

AASHTO PRACTITIONER'S HANDBOOK

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ASSESSING INDIRECT EFFECTS AND CUMULATIVE IMPACTS UNDER NEPA

This Handbook is intended to assist practitioners in assessing indirect effects and cumulative impacts in the evaluation of transportation projects under the National Environmental Policy Act (NEPA). Issues covered in this Handbook include:

- Understanding the definitions of direct effects, indirect effects, and cumulative impacts
- Gathering the information needed for the analysis
- Deciding the appropriate scope and level of detail
- Carrying out the analysis
- Identifying mitigation opportunities
- Documenting the analysis
- Using the transportation planning process to support NEPA-level studies of indirect effects and cumulative impacts

The Practitioner's Handbooks are produced by the Center for Environmental Excellence by AASHTO. The Handbooks provide practical advice on a range of environmental issues that arise during the planning, development, and operation of transportation projects.

The Handbooks are primarily intended for use by project managers and others who are responsible for coordinating compliance with a wide range of regulatory requirements. With their needs in mind, each Handbook includes:

- key issues to consider;
- a background briefing;
- practical tips for achieving compliance; and
- a list of reference materials.

In addition, key regulations, guidance materials, and sample documents for each Handbook are posted on the Center's web site at <http://environment.transportation.org>.



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Overview



The requirement to assess indirect and cumulative impacts of proposed Federal actions was established in the Council on Environmental Quality (CEQ) regulations implementing the National Environmental Policy Act (NEPA).

- Indirect effects are caused by the project or plan, but are separated from direct effects by time and/or distance. Indirect effects include induced growth and related environmental impacts.
- Cumulative impacts are the aggregate result of the incremental direct and indirect effects of a project or plan, the effects of past and present actions, and effects of reasonably foreseeable future actions by others on resources of concern.

This Handbook focuses primarily on the assessment of indirect effects and cumulative impacts for individual transportation projects. This Handbook also briefly describes a range of approaches for using the statewide or metropolitan transportation planning process to address indirect effects and cumulative impacts for a region or corridor, including the possibility of adopting a planning-level analysis for use in the NEPA process for an individual project.

A consistent theme throughout this Handbook is the importance of maintaining a clear distinction between an indirect effects analysis and a cumulative impacts analysis. For that reason, those analyses are addressed separately in the Practical Tips section of the Handbook.

Background Briefing

This section introduces the key terms and concepts used in the assessment of indirect effects and cumulative impacts in the NEPA process. It also briefly describes key guidance documents. For a more extensive listing of guidance documents and research reports relating to indirect and cumulative impacts analyses, refer to the Reference Materials section of this Handbook.

Key Terms and Concepts

Direct Effects. The CEQ regulations state that direct effects are “caused by the action and occur at the same time and place”¹ Direct effects are typically well understood and predictable. Direct effects are action-focused effects. Examples of common direct effects for transportation projects include residential and business displacements, the fill of wetlands to construct a roadway, or the removal of a historic structure.

Indirect Effects. Indirect effects are those effects that “. . . are caused by the action and are later in time and farther removed in distance, but are still reasonably foreseeable.” Indirect effects “may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density, or growth rate, and related effects on air and water and other natural systems, including ecosystems.”² Indirect effects are action-focused effects. Two types of indirect effects are commonly recognized: induced-growth effects and encroachment-alteration effects.³

- **Induced-Growth Effects.** Induced-growth effects are changes in the location, magnitude, or pace of future development that result from changes in accessibility caused by the project. An example of an induced-growth effect is commercial development occurring around a new interchange and the environmental impacts associated with this development.

¹ 40 CFR 1508.8.

² 40 CFR 1508.8.

³ NCHRP Report 466, “Desk Reference for Estimating the Indirect Effects of Proposed Transportation Projects” (2002), p. 55.



Documents

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- **Encroachment-Alteration Effects.** Encroachment-alteration effects are physical, chemical, or biological changes in the environment that occur as a result of the project but are removed in time or distance from the direct effects. An example of an encroachment effect is a long-term decline in the viability of a population of a particular species as a result of habitat fragmentation caused by the project. These types of effects are sometimes categorized as direct effects rather than indirect effects. The categorization is not important as long as the NEPA document demonstrates that the encroachment-alteration effects have been considered.

Cumulative Impacts. A cumulative impact is “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. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.”⁴

Distinctions between Direct, Indirect, and Cumulative Impacts

TYPE OF EFFECT	DIRECT	INDIRECT	CUMULATIVE
Nature of Effect	Typical/Inevitable/Predictable	Reasonably Foreseeable/Probable	Reasonably Foreseeable/Probable
Cause of Effect	Project	Project's Direct and Indirect Effects	Project's Direct and Indirect Effects and Effects of Other Activities
Timing of Effect	Project Construction and Implementation	At Some Future Time other than Direct Effect	In the Past, at Time of Project Construction, or in the Future
Location of Effect	At the Project Location	Within Boundaries of Systems Affected by the Project	Within Boundaries of Systems Affected by the Project

Source: NCHRP Report 403, *Guidance for Estimating the Indirect Effects of Proposed Transportation Projects* (1998).

“But-For” Relationship. As a general rule, a project may be considered to cause an impact if the project is necessary for the impact to occur. This relationship is sometimes described as a “but-for” relationship: that is, the development would not have occurred but for the transportation project. A but-for condition can exist as a matter of law—e.g., if an action cannot take place without a permit. A but-for condition can also exist as a matter of fact—e.g., if a developer would choose not to build a shopping mall unless a nearby road is expanded.

Necessary vs. Sufficient. Even when a project is a necessary condition for an impact to occur, there may be—and often are—other conditions that also need to be present in order for the impact to occur. Thus, while the transportation project may be a necessary condition, it may not be a sufficient condition for the impact to occur. Other conditions that may be necessary for a development project typically include but are not limited to:

- suitable, available land for development or redevelopment.
- economic conditions that support development, e.g., markets, acceptable rate of return on investment in land purchase, design, construction, and other costs.
- zoning and other land use controls and policies suitable for the type of development suggested by market conditions.
- other infrastructure that supports development, e.g., water and sewer service.
- amenities, e.g., schools, access to recreational opportunities.

“Reasonably Foreseeable.” Indirect and cumulative impacts must be considered if they are reasonably foreseeable. Impacts that are merely possible, or that are considered “speculative,” are not reasonably foreseeable. In one of the leading court decisions on this topic, the U.S. Court of Appeals for the First Circuit explained the legal standard as follows:

[O]nly those effects that are “likely” (or “foreseeable” or “reasonably foreseeable”) need be discussed, ... and, as in other legal contexts, the terms “likely” and “foreseeable,” as applied to a type of environmental impact, are properly interpreted as meaning that the impact is sufficiently likely to occur that a person of ordinary prudence would take it into account in reaching a decision.⁵

⁴ 40 CFR 1508.7.

⁵ *Sierra Club v. Marsh*, 976 F.2d 763, 767 (1st Cir. 1992).

The CEQ provides a similar interpretation, requiring agencies to consider the “uncertain, but probable” indirect effects of their actions:

The EIS must identify all the indirect effects that are known, and make a good faith effort to explain the effects that are not known but are “reasonably foreseeable.” If there is total uncertainty about the identity of future land owners or the nature of future land uses, then of course, the agency is not required to engage in speculation or contemplation about their future plans. But, in the ordinary course of business, people do make judgments based upon reasonably foreseeable occurrences. It will often be possible to consider the likely purchasers and the development trends in that area or similar areas in recent years; or the likelihood that the land will be used for an energy project, shopping center, subdivision, farm, or factory. The agency has the responsibility to make an informed judgment, and to estimate future impacts on that basis, especially if trends are ascertainable or potential purchasers have made themselves known. The agency cannot ignore these uncertain, but probable, effects of its decisions.⁶

Other Terminology Issues. Just as it is important to understand when similar terms have different meanings, it also is important to understand when different terms have the same meaning. There is no substantive distinction in the CEQ regulations between “effect” and “impact,” nor is there a substantive distinction between “indirect” and “secondary.” To avoid confusion, it is good practice to use these terms consistently within a NEPA document.

- **Effects vs. Impacts.** The CEQ regulations use the terms “indirect effects” (40 CFR § 1508.8) and “cumulative impacts” (1508.7). To be consistent with usage in the CEQ regulations, this Handbook also uses the terms “indirect effects” and “cumulative impacts.” This terminology is a matter of convention, and does not reflect a substantive distinction between the meaning of “effects” and “impacts,” which are described as synonymous in the CEQ regulations.⁷ The CEQ itself has not been consistent in its use of these terms: while the regulations refer to cumulative impacts, several CEQ guidance documents refer to “cumulative effects,” including the CEQ’s handbook on this topic. In practice, it is acceptable to refer to effects or impacts, as long as the terms are used consistently.
- **Indirect vs. Secondary.** The term “secondary effects” is sometimes used as a substitute for “indirect effects.” While use of this term does not affect the legal adequacy of the analysis, the CEQ regulations refer only to “indirect effects” and do not use the term “secondary effects.” For consistency with the CEQ regulations, this Handbook exclusively uses the term “indirect effects.”

Key Reference Documents

There are many guidance documents and reference materials that provide advice for practitioners on how to conduct indirect effects and cumulative impacts analyses. See the Reference Materials section of this Handbook for additional information on these guidance documents.

- **CEQ.** In 1997, the CEQ issued the Handbook, Considering Cumulative Effects under the National Environmental Policy Act. This Handbook is non-binding and is not considered a guidance document, but has been widely followed. There is no comparable CEQ handbook or guidance document for indirect effects. In 2005, the CEQ issued a memorandum on consideration of “past actions” in cumulative impacts analyses.
- **FHWA.** In 2003, FHWA issued an interim guidance document, Questions and Answers Regarding the Consideration of Indirect and Cumulative Impacts in the NEPA Process. This interim guidance has never been finalized. It remains FHWA’s most current and comprehensive guidance on indirect effects and cumulative impacts.
- **State DOTs.** Several state DOTs have developed their own guidance documents for conducting indirect effects and/or cumulative impacts assessments, including California, Maryland, Montana, North Carolina, Ohio, Oregon, Pennsylvania, Texas, Washington, and Wisconsin. See the Reference Materials section of this Handbook for references to state DOT guidance documents.
- **NCHRP Reports.** Several reports on indirect effects and cumulative impacts have been produced by the National Cooperative Highway Research Program (NCHRP), including NCHRP Report 403, Guidance for Estimating the Indirect Effects of Proposed Transportation Projects (1998). This report presents an eight-step process for

6 CEQ, “Forty Most Asked Questions Concerning CEQ’s National Environmental Policy Act Regulations,” 46 Fed. Reg. 18026 (March 23, 1981), Response to Question 18.

7 40 CFR § 1508.8 (“Effects and impacts as used in these regulations are synonymous. Effects includes ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic, historic, cultural, economic, social, or health, whether direct, indirect, or cumulative. Effects may also include those resulting from actions which may have both beneficial and detrimental effects, even if on balance the agency believes that the effect will be beneficial.”).

analyzing indirect effects of transportation projects. It has been widely followed by state DOTs in developing their guidance for analyzing indirect effects.⁸

Key Issues to Consider

Initial Steps

- Who will have primary responsibility for preparing the analyses? What other organizations or entities will be involved as reviewers or contributors of information?
- What guidance is applicable, e.g., an individual state's handbook or policy for considering indirect and/or cumulative impacts?
- What level of effort is likely to be required? Have the resource demands associated with these analyses been addressed in the project's schedule and budget?

Indirect Effects

- Does the project have an explicit economic development purpose, e.g., is economic development part of the purpose and need statement? How will the extent of this economic development and related impacts be estimated?
- Does the project provide new capacity, provide new access, create a land use or transportation node, or reduce regional travel times? How will the potential land use effects of these changes be accounted for?
- What methodologies are applicable and how should the practitioner choose between qualitative and quantitative methods?
- If indirect land use effects are involved, how will these estimates (often in units such as households and employment) be translated into environmental impacts?
- What is the incremental effect on the resources in the future with the project as compared to the future condition without the project, e.g. the difference between the No Build and Build condition?
- Are there measures that can be taken that reduce or avoid project-related impacts to each resource, or enhance the resilience of each resource to this and other impacts? Who would be responsible for implementing those measures?

Cumulative Impacts

- What specific resources should be addressed as part of the cumulative impacts analysis?
- What is the current health of each resource? What past actions/trends, whether public or private, led to this condition? What are the current trends and projected future health of the resource?
- What other transportation projects have been recently completed, or are currently under construction?
- Which future transportation projects are reasonably foreseeable? What are the potential environmental impacts of these projects on each resource?
- Which future non-transportation projects and developments, whether public or private, are reasonably foreseeable? What are the potential environmental impacts of these projects?
- How will the combined effects of past actions, other present actions, reasonably foreseeable future actions, and the proposed project affect the health of each resource?
- Are there any past, present, or reasonably foreseeable future mitigation measures that should be considered as part of the cumulative impacts analysis? For example, have the sponsors of the 'other actions' committed to carry out mitigation measures for the impacts of their actions?

⁸ See the Reference Materials section of this Handbook for additional NCHRP reports and other materials related to indirect and cumulative impacts analysis.

- How will the indirect effects and cumulative impacts assessments be incorporated into the NEPA document?
- Will the entire indirect effects and cumulative impacts analysis be included in the NEPA document itself? Or will a separate technical report be prepared, with a summary in the NEPA document?
- Will indirect effects and cumulative impacts be considered together in a single section or chapter, or will these analyses be clearly demarcated in the NEPA document?
- What additional supporting documentation needs to be included in the project file?

Practical Tips

The issues of indirect and cumulative impacts are often considered together, but each involves a distinct set of issues and analyses. To maintain a clear distinction between the two concepts, this Practical Tips section addresses indirect effects and cumulative impacts separately. It then addresses documentation of these analyses. Finally, it describes approaches for using the pre-NEPA planning process to support NEPA studies of indirect effects and cumulative impacts.

Indirect Effects Analysis

As noted in the Background Briefing, an indirect effects analysis can include “induced-growth effects” as well as “encroachment-alteration effects.” While both types of effects are important, the issue of induced growth arises most frequently and presents the greatest conceptual and technical challenges for practitioners. Therefore, this section focuses on ways to analyze the growth-related indirect effects of a transportation project.

An analysis of growth-related indirect effects involves tracing the chain of causation connecting a transportation project to future land use changes and then to the impacts of those changes. The steps in this chain of causation can be expressed as three distinct questions:

- Does the project have the potential to increase mobility and/or accessibility? If so, in what geographic area is increased accessibility likely to occur?
- Is the increased accessibility likely to cause changes in development patterns (timing, type, location, or amount)? If so, where are those changes in development likely to occur?
- What impacts are likely to result from changes in development patterns that are caused by the project? What specific types of resources could be impacted?

As a framework for addressing these questions, this Handbook outlines a step-by-step approach that includes: information-gathering; an initial assessment to determine overall approach; developing the scope and methodology; conducting the analysis; and considering mitigation. This approach is based upon, and is intended to be consistent with, the FHWA guidance, state DOT guidance, and NCHRP reports referenced above.

1 | Information Gathering

The first step in preparing an analysis of indirect effects is gathering information. This process does not occur all at once. During scoping, the practitioner assembles basic information about the project and the surrounding area. If this information indicates that a more in-depth analysis is warranted, more extensive information-gathering is undertaken. The following summary briefly describes the types of information that should be gathered for an indirect effects analysis.

Project Purpose. The project purpose provides an indication of a project's potential to cause indirect impacts. For example, if a project has an explicit economic development purpose, there is generally a presumption that the project will induce growth. Therefore, an in-depth indirect effects analysis usually is needed for projects that are explicitly intended to promote economic development. It also is important to recognize that a project may induce growth even when it does not have an explicit economic development purpose. A project with a transportation-focused purpose could still induce growth—for example, by providing additional capacity that enables faster or more intense growth than would otherwise occur.

Potential for Increased Mobility and/or Accessibility. The potential for travel time savings (shorter, faster trips) and/or increased accessibility is a key determinant of a project's potential to induce growth. If a project simply involves the repair or replacement of an existing structure, without any increase in capacity or adding a new access point, it generally will have little or no ability to induce growth. On the other hand, if a project substantially reduces travel times or creates a new access point on a transportation facility, the project may have the potential to induce growth. Traffic modeling provides a quantitative basis for assessing potential travel time savings. Early in a study, when forecasts are not yet available or are highly preliminary, it may be possible to assess travel time savings qualitatively based on the nature of the improvement being proposed.

Growth Trends and Projections. The basis for assessing induced growth is an understanding of the growth trends that would occur in the absence of the project. Growth trends can be described in many ways, including data on population and employment, housing construction, commercial and industrial development, conversion of undeveloped land, and other factors. While the specific data used will vary from project to project, it is always important to describe existing growth trends in some manner as a frame of reference for assessing a project's potential to induce different or greater growth than would have otherwise occurred. Keep in mind that a "No Action" growth projection should reflect growth as it would be expected to occur without the proposed project. Developing such a projection involves subjectivity and judgment; the assumptions and methodology used in developing such projections should be carefully documented.

Land Use Plans. Land use plans and other related plans, such as economic development plans, provide a basis for distinguishing between planned and unplanned growth. There are times when development is planned prior to development of the roadway network. The fact that growth has been planned doesn't necessarily mean it was not induced by a project; a project can be the necessary condition for planned growth, such as when a new interchange is constructed to serve a master-planned development. Nonetheless, the distinction between planned and unplanned growth is often an important consideration in project decision-making, because planned growth is generally considered preferable to unplanned growth. In addition, the distinction between planned and unplanned growth may be relevant in determining the level of detail required in the indirect impacts analysis. Growth that is unplanned, or that conflicts directly with land use plans, may warrant a more detailed discussion in the indirect effects analysis. Under the CEQ regulations, any inconsistencies with land use plans must be specifically identified in an EIS.⁹

Constraints on Growth Potential. Even in situations where a transportation project increases mobility and accessibility, other factors may limit the potential for induced growth. Constraints on growth include factors such as lack of demand, lack of available land, lack of water and sewer infrastructure, land use controls, regulatory constraints, and public opposition to development. These types of factors also play an important role in assessing a project's potential to cause induced growth, and are particularly important in assessing the degree to which increased accessibility and mobility will translate into increased growth.

Presence of Protected/Sensitive Resources. If a project has the potential to induce growth, it is necessary to consider whether the induced growth is likely to impact protected, impaired, threatened, or otherwise sensitive resources—for example, wetlands, forests, farmland, or wildlife habitat. As a basis for making this determination, an indirect effects analysis typically includes an inventory of the noteworthy natural and human resources in the area where induced growth could occur.

2 | Initial Assessment of Indirect Effects

As noted above, an indirect effects analysis typically begins with an initial assessment of a project's potential to cause indirect effects. The initial assessment focuses on determining whether a project is likely to cause indirect effects and the overall magnitude of those effects. This assessment generally is qualitative and is based on existing data sources. It provides a basis for deciding whether a more detailed analysis is needed.

An indirect effects analysis takes into account both encroachment-alteration effects and induced-growth effects. For most transportation projects, the indirect effects of greatest concern involve the project's potential to induce growth—or, more specifically, its potential to cause changes in the amount, timing, location, or type of development—as well as the potential for that induced growth to cause impacts on the environment.

In general, a project is more likely to require an in-depth analysis of indirect effects if the project provides new transportation capacity that increases accessibility by reducing travel times or if the project provides a new access point from a facility; serves

⁹ 40 CFR 1506.2(d) ("To better integrate environmental impact statements into state or local planning processes, statements shall discuss any inconsistency of a proposed action with any approved state or local plan and laws (whether or not Federally sanctioned). Where an inconsistency exists, the statement should describe the extent to which the agency would reconcile its proposed action with the plan or law").