Considering Cumulative Effects Under the National Environmental Policy Act

Council on Environmental Quality

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PREFACE

This handbook presents the results of research and consultations by the Council on Environmental Quality (CEQ) concerning the consideration of cumulative effects in analyses prepared under the National Environmental Policy Act (NEPA). It introduces the NEPA practitioner and other interested parties to the complex issue of cumulative effects, outlines general principles, presents useful steps, and provides information on methods of cumulative effects analysis and data sources. The handbook does not establish new requirements for such analyses. It is not and should not be viewed as formal CEQ guidance on this matter, nor are the recommendations in the handbook intended to be legally binding.

EXECUTIVE SUMMARY

The Council on Environmental Quality's (CEQ) regulations (40 CFR §§ 1500 - 1508) implementing the procedural provisions of the National Environmental Policy Act (NEPA) of 1969, as amended (42 U.S.C. §§ 4321 *et seq.*), define cumulative effects as

> the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions (40 CFR § 1508.7).

Although the regulations touch on every aspect of environmental impact analysis, very little has been said about cumulative effects. As a result, federal agencies have independently developed procedures and methods to analyze the cumulative effects of their actions on environmental resources, with mixed results.

The CEQ's "Considering Cumulative Effects Under the National Environmental Policy Act" provides a framework for advancing environmental impact analysis by addressing cumulative effects in either an environmental assessment (EA) or an environmental impact statement (EIS). The handbook presents practical methods for addressing coincident effects (adverse or beneficial) on specific resources, ecosystems, and human communities of all related activities, not just the proposed project or alternatives that initiate the assessment process.

In their environmental analyses, federal agencies routinely address the direct and (to a lesser extent) indirect effects of the proposed action on the environment. Analyzing cumulative effects is more challenging, primarily because of the difficulty of defining the geographic (spatial) and time (temporal) boundaries. For example, if the boundaries are defined too broadly, the analysis becomes unwieldy; if they are defined too narrowly, significant issues may be missed, and decision makers will be incompletely informed about the consequences of their actions.

The process of analyzing cumulative effects can be thought of as enhancing the traditional components of an environmental impact assessment: (1) scoping, (2) describing the affected environment, and (3) determining the environmental consequences. Generally it is also critical to incorporate cumulative effects analysis into the development of alternatives for an EA or EIS. Only by reevaluating and modifying alternatives in light of the projected cumulative effects can adverse consequences be effectively avoided or minimized. Considering cumulative effects is also essential to developing appropriate mitigation and monitoring its effectiveness.

In many ways, scoping is the key to analyzing cumulative effects; it provides the best opportunity for identifying important cumulative effects issues, setting appropriate boundaries for analysis, and identifying relevant past, present, and future actions. Scoping allows the NEPA practitioner to "count what counts." By evaluating resource impact zones and the life cycle of effects rather than projects, the analyst can properly bound the cumulative effects analysis. Scoping can also facilitate the interagency cooperation needed to identify agency plans and other actions whose effects might overlap those of the proposed action.

When the analyst describes the affected environment, he or she is setting the environmental baseline and thresholds of environmental change that are important for analyzing cumulative effects. Recently developed indicators of ecological integrity (e.g., index of biotic integrity for fish) and landscape condition (e.g., fragmentation of habitat patches) can be used as benchmarks of accumulated change over time. In addition, remote sensing and geographic information system (GIS) technologies provide improved means to analyze historical change in indicators of the condition of resources, ecosystems, and human communities, as well as the relevant stress factors. Many dispersed local information sources and emerging regional data collection programs are now available to describe the cumulative effects of a proposed action.

Determining the cumulative environmental consequences of an action requires delineating the cause-and-effect relationships between the multiple actions and the resources, ecosystems, and human communities of concern. Analysts must tease from the complex networks of possible interactions those that substantially affect the resources. Then, they must describe the response of the resource to this environmental change using modeling, trends analysis, and scenario building when uncertainties are great. The significance of cumulative effects depend on how they compare with the environmental baseline and relevant resource thresholds (such as regulatory standards). Most often, the historical context surrounding the resource is critical to developing these baselines and thresholds and to supporting both imminent and future decision-making.

Undoubtedly, the consequences of human activities will vary from those that were predicted and mitigated. This will be even more problematic because of cumulative effects; therefore, monitoring the accuracy of predictions and the success of mitigation measures is critical. Adaptive management provides the opportunity to combine monitoring and decision making in a way that will better ensure protection of the environment and attainment of societal goals.

Successfully analyzing cumulative effects ultimately depends on the careful application of individual methods, techniques, and tools to the environmental impact assessment at hand. There is a close relationship between impact assessment and environmental planning, and many of the methods developed for each are applicable to cumulative effects analysis. The unique requirements of cumulative effects analysis (i.e., the focus on resource sustainability and the expanded geographic and time boundaries) must be addressed by developing an appropriate conceptual model. To do this, a suite of primary methods can be used: questionnaires, interviews, and panels; checklists; matrices; networks and system diagrams; modeling; trends analysis; and overlay mapping and GIS. As with project-specific effects, tables and matrices can be used to evaluate cumulative effects (and have been modified specifically to do so). Special methods are also available to address the unique aspects of cumulative effects, including carrying capacity analysis, ecosystem analysis, economic impact analysis, and social impact analysis.

This handbook was developed by reviewing the literature and interviewing practitioners of environmental impact assessment. Most agencies that have recently developed their own guidelines for analyzing cumulative effects recognize cumulative effects analysis as an integral part of the NEPA process, not a separate effort. This handbook is not formal guidance nor is it exhaustive or definitive; it should assist practitioners in developing their own study-specific approaches. CEQ expects that the handbook (and similar agency guidelines) will be updated periodically to reflect additional experience and new methods, thereby, constantly improving the state of cumulative effects analysis.

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The handbook begins with an introduction to the cumulative effects problem and its relevance to the NEPA process. The introduction defines eight general principles of cumulative effects analysis and lays out ten specific steps that the NEPA practitioner can use to analyze cumulative effects. The next three chapters parallel the environmental impact assessment process and discuss analyzing cumulative effects while (1) scoping, (2) describing the affected environment, and (3) determining environmental consequences. Each component in the NEPA process is the logical place to complete necessary steps in cumulative effects analysis, but practitioners should remember that analyzing for cumulative effects is an iterative process. Specifically, the results of cumulative effects analysis can and should contribute to refining alternatives and designing mitigation. Table E-1 illustrates how the principles of cumulative effects analysis can be the focus of each component of the NEPA process. Chapter 5 discusses the methods, techniques, and tools needed to develop a study-specific methodology and actually implement cumulative effects analysis. Appendix A provides summaries of 11 of these methods.

Cumulative effects analysis is an emerging discipline in which the NEPA practitioner can be overwhelmed by the details of the scoping and analytical phases. The continuing challenge of cumulative effects analysis is to focus on important cumulative issues, recognizing that a better decision, rather than a perfect cumulative effects analysis, is the goal of NEPA and environmental impact assessment professionals.

Table E-1. Incorporating principles of cumulative effects analysis (CEA) into the components of environmental impact assessment (EIA)

EIA Components	CEA Principles
Scoping	• Include past, present, and future actions. • Include all federal, nonfederal, and private actions. • Focus on each affected resource, ecosystem, and human community. • Focus on truly meaningful effects.
Describing the Affected Environment	• Focus on each affected resource, ecosystem, and human community. • Use natural boundaries.
Determining the Environmental Consequences	• Address additive, countervailing, and synergistic effects. • Look beyond the life of the action. • Address the sustainability of resources, ecosystems, and human communities.