submitted under the Safe Drinking Water Act (SDWA) for the Madison aquifer at the location of the proposed Marlin injection well in Fremont County, Wyoming.

The State had requested that EPA approve the AE to allow the Marlin well to be used for disposal of wastewater from oil and gas operations containing salts, heavy metals, hydrocarbons, and chemicals used for hydraulic fracturing and oil/gas production. These pollutants would have contaminated this portion of the Madison aquifer and left it unusable as a source of drinking water in the future. Furthermore, EPA considered the project proponent's plans for multiple additional wells that could cumulatively result in the disposal of millions of gallons of wastewater per day thereby impacting this aquifer over an even larger area.

EPA's decision to deny the AE included careful consideration of information received from the state, the applicant, the community, and the Tribal governments on the Wind River Indian Reservation in accordance with SDWA requirements. The Region's analysis considered the Madison aquifer's importance as a source of drinking water throughout the state, including in Wyoming's Wind River Basin. For example, in other locations, groundwater from the Madison aquifer is used to supply drinking water wells and is also piped long distances to supply drinking water to communities, including in rural areas.

Dewey Burdock South Dakota Underground Injection Control In Situ Recovery (Safe Drinking Water Act Underground Injection Control Permits). *This permitting decision considered a wide variety of potential impacts and incorporated direct, meaningful engagement of Tribes and their needs for health, well-being, and quality of life as relevant factors in analyzing the UIC permitting and aquifer exemption decisions consistent with the purpose of the statute and implementing regulations.*

In November 2020, the EPA issued its first-in-the-nation underground injection control (UIC) permits regulating uranium in situ recovery (ISR) operations. These permits ensure that underground sources of drinking water will be protected from impacts associated with mining activities and deep disposal of ISR-related waste fluids on site. The EPA's UIC "area" permitting regulations under the Safe Drinking Water Act (SDWA) require consideration of cumulative effects "of drilling and operation of additional injection wells" when evaluating permit applications.¹⁶ This information was also considered in the EPA's aquifer exemption decision.

The EPA considered various impacts in its cumulative effects analysis (CEA) and environmental justice analysis, including groundwater quality/availability, surface water/wetlands, surface spills/leaks, land use, soils, geology, radiological, air quality, climate change, transportation, potential accidents, ecological resources, waste management, historic mining, and spiritual and cultural resources. In developing, taking comments on, and finalizing the permits, EPA Region 8 expanded the scope of the environmental justice analysis to include consideration of Tribal spiritual and cultural interests in the Black Hills as a sacred site (outside Indian country) and enhanced outreach to interested parties, including six public hearings and extensive Tribal consultation consistent with the EPA's environmental justice and Tribal consultation policies.

Consistent with the EPA's UIC regulatory and associated omnibus authorities under the SDWA, the final permits incorporate certain conditions in response to Tribal and public concerns, and informed by EPA's CEA and environmental justice analyses, related to the protection of underground sources of drinking water. These conditions include: (1) requiring an ISR Wellfield Closure Plan, including a geochemical model and targeted groundwater monitoring; (2) requiring additional hydrogeologic characterization and monitoring prior to the EPA authorizing ISR operations; (3) verifying deep geologic confinement to ensure containment of ISR fluid wastes; and (4) a requirement for any written reports by the Permittee about noncompliance to be provided to EPA in electronic format for release to the public and Tribal governments to enhance public transparency.

¹⁶ 40 C.F.R. § 144.33(c)(3). The cumulative effects analysis described fulfills the requirement for the EPA to consider the cumulative effects of drilling and operation of the additional injection wells proposed under an area permit during evaluation of the permit application.

National Pollutant Discharge Elimination System Permit, Cook Inlet, Alaska. *This permitting decision incorporated critical aspects of Tribal lived experience—history, heritage diet—and was centered on protecting the health of local Native communities.*

In 2007, the EPA reissued the National Pollutant Discharge Elimination System General Permit for Oil and Gas Exploration, Development and Production Facilities in State and Federal Waters in Cook Inlet in Alaska. The permit authorized certain discharges of pollutants into Cook Inlet from oil and gas exploration, development, and production platforms and related facilities subject to limits and requirements designed to minimize pollution and protect water quality. These proposed limits and requirements were based, in part, on an assessment of the Traditional Ecological Knowledge contributed by the Cook Inlet area Tribes during the Tribal consultation process, which highlighted concerns about heightened stress caused by multiple pollution sources (cumulative impacts) that negatively impact the health of local Native communities, traditional food sources, and the environment. The 2007 final permit¹⁷ established new limits on the amount of treatment chemicals that could be added and on toxicity triggers for discharges, such as cooling water, and required that operators of all new facilities installed during the 5-year term conduct baseline monitoring to gain a better understanding of the potential impacts of the discharges.

Community-scale Approaches

U.S. Department of the Interior: Historic and Ongoing Impacts of Federal Dams on the Columbia River Basin Tribes (June 2024) (DOI 2024). *This example of a federal report documents the historic, ongoing, and cumulative impacts of federal Columbia River dams on Columbia River Basin Tribes and provides recommendations for how the federal government can uphold its treaty and trust responsibilities to the Basin Tribes by acknowledging and addressing these impacts with future actions.*

Section I of this report discusses the Tribes' enduring relationships to the Columbia River, including the First Foods traditions and fishing and hunting rights. It also summarizes more than a century of actions taken by the treaty Tribes to defend their treaty rights. Section II provides a history of the federal development of dams in the Columbia River Basin. Section III provides the Department of the Interior's examination and summary of the historic, ongoing, and cumulative effects of the federal Columbia River hydropower dams on the Tribes, informed by the perspectives provided by the Tribes over the decades. These impacts include effects on Tribal villages and homesites; cultural resources and sacred sites; lands,

¹⁷ See EPA Fact Sheet, Oil and Gas Exploration Located in the Federal Waters of Cook Inlet, Proposed Action, National Pollutant Discharge Elimination System Permit Number: AKG-28-5100 (2013) (summarizing permit conditions added in 2007 to address concerns related Tribal communities), <https://www.epa.gov/sites/default/files/2017-10/documents/r10-npdes-cook-inlet-oil-gas-akg285100-fact-sheet-2013.pdf>.

fisheries, and other natural resources; Tribal harvest rights, including treaty rights; economies and livelihoods; and the resulting cumulative impacts from all these adverse consequences on Tribal ways of life, well-being, and sovereignty. Section IV offers recommendations for how the federal government can, consistent with its treaty obligations and trust responsibilities, better address these impacts. Among the recommendations is that federal agencies acknowledge and integrate the effects described in the report in analyses under the National Environmental Policy Act for proposed federal actions, and other analyses. These recommendations include specific ways the impacts described in this report should inform National Environmental Policy Act (NEPA) and other compliance analyses.

Chicago Department of Public Health’s Health Impact Assessment for Permitting Decision (CDPH 2022). *This example illustrates how a health impact assessment (HIA) informed a permitting decision and other actions to address cumulative impacts. This process included public engagement with a focus on the health of the potentially affected community and on disproportionate burden shouldered by the community.*

In November 2020, Reserve Management Group, doing business as Southside Recycling, applied to the Chicago Department of Public Health (CDPH) for a permit to operate a large metal recycling facility in a primarily Latino community on the Southeast Side of Chicago after closing its facility in the predominantly White Lincoln Park neighborhood. The Southeast Side community was largely opposed to the facility. During CDPH’s review of this application, the EPA recommended that CDPH complete an HIA to ensure a thorough consideration of health and environmental justice concerns. This review was done under Chicago’s Air Quality Zoning ordinance that requires large industrial zoning applicants to submit an air quality impact study and get a written recommendation from CDPH and the City Department of Transportation as a condition for site plan approval (CDPH 2021).

CDPH and its environmental consultant, with assistance from the EPA, prepared a comprehensive inventory of emission sources, calculated potential emissions, modeled air dispersion and deposition of contaminants, and conducted on-site soil sampling, then used this information as inputs for a risk model. These data allowed CDPH to characterize existing site conditions and predict how the proposed Southside Recycling operations—together with current Reserve Management Group business operations on the property—would affect community health risks.

The HIA found that certain census block groups in the Southeast Side community rank among the highest in Chicago for vulnerability to air pollution, and that this vulnerability is tied to underlying health and social conditions. Further, the Southeast Side population has higher rates of chronic conditions, such as coronary heart disease and chronic obstructive pulmonary disease in adults, than Chicago overall. The HIA also found that community conditions on the Southeast Side have been affected by the presence of past and current industry, and that the proposed Southside Recycling facility would contribute additional

negative impacts to the environment, health, and quality of life for area residents. Officials also discovered clear instances of noncompliance with city health and environmental regulations.

CDPH denied the permit application for the scrap metal facility on the city's Southeast Side. This permit denial has been upheld in Cook County Circuit Court, with additional legal action pending (Chase, 2024).

The HIA also recommended that Chicago take further action to address cumulative impacts throughout the city. In September 2023, Chicago and community leaders released the city's first cumulative impacts assessment, together with a draft environmental justice action plan. The process used drew upon CDPH's experience with the HIA¹⁸ (CDPH 2023b).

Advancing Analysis of Cumulative Impacts: Considering Multiple and Aggregate Stressors in National-scale Rulemakings and Guidance

Air Toxics Rules for the Synthetic Organic Chemical Manufacturing Industry and Polymers & Resins Industries (EPA 2023f, 2024f). *This rulemaking includes an example of a community risk assessment of air toxics emissions from large stationary sources for the purpose of providing information to the public on potential cancer risks from air toxics exposures.*

This Synthetic Organic Chemical Manufacturing Industry (SOCMI) rulemaking will provide critical public health protections for communities near chemical plants covered by the rule. In addition, the EPA expects that this rule will reduce disproportionate harm to socially vulnerable communities and children. While the EPA did not conduct a formal cumulative impacts analysis to inform decisions on this rulemaking, the Agency conducted a community risk assessment when it proposed the rule to provide the public with the best possible information about how the proposal will affect cancer risk from air toxics exposure. That assessment examined the impacts of the proposed requirements for synthetic organic chemical manufacturers on air toxics-related cancer risks from all large facilities in communities within about 6 miles of the plants—including facilities not covered by the rule. The assessment showed that the rule would reduce the number of people who have elevated air toxics-related cancer risk by 96% in those communities.

The final rule will keep more than 6,200 tons of air toxics out of the air each year, including significantly reducing emissions of two chemicals linked to cancer: ethylene oxide (EtO) and

¹⁸ For more information, see https://www.chicago.gov/city/en/depts/cdph/supp_info/Environment/cumulative-impact-assessment.html (CDPH 2023a).

chloroprene. The rule will cut EtO emissions by nearly 54 tons per year and will cut chloroprene emissions by nearly 14 tons per year, an 80% reduction in each chemical generated from equipment and processes covered by the rule compared with emissions before its implementation.

The EPA expects this risk reduction measure to reduce disproportionate harm to nearby communities often overburdened by pollution. The Agency analyzed the makeup of communities near the plants covered by the final rule. Those communities have a higher-than-average percentage of residents who are people of color, of low socioeconomic status, or both. The rule will also benefit children by reducing their exposure to air toxics emissions.

Updated Residential Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities (January 2024) (EPA 2024h). *This example recognizes that a host of factors produce a disproportionate burden of lead exposure on certain children and centers the guidance on health protection, reduction of disproportionate burdens, and development of fit-for-purpose guidance contingent on the presence of aggregate sources of contamination.*

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Oil and Hazardous Substances Pollution Contingency Plan mandate that the EPA develop protective exposure levels for contaminated sites and establish a risk management paradigm informed by many factors, including health effects at issue and the population at risk. Relying on the best available science, the Office of Land and Emergency Management reduced the residential soil lead regional screening level (RSL) and removal management level to 200 parts per million (ppm), and further reduced the RSL to 100 ppm when there is aggregate lead exposure. Through these recommendations, the EPA is helping ensure that Superfund and Resource Conservation and Recovery Act (RCRA) corrective action residential soil lead cleanups adequately reduce childhood exposures, which, if unaddressed, could lead to lifelong adverse health effects.

Studies conducted in communities at or near Superfund sites provided evidence that aggregate lead exposure has generally resulted in a disproportionate number of children with elevated blood lead levels in such communities. Further, the 2013 and 2024 Lead Integrated Science Assessments found that childhood exposure, race and ethnicity, proximity to lead sources, residential factors (housing age), and poor nutrition may be linked to increased risk of lead-related health effects.

Implementation guidance emphasizes that the Superfund program promotes collaboration to provide a more comprehensive approach to reducing lead exposures at residential lead Superfund sites. It notes that many federal, local, state, and Tribal agencies have diverse legal authorities to address sources of lead exposure in communities. The guidance recommends that EPA regions work collaboratively with state, territorial, Tribal, and public health agencies

to prioritize addressing sites, considering factors such as current levels of exposure and communities with increased risk.

Risk Management Program: Safer Communities by Chemical Accident Prevention (March 2024) (EPA 2024a). *While a full cumulative impacts analysis was not conducted, this example rule centers on protecting public health of people in communities disproportionately burdened by proximity to Risk Management Program (RMP) facilities. Proximity has been shown to be an appropriate proxy for exposure risk and adverse health conditions (Chakraborty & Maantay, 2011). Proximity to one or more facilities can also be a factor in considering equitable distribution and facility density in siting additional facilities (Fusi et al., 2022).*

To improve safety; assist in planning, preparedness, and response to reportable accidents; improve public awareness of chemical hazards at regulated facilities; and respond to public input, the EPA has made several changes to its Risk Management Program (RMP). Facilities subject to the RMP pose significant risks to the public and the environment because of the types and quantities of hazardous substances they store and use in chemical processes.

The EPA conducted a proximity analysis to compare populations using income, race, and national origin living within 1 and 3 miles of an RMP facility to the overall U.S. population. The analysis found that populations with low incomes and of a race or ethnicity other than non-Hispanic White are more likely to live near an RMP facility compared with the national average. For RMP facilities that had an accident between 2004 and 2020, the percentage of these populations living nearby is even higher.

The final rule strengthens the existing program and includes new safeguards not addressed in prior RMP rules. Some of the new requirements include safer technology and chemical alternative identification, more thorough incident investigations, and third-party auditing, all of which should benefit nearby communities. The most stringent requirements of the rule fall upon facilities that pose heightened risk to such communities. When implemented, the rule is expected to make communities safer by reducing the frequency of chemical releases and their adverse effects.

