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National Environmental Policy Act Guidance on Consideration of Greenhouse Gas Emissions and Climate Change

A Notice by the [Council on Environmental Quality](#) on 01/09/2023

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AGENCY:

Council on Environmental Quality.

ACTION:

Notice of interim guidance; request for comments.

SUMMARY:

The Council on Environmental Quality (CEQ) is issuing this interim guidance to assist agencies in analyzing greenhouse gas (GHG) and climate change effects of their proposed actions under the National Environmental Policy Act (NEPA). CEQ is issuing this guidance as interim guidance so that agencies may make use of it immediately while CEQ seeks public comment on the guidance. CEQ intends to either revise the guidance in response to public comments or finalize the interim guidance.

DATES:

This interim guidance is effective immediately. CEQ invites interested persons to submit comments on or before March 10, 2023.

ADDRESSES:

You may submit comments, identified by docket number CEQ-2022-0005, by any of the following methods:

- *Federal eRulemaking Portal:* <https://www.regulations.gov> (<https://www.regulations.gov>). Follow the instructions for submitting comments.
- *Fax:* 202-456-6546.
- *Mail:* Council on Environmental Quality, 730 Jackson Place NW, Washington, DC 20503.

All submissions received must include the agency name, “Council on Environmental Quality,” and the docket number, CEQ-2022-0005. All comments received will be posted without change to <https://www.regulations.gov> (<https://www.regulations.gov>), including any personal information provided. Do not submit electronically any information you consider to be private, Confidential Business Information (CBI), or other information, the disclosure of which is restricted by statute.

FOR FURTHER INFORMATION CONTACT:

Jomar Maldonado, Director for NEPA, 202-395-5750 or Jomar.MaldonadoVazquez@ceq.eop.gov (<mailto:Jomar.MaldonadoVazquez@ceq.eop.gov>).

SUPPLEMENTARY INFORMATION:

I. Introduction

The Council on Environmental Quality (CEQ) issues this guidance to assist Federal agencies in their consideration of the effects of greenhouse gas (GHG) emissions^[1] and climate change when evaluating proposed major Federal actions in accordance with the National Environmental Policy Act (NEPA)^[2] and the CEQ Regulations Implementing the Procedural Provisions of NEPA (CEQ Regulations).^[3] This guidance will facilitate compliance with existing NEPA requirements, improving the efficiency and consistency of reviews of proposed Federal actions for agencies, decision makers, project proponents, and the public.^[4] This guidance provides Federal agencies a common approach for assessing their proposed actions, while recognizing each agency's unique circumstances and authorities.

The United States faces a profound climate crisis and there is little time left to avoid a dangerous—potentially catastrophic—climate trajectory. Climate change is a fundamental environmental issue, and its effects on the human environment fall squarely within NEPA's purview.^[5] Major Federal actions may result in substantial GHG emissions or emissions reductions, so Federal leadership that is informed by sound analysis is crucial to addressing the climate crisis. Federal proposals may also be affected by climate change, so they should be designed in consideration of resilience and adaptation to a changing climate.^[6] Climate change is a particularly complex challenge given its global nature and the inherent interrelationships among its sources and effects. Further, climate change raises environmental justice concerns because it will disproportionately and adversely affect human health and the environment in some communities, including communities of color, low-income communities, and Tribal Nations and Indigenous communities. Given the urgency of the climate crisis and NEPA's important role in providing critical information to decision makers and the public, NEPA reviews should quantify proposed actions' GHG emissions, place GHG emissions in appropriate context and disclose relevant GHG emissions and relevant climate impacts, and identify alternatives and mitigation measures to avoid or reduce GHG emissions. CEQ encourages agencies to mitigate GHG emissions associated with their proposed actions to the greatest extent possible, consistent with national, science-based GHG reduction policies established to avoid the worst impacts of climate change.^[7]

As discussed in this guidance, when conducting climate change analyses in NEPA reviews, agencies should consider: (1) the potential effects of a proposed action on climate change, including by assessing both GHG emissions and reductions from the proposed action; and (2) the effects of climate change on a proposed action and its environmental impacts. Analyzing reasonably foreseeable climate effects in NEPA reviews^[8] helps ensure that decisions are based on the best available science and account for the urgency of the climate crisis. Climate change analysis also enables agencies to evaluate reasonable alternatives and mitigation measures that could avoid or reduce potential climate change-related effects and help address mounting climate resilience and adaptation challenges.

Accurate and clear climate change analysis:

- Helps decision makers, stakeholders, and the public to identify and assess reasonable courses of action that will reduce GHG emissions and climate change effects;
- Enables agencies to make informed decisions to help meet applicable Federal, State, Tribal, regional, and local climate action goals;^[9]
- Promotes climate change resilience and adaptation and prioritizes the national need to ensure climate-resilient infrastructure and operations, including by considering the reasonably foreseeable effects of climate change on infrastructure investments and the resources needed to protect such investments over their lifetime;^[10]
- Protects national security by helping to identify and reduce climate change-related threats including potential resource conflicts, stresses to military operations and installations, and the potential for abrupt stressors;^[11]

- Enables agencies to better understand and address the effects of climate change on vulnerable communities, thereby responding to environmental justice concerns and promoting resilience and adaptation; □

- Supports the international leadership of the United States on climate issues; ^[12] and

- Enables agencies to better assess courses of action that will provide pollution reduction co-benefits and long-term cost savings and reduce litigation risk to Federal actions—including projects carried out pursuant to the Bipartisan Infrastructure Law ^[13] and the Inflation Reduction Act. ^[14]

This interim ^[15] GHG guidance, effective upon publication, builds upon and updates CEQ's 2016 *Final Guidance for Federal Departments and Agencies on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in National Environmental Policy Act Reviews* ("2016 GHG Guidance"), highlighting best practices for analysis grounded in science and agency experience. ^[16] CEQ is issuing this guidance to provide for greater clarity and more consistency in how agencies address climate change in NEPA reviews. This guidance applies longstanding NEPA principles to the analysis of climate change effects, which are a well-recognized category of effects on the human environment requiring consideration under NEPA. In fact, Federal agencies have been analyzing climate change impacts and GHG emissions in NEPA documents for many years. CEQ intends the guidance to assist agencies in publicly disclosing and considering the reasonably foreseeable effects of their proposed actions. CEQ encourages agencies to integrate the climate and other environmental considerations described in this guidance early in their planning processes. CEQ will review any agency proposals for revised NEPA procedures, including any revision of existing categorical exclusions, in light of this guidance. ^[17]

II. Summary of Key Content

This guidance explains how agencies should apply NEPA principles and existing best practices to their climate change analyses by:

- Recommending that agencies leverage early planning processes to integrate GHG emissions and climate change considerations into the identification of proposed actions, reasonable alternatives (as well as the no-action alternative), and potential mitigation and resilience measures;
 - Recommending that agencies quantify a proposed action's projected GHG emissions or reductions for the expected lifetime of the action, considering available data and GHG quantification tools that are suitable for the proposed action;
 - Recommending that agencies use projected GHG emissions associated with proposed actions and their reasonable alternatives to help assess potential climate change effects;
 - Recommending that agencies provide additional context for GHG emissions, including through the use of the best available social cost of GHG (SC-GHG) estimates, to translate climate impacts into the more accessible metric of dollars, allow decision makers and the public to make comparisons, help evaluate the significance of an action's climate change effects, and better understand the tradeoffs associated with an action and its alternatives;
 - Discussing methods to appropriately analyze reasonably foreseeable direct, indirect, and cumulative GHG emissions;
 - Guiding agencies in considering reasonable alternatives and mitigation measures, as well as addressing short- and long-term climate change effects;
 - Advising agencies to use the best available information and science when assessing the potential future state of the affected environment in NEPA analyses and providing up to date examples of existing sources of scientific information;
 - Recommending agencies use the information developed during the NEPA review to consider reasonable alternatives that would make the actions and affected communities more resilient to the effects of a changing climate;
- Outlining unique considerations for agencies analyzing biogenic carbon dioxide sources and carbon stocks ^[18] associated with land and resource management actions under NEPA;
- Advising agencies that the "rule of reason" inherent in NEPA and the CEQ Regulations should guide agencies in determining, based on their expertise and experience, how to consider an environmental

effect and prepare an analysis based on the available information; and

- Reminding agencies to incorporate environmental justice considerations into their analyses of climate-related effects, consistent with Executive Orders 12898 and 14008.

III. Background

Consistent with NEPA, climate change analysis is a critical component of environmental reviews and integral to Federal agencies managing and addressing climate change.^[19] Recognizing the increasing urgency of the climate crisis and advances in climate science and GHG analysis techniques, CEQ has clarified and updated its 2016 GHG guidance on particular components including basic updates to reflect developments in climate science, methods to provide context for the impacts associated with GHG emissions, analysis of indirect effects, programmatic approaches, and environmental justice considerations. This guidance is applicable to all Federal actions subject to NEPA, with a focus on those for which an environmental assessment or environmental impact statement is prepared.^[20] This guidance does not—and cannot—expand the range of Federal agency actions that are subject to NEPA.^[21]

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A. NEPA

NEPA is designed to promote consideration of potential effects on the human environment^[22] that would result from proposed Federal agency actions, and to provide the public and decision makers with useful information regarding reasonable alternatives^[23] and mitigation measures to improve the environmental outcomes of Federal agency actions. NEPA encourages early planning, ensures that the environmental effects of proposed actions are considered before decisions are made, and informs the public of significant environmental effects of proposed Federal agency actions, promoting transparency and accountability.^[24]

Agencies implement NEPA through one of three levels of analysis: a categorical exclusion (CE); an environmental assessment (EA); or an environmental impact statement (EIS). Agencies have discretion in how they tailor their individual NEPA reviews in consideration of this guidance, consistent with the CEQ Regulations and their respective implementing procedures and policies.^[25] NEPA reviews should identify measures to avoid, minimize, or mitigate adverse effects of Federal agency actions.^[26] Better analysis and informed decisions are the ultimate goal of the NEPA process.^[27] Inherent in NEPA and the CEQ Regulations is a “rule of reason” that allows agencies to determine, based on their expertise and experience, how to consider an environmental effect and prepare an analysis based on the available information. The usefulness of that information to the decision-making process and the public, and the extent of the anticipated environmental consequences, are important factors to consider when applying that “rule of reason.”

B. Climate Change

Climate change is a defining national and global environmental challenge of this time, threatening broad and potentially catastrophic impacts to the human environment. It is well established that rising global atmospheric GHG concentrations are substantially affecting the Earth's climate, and that the dramatic observed increases in GHG concentrations since 1750 are unequivocally caused by human activities including fossil fuel combustion.^[28] CEQ's first Annual Report in 1970 discussed the various ways that human-driven actions were understood to potentially alter global temperatures and weather patterns.^[29] At that time, the mean level of atmospheric carbon dioxide (CO₂) had been measured as increasing to 325 parts per million (ppm) from a pre-Industrial average of 280 ppm.^[30] Since 1970, the global average concentration of atmospheric CO₂ has increased to 414.21 ppm as of 2021, setting a new record high.^[31] Methane is a potent GHG; over a 100-year period, the emissions of a ton of methane contribute 28 to 36 times as much to global warming as a ton of carbon dioxide. Over a 20-year timeframe, methane is about 84 times as potent as carbon dioxide.^[32] Concentrations of methane (CH₄), have more than doubled from pre-Industrial levels.^[33] Methane concentrations continue to grow rapidly.^[34] Concentrations of other GHGs have similarly continued to grow, including nitrous oxide (N₂O) and hydrofluorocarbons (HFC).^[35] Since the publication of CEQ's first Annual Report, human activities have caused the carbon dioxide content of the atmosphere of our planet to increase to □ its highest level in at least 800,000 years.^[36]

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Rising GHG levels are causing corresponding increases in average global temperatures and in the frequency and severity of natural disasters including storms, flooding, and wildfires.^[37] Even if the United States and the world meet ambitious de-carbonization targets, those trends will continue for many years, adversely affecting critical components of the human environment, including water availability, ocean acidity, sea-level rise, ecosystem functions, biodiversity, energy production, energy transmission and distribution, agriculture and food security, air quality, and human health.^[38]

Based primarily on the scientific assessments of the U.S. Global Change Research Program (USGCRP), the National Research Council, and the Intergovernmental Panel on Climate Change (IPCC), in 2009 the Environmental Protection Agency (EPA) issued a finding that declared that the changes in our climate caused by elevated concentrations of GHGs in the atmosphere are reasonably anticipated to endanger the public health and welfare of current and future generations.^[39] Since then, EPA has acknowledged more recent scientific assessments that highlight the urgency of addressing the rising concentration of GHGs in the atmosphere^[40] and has found that certain communities, including communities of color, low-income communities, Tribal Nations and Indigenous communities, are especially vulnerable to climate-related effects.^[41] Climate change also is likely to increase a community's vulnerability to other environmental impacts, further exacerbating environmental justice concerns. The effects of climate change observed to date and projected to occur in the future include more frequent and intense heat waves, longer fire seasons and more severe wildfires, degraded air quality, increased drought, greater sea-level rise, an increase in the intensity and frequency of extreme weather events, harm to water resources, harm to agriculture, ocean acidification, and harm to wildlife and ecosystems.^[42] The IPCC Assessment Report reinforces these findings by providing scientific evidence of the impacts of climate change driven by human-induced GHG emissions, on our ecosystems, infrastructure, human health, and socioeconomic makeup.^[43] Moreover, the effects of climate change are likely to fall disproportionately on vulnerable communities, including communities of color, low-income communities and Tribal Nations and Indigenous communities with environmental justice concerns.^[44]

IV. Quantifying, Disclosing, and Contextualizing Climate Impacts, and Addressing the Potential Climate Change Effects of Proposed Federal Actions

Consistent with section 102(2)(C) of NEPA, Federal agencies must disclose and consider the reasonably foreseeable effects of their proposed actions including the extent to which a proposed action and its reasonable alternatives (including the no action alternative) would result in reasonably foreseeable GHG emissions that contribute to climate change. Federal agencies also should consider the ways in which a changing climate may impact the proposed action and its reasonable alternatives, and change the action's environmental effects over the lifetime of those effects.

This guidance is intended to assist agencies in disclosing and considering the effects of GHG emissions and climate change. This guidance does not establish any particular quantity of GHG emissions as “significantly” affecting the quality of the human environment. However, quantifying a proposed action's reasonably foreseeable GHG emissions whenever possible, and placing those emissions in appropriate context are important components of analyzing a proposed action's reasonably foreseeable climate change effects.

This section of the guidance identifies and explains the following steps agencies should take when analyzing a proposed action's climate change effects under NEPA:

(1) Quantify the reasonably foreseeable GHG emissions (including direct and indirect emissions) of a proposed action, the no action alternative, and any reasonable alternatives as discussed in Section IV(A) below. □

(2) Disclose and provide context for the GHG emissions and climate impacts associated with a proposed action and alternatives, including by, as relevant, monetizing climate damages using estimates of the SC-GHG, placing emissions in the context of relevant climate action goals and commitments, and providing common equivalents, as described below in Section IV(B).

(3) Analyze reasonable alternatives, including those that would reduce GHG emissions relative to baseline conditions, and identify available mitigation measures to avoid, minimize, or compensate for climate effects.

A. Quantifying a Proposed Action's GHG Emissions

To ensure that Federal agencies consider the incremental contribution of their actions to climate change, agencies should quantify the reasonably foreseeable direct and indirect GHG emissions of their proposed actions and reasonable alternatives (as well as the no-action alternative) and provide additional context to describe the effects associated with those projected emissions in NEPA analysis.^[45]

Climate change results from an increase in atmospheric GHG concentrations from the incremental addition of GHG emissions from a vast multitude of individual sources.^[46] The totality of climate change impacts is not attributable to any single action, but is exacerbated by a series of actions including actions taken pursuant to decisions of the Federal Government. Therefore, it is crucial for the Federal Government to analyze and consider the potential climate change effects of its proposed actions.^[47]

NEPA requires more than a statement that emissions from a proposed Federal action or its alternatives represent only a small fraction of global or domestic emissions. Such a statement merely notes the nature of the climate change challenge, and is not a useful basis for deciding whether or to what extent to consider climate change effects under NEPA. Moreover, such comparisons and fractions also are not an appropriate method for characterizing the extent of a proposed action's and its alternatives' contributions to climate change because this approach does not reveal anything beyond the nature of the climate change challenge itself—the fact that diverse individual sources of emissions each make a relatively small addition to global atmospheric GHG concentrations that collectively have a large effect.

Therefore, when considering GHG emissions and their significance, agencies should use appropriate tools and methodologies to quantify GHG emissions, compare GHG emission quantities across alternative scenarios (including the no action alternative), and place emissions in relevant context, including how they relate to climate action commitments and goals. This approach allows an agency to present the environmental and public health effects of a proposed action in clear terms and with sufficient information to make a reasoned choice between no action and other alternatives and appropriate mitigation measures. This approach will also ensure the professional and scientific integrity of the NEPA review.^[48]

As part of the NEPA documents they prepare, agencies should quantify the reasonably foreseeable gross GHG emissions increases and gross GHG emission reductions^[49] for the proposed action, no action alternative, and any reasonable alternatives over their projected lifetime, using reasonably available information and data.^[50] Agencies generally should quantify gross emissions increases or reductions (including both direct and indirect emissions) individually by GHG, as well as aggregated in terms of total CO₂ equivalence^[51] by factoring in each pollutant's global warming potential (GWP), using the best available science and data.^[52] Agencies also should quantify proposed actions' total net GHG emissions or reductions^[53] (both by pollutant and by total CO₂ -equivalent emissions) relative to baseline conditions.^[54] To facilitate readability, agencies should include an overview of this information in the summary sections of EISs and, when relevant, in the summary section of EAs. Agencies also may use visual tools, such as charts and figures, to help readers more easily comprehend emissions data and compare emissions across alternatives.

Where feasible, agencies should also present annual GHG emission increases or reductions. This is particularly important where a proposed action presents both reasonably foreseeable GHG emission increases and GHG emission reductions. The agency generally should present annual GHG emissions increases or reductions, as well as net GHG emissions over the projected lifetime of the action, consistent with existing best practices.^[55] Agencies should be guided by a rule of reason and the concept of proportionality in undertaking this analysis, particularly for proposed actions with net beneficial climate effects, as described below.

Quantification and assessment tools are widely available and are already in broad use in the Federal Government and private sector, by state and local governments, and globally. CEQ maintains a GHG Accounting Tools website listing many such tools.^[56] These tools are designed to assist agencies, institutions, organizations, and companies that have different levels of technical sophistication, data availability, and GHG source profiles. Agencies should use tools that reflect the best available science and data. These tools can provide GHG emissions estimates, including emissions from fossil fuel combustion and carbon sequestration^[57] for many of the sources and sinks potentially affected by proposed resource management actions.^[58] When considering which tools to employ, it is important to consider the proposed action's temporal scale and the availability of input data.^[59] Furthermore, agencies should seek to obtain the information needed to quantify GHG emissions, including by requesting or requiring information held by project applicants or by conducting modeling when relevant.

In the rare instance when an agency determines that tools, methodologies, or data inputs are not reasonably available to quantify GHG emissions associated with a specific action, the agency should explain why such an analysis cannot be done, and should seek to present a reasonable estimated range of quantitative emissions for the proposed action and alternatives. Where tools are available for some aspects of the analysis but not others, agencies should use all reasonably available tools and describe any relevant limitations. Agencies are encouraged to identify and communicate any data or tool gaps that they encounter to CEQ.

If an agency determines that it cannot provide even a reasonable range of potential GHG emissions, the agency should provide a qualitative analysis and its rationale for determining that a quantitative analysis is not possible. A qualitative analysis may include sector-specific descriptions of the GHG emissions from the category of Federal agency action that is the subject of the NEPA analysis, but should seek to provide additional context for potential resulting emissions.

Agencies should be guided by the rule of reason, as well as their expertise and experience, in conducting analysis commensurate with the quantity of projected GHG emissions and using GHG quantification tools suitable for the proposed action.^[60] The rule of reason and the concept of proportionality caution against providing an in-depth analysis of emissions regardless of the insignificance of the quantity of GHG emissions that the proposed action would cause. For example, some proposed actions may involve net GHG emission reductions or no net GHG increase, such as certain infrastructure or renewable energy projects. For such actions, agencies should generally quantify projected GHG emission reductions, but may apply the rule of reason when determining the appropriate depth of analysis such that precision regarding emission reduction benefits does not come at the expense of efficient and accessible analysis. Absent exceptional circumstances, the relative minor and short-term GHG emissions associated with construction of certain renewable energy projects, such as utility-scale solar and offshore wind, should not warrant a detailed analysis of lifetime GHG emissions. As a second example, actions with only small GHG emissions may be able to rely on less detailed emissions estimates.

B. Disclosing and Providing Context for a Proposed Action's GHG Emissions and Climate Effects

In addition to quantifying emissions as described in Section IV(A), agencies should disclose and provide context for GHG emissions and climate effects to help decision makers and the public understand proposed actions' potential GHG emissions and climate change effects. To disclose effects and provide additional context for proposed actions' emissions once GHG emissions have been estimated, agencies should use the following best practices, as relevant:

(1) In most circumstances, once agencies have quantified GHG emissions, they should apply the best available estimates of the SC-GHG^[61] to the incremental metric tons of each individual type of GHG emissions^[62] expected from a proposed action and its alternatives.^[63] SC-GHG estimates allow monetization (presented in U.S. dollars) of the climate change effects from the marginal or incremental emission of GHG emissions, including carbon dioxide, methane, and nitrous oxide.^[64] These 3 GHGs represent more than 97 percent of U.S. GHG emissions.^[65] The SC-GHG provides an appropriate and valuable metric that gives decision makers and the public useful information and context about a proposed action's climate effects even

if no other costs or benefits are monetized, because metric tons of GHGs can be difficult to understand and assess the significance of in the abstract.^[66] The SC-GHG translates metric tons of emissions into the familiar unit of dollars, allows for comparisons to other monetized values, and estimates the damages associated with GHG emissions over time and associated with different GHG pollutants.^[67] The SC-GHG also can assist agencies and the public in assessing the significance of climate impacts. This is a simple and straightforward calculation that should not require additional time or resources.

Certain circumstances may make monetization using the SC-GHG particularly useful, such as if a NEPA review monetizes other costs and benefits for the proposed action (see Section VI(F)); if the alternatives differ in GHG emissions over time or in the type of GHGs emitted; or if the significance of climate change effects is difficult to assess or not apparent to the public without monetization. SC-GHG estimates can help describe the net social costs of increasing GHG emissions as well as the net social benefits of reducing such emissions. Given NEPA's mandates to consider worldwide and long-range environmental problems,^[68] it is most appropriate for agencies to focus on SC-GHG estimates that capture global climate damages and, consistent with the best available science, reflect a timespan covering the vast majority of effects and discount future effects at rates that consider future generations. It is often also worth affirming that SC-GHG estimates, including those available at the publication of this guidance, may be conservative underestimates because various damage categories (like ocean acidification) are not currently included.

(2) Where helpful to provide context, such as for proposed actions with relatively large GHG emissions or reductions or that will expand or perpetuate reliance on GHG-emitting energy sources, agencies should explain how the proposed action and alternatives would help meet or detract from achieving relevant climate action goals and commitments, including Federal goals, international agreements, state or regional goals, Tribal goals, agency-specific goals, or others as appropriate.^[69] However, as explained above, NEPA requires more than a statement that emissions from a proposed Federal action or its alternatives represent only a small fraction of global or domestic emissions. Such comparisons and fractions are not an appropriate method for characterizing the extent of a proposed action's and its alternatives' contributions to climate change. Agencies also should discuss whether and to what extent the proposal's reasonably foreseeable GHG emissions are consistent with GHG reduction goals, such as those reflected in the U.S. nationally determined contribution under the Paris Agreement. Federal planning documents that illustrate multi-decade pathways to achieve policy may also provide useful information, such as the *Long-Term Strategy of the United States: Pathways to Net-Zero Greenhouse Gas Emissions by 2050*.^[70] Similarly, agencies' own climate goals may provide relevant context. Evaluating a proposed action's and its alternatives' consistency with such goals and commitments can help illuminate the policy context, the importance of considering alternatives and mitigation, and tradeoffs of the decision and help agencies evaluate the significance of a proposed action's GHG emissions and climate change effects. This type of comparison provides a different kind of disclosure and context than that provided by application of SC-GHG estimates as described above, demonstrating the potential utility of multiple contextualization methods.

(3) Where relevant, agencies should summarize and cite to available scientific literature to help explain the real-world effects—including those that will be experienced locally in relation to the proposed action—associated with an increase in GHG emissions that contribute to climate change, such as sea-level rise, temperature changes, ocean acidity, and more frequent and severe wildfires and drought, and human health effects (including to underserved populations).^[71] Agencies should use the best available information, including scenarios and climate modeling information that are most relevant to a proposed action.^[72]

(4) Agencies also can provide accessible comparisons or equivalents to help the public and decision makers understand GHG emissions in more familiar terms. Techniques may include placing a proposed action's GHG emissions in more familiar metrics such as household emissions per year, annual average emissions from a certain number of cars on the road, or gallons of gasoline burned.^[73] Such comparisons may be a useful supplement and can, for example, be presented along with monetized damage estimates using SC-GHG values. Agencies should use disclosure and contextualization methods that best fit their proposed actions and alternatives.

C. Reasonable Alternatives

Considering reasonable alternatives, including alternatives that avoid or mitigate GHG emissions, is fundamental to the NEPA process and accords with Sections 102(2)(C) and 102(2)(E) of NEPA, which independently require the consideration of alternatives in environmental documents.^[74] NEPA calls upon agencies to use the NEPA process to identify and assess the reasonable alternatives to proposed actions that will avoid or minimize adverse effects on the human environment.^[75]

Consideration of alternatives provides an agency decision maker the information needed to examine other possible approaches to a particular proposed action (including the no action alternative) that could alter environmental effects or the balance of factors considered in making the decision. Agencies make better informed decisions by comparing relevant GHG emissions, GHG emission reductions, and carbon sequestration potential across reasonable alternatives, assessing trade-offs with other environmental values, and evaluating □ the risks from or resilience to climate change inherent in a proposed action and its design.

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Agencies must consider a range of reasonable alternatives, as well as reasonable mitigation measures if not already included in the proposed action or alternatives, consistent with the level of NEPA review (*e.g.*, EA or EIS) and the purpose and need for the proposed action.^[76] Agencies should leverage the early phases of their existing planning processes to help identify potential alternatives to address an action's anticipated environmental effects. When analyzing alternatives, agencies should compare the anticipated levels of GHG emissions from each alternative—including the no action alternative—and mitigation to provide information to the public and enable the decision maker to make an informed choice. To help provide clarity, agencies should consider presenting charts, tables, or figures, as appropriate, to compare GHG emissions and climate effects across alternatives.

Neither NEPA, the CEQ Regulations, or this guidance require the decision maker to select the alternative with the lowest net GHG emissions or climate costs or the greatest net climate benefits. However, and in line with the urgency of the climate crisis, agencies should use the information provided through the NEPA process to help inform decisions that align with climate change commitments and goals. For instance, agencies should evaluate reasonable alternatives that may have lower GHG emissions, which could include technically and economically feasible clean energy alternatives to proposed fossil fuel-related projects, and consider mitigation measures to reduce GHG emissions to the greatest extent possible.

Where relevant—such as for proposed actions that will generate substantial GHG emissions—agencies should identify the alternative with the lowest net GHG emissions or the greatest net climate benefits among the alternatives they assess. And, as described throughout this guidance, they should use the NEPA process to make informed decisions grounded in science that are transparent with respect to how Federal actions will help meet climate change goals and commitments, or alternately, detract from them.

D. Baseline for Considering Environmental Effects

A NEPA review must identify the area affected by a proposed action (*i.e.*, the affected environment).^[77] Identification of the affected environment includes identifying and describing reasonably foreseeable environmental trends, including climate change effects. The NEPA review also must identify the current and projected future state of the affected environment without the proposed action (*i.e.*, the no action alternative), which serves as the baseline for considering the effects of the proposed action and its reasonable alternatives.^[78] For an estimate of GHG emissions from the proposed action to have meaningful context, an accurate estimate of GHG emissions without the proposed action should be included in a NEPA review. The temporal bounds for the analysis are determined by the projected initiation of the action and the expected life of the proposed action and its effects.^[79] It is noteworthy that the impacts of GHGs can be very long-lasting.^[80]

E. Direct and Indirect Effects

NEPA requires agencies to consider the reasonably foreseeable direct and indirect effects of their proposed actions and reasonable alternatives (as well as the no-action alternative).^[81] The term “direct effects” refers to reasonably foreseeable effects that are caused by the action and occur at the same time and place.^[82] The

term “indirect effects” refers to effects that are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable.^[83] Indirect effects generally include reasonably foreseeable emissions related to a proposed action that are upstream or downstream of the activity resulting from the proposed action.^[84] For example, where the proposed action involves fossil fuel extraction, direct emissions typically include GHGs emitted during the process of exploring for and extracting the fossil fuel. The reasonably foreseeable indirect effects of such an action likely would include effects associated with the processing, refining, transporting, and end-use of the fossil fuel being extracted, including combustion of the resource to produce energy. Indirect emissions^[85] are often reasonably foreseeable since quantifiable connections frequently exist between a proposed activity that involves use or conveyance of a commodity or resource, and changes relating to the production or consumption of that resource.^[86]

As discussed in Section IV(A), agencies generally should quantify all reasonably foreseeable emissions associated with a proposed action and reasonable alternatives (as well as the no-action alternative). Quantification should include the reasonably foreseeable direct and indirect GHG emissions of their proposed actions. Agencies also should disclose the information and any assumptions used in the analysis and explain any uncertainty.^[87] In assessing a proposed action’s, and reasonable alternatives’, reasonably foreseeable direct and indirect GHG emissions, the agency should use the best available information.^[88] As with any NEPA review, the rule of reason should guide the agency’s analysis and the level of □ effort can be proportionate to the scale of the net GHG effects and whether net effects are positive or negative, with actions resulting in very few or an overall reduction in GHG emissions generally requiring less detailed analysis than actions with large emissions.^[89]

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Agencies should seek to obtain the information needed to quantify emissions, including by requesting or requiring information held by other entities (such as project applicants), because such information is generally essential to reasoned decision making.^[90] Where information regarding direct or indirect emissions is not available, agencies should make best efforts to develop a range of potential emissions.^[91] Agencies can provide an upper bound for effects analysis by treating the resource provided or enabled by the actions they take as new or additional. In the example of fossil fuel extraction or transportation, this is sometimes referred to as a “full burn” assumption, as the agency can provide an upper bound estimate of GHG emissions by assuming that all of the available resources will be produced and combusted to create energy.^[92]

Some proposed actions, such as those increasing the supply of certain energy resources like oil, natural gas, or renewable energy generation, may result in changes to the resulting energy mix as energy resources substitute for one another on the domestic or global energy market.^[93] Different energy resources emit different amounts of GHGs and other air pollutants.^[94] For proposed actions involving such resource substitution considerations, where relevant, CEQ encourages agencies to conduct substitution analysis to provide more information on how a proposed action and its alternatives are projected to affect the resulting resource or energy mix, including resulting GHG emissions.^[95] Substitution analysis generally is relevant to actions related to the extraction, transportation, refining, combustion, or distribution of fossil fuels, for example. Agencies should not simply assume that if the federal action does not take place, another action will perfectly substitute for it and generate identical emissions, such that the action’s net emissions relative to the baseline are zero.^[96] Such an assumption of perfect substitution typically contradicts basic economic principles of supply and demand.^[97] Instead, where relevant, agencies can use available models to help conduct substitution analysis.^[98] Agencies should disclose any assumptions and inputs used in substitution analysis and use models that accurately account for reasonable and available energy substitute resources, including renewable energy. Further, the analysis generally should be complemented with evaluation that compares the proposed action’s and reasonable alternatives’ energy use against scenarios or energy use trends that are consistent with achieving science-based GHG reduction goals, such as those pursued in the *Long-Term Strategy of the United States*.^[99]

In addition to addressing an action’s direct and indirect effects, NEPA requires agencies to address the effects of “connected” actions.^[100] When evaluating a proposed Federal action, agencies should account for other closely related actions that should be discussed in the same EIS or EA. Actions are connected if they: (i)

automatically trigger other actions that may require environmental impact statements; (ii) cannot or will not proceed unless other actions are taken previously or simultaneously; or (iii) are interdependent parts of a larger action and depend on the larger action for their justification.^[101] For example, NEPA reviews for proposed resource extraction and development projects typically should address the reasonably foreseeable effects of other closely related agency actions that authorize separate phases or aspects of development. Depending on the relationship between any of the phases, as well as the authority under which they may be carried out, agencies should use the analytical scope that best informs their decision making.

F. Cumulative Effects

In addition to analyzing a proposed action's direct and indirect effects, NEPA and CEQ's regulations require an agency to also consider the proposed action's cumulative effects.^[102] Cumulative effects are effects on the environment that result from the incremental effects of the action when added to the effects of other past, present, and reasonably foreseeable actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions.^[103] In evaluating a proposed action's cumulative climate change effects, an agency should consider the proposed action in the context of the emissions from past, present, and reasonably foreseeable actions. When assessing cumulative effects, agencies should also consider whether certain communities experience disproportionate cumulative effects, thereby raising environmental justice concerns.^[104]

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All types of GHG emissions contribute to real-world physical changes. Given that climate change is the result of the increased global accumulation of GHGs climate effects analysis is inherently cumulative in nature. Thus, the analysis and public disclosure of cumulative effects can be accomplished by quantifying GHG emissions and providing context for understanding their effects as discussed above, including by monetizing climate damages using estimates of the SC-GHG, placing those damages in the context of relevant climate action goals and commitments, and summarizing and citing to available scientific literature to help explain real world effects.

G. Short- and Long-Term Effects

When considering effects, agencies should take into account both the short- and long-term adverse and beneficial effects using a temporal scope that is grounded in the concept of reasonable foreseeability. Some proposed actions and reasonable alternatives will require consideration of effects from different stages of the action to ensure the direct effects and reasonably foreseeable indirect effects are appropriately assessed; for example, the effects of construction are different from the effects of the operations and maintenance of a facility.

The effects analysis should cover the action's reasonably foreseeable lifetime, including anticipated GHG emissions associated with construction, operations, and decommissioning. Agencies should identify an appropriate lifetime for the proposed action using available indicators and guided by the concept of reasonable foreseeability.

Identifying an appropriate lifetime for the action also will inform assessment of long-term emissions benefits of proposed actions and reasonable alternatives. For example, development of a new wind energy project may result in short-term construction GHG emissions but overall long-term GHG benefits. Agencies should describe both short- and long-term effects in comparison to the no action alternative in NEPA reviews and clearly explain the net effect of their actions even if precision regarding the timing of short- and long-term effects is not possible.

H. Mitigation

Identifying and analyzing potential mitigation measures is an important component of the NEPA process.^[105] Evaluating potential mitigation measures generally involves first determining whether impacts from a proposed action or alternatives can be avoided, then considering whether adverse impacts can be minimized, then, when impacts are unavoidable, rectifying them and, if appropriate, requiring compensation for residual impacts.^[106] Mitigation plays a particularly important role in how agencies should assess the potential

climate change effects of proposed actions and reasonable alternatives. Agencies should consider mitigation measures that will avoid or reduce GHG emissions. Given the urgency of the climate crisis, CEQ encourages agencies to mitigate GHG emissions to the greatest extent possible.

Agencies should consider mitigation, particularly avoidance and minimization, as early as possible in the development of their actions, including during scoping, public engagement, and alternatives analysis. As part of early and meaningful public engagement, agencies should solicit public input on potential mitigation measures, including from communities that the proposed action and reasonable alternatives may affect. In their NEPA documents, agencies should discuss any mitigation measures considered and whether they included those measures in the preferred alternative. Where potential mitigation measures are not adopted, agencies should explain why as early as practicable in the NEPA process.

Agencies should consider available mitigation measures that avoid, minimize, or compensate for GHG emissions and climate change effects when those measures are reasonable and consistent with achieving the purpose and need for the proposed action. Such mitigation measures could include enhanced energy efficiency, renewable energy generation and energy storage, lower-GHG-emitting technology, reduced embodied carbon in construction materials, carbon capture and sequestration, sustainable land management practices, and capturing GHG emissions such as methane.

Federal agencies also should evaluate the quality of that mitigation by ensuring it meets appropriate performance standards.^[107] Appropriate performance standards help ensure that GHG mitigation is additional, verifiable, durable, enforceable, and will be implemented.^[108] NEPA does not limit consideration of mitigation to actions involving significant effects. However, mitigation can be particularly effective in helping agencies reduce or avoid significant effects.^[109] Agencies can discuss the scope of their mitigation authority to support any mitigation commitments relied upon in NEPA analysis, including mitigation supporting a finding of no significant impact.^[110] In addition, consistent with existing agency best practice, an agency's decision on a proposed action should identify the mitigation measures that the agency commits to take, recommends, or requires others to take.^[111]

The CEQ Regulations and guidance also recognize the value of monitoring to ensure that mitigation is carried out as provided in a record of decision or finding of no significant impact.^[112] Monitoring intensity and duration □ should be aligned with the mitigation action taken.

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Finally, while this subsection primarily addresses mitigating a proposed action's GHG emissions, agencies also should consider environmental design features, alternatives, and mitigation measures to address the effects of climate change on the proposed action, including to enhance resilience and adaptation. See Section IV(D).

I. Special Considerations for Biological GHG Sources and Sinks

Many GHG emissions come from combusting fossil fuels and releasing substances into the atmosphere.^[113] In addition to these sources, some GHG emissions are related to the natural carbon cycle,^[114] or result from the combustion, harvest, decomposition, or other processing of biologically based materials.^[115] These types of emissions are referred to as “biogenic.”^[116] Biogenic GHG emissions from land management actions—such as prescribed burning, timber stand improvements, fuel load reductions, and scheduled harvesting—involve GHG emissions and carbon sequestration that operate within the global carbon and nitrogen cycle, which may be affected by those actions. Similarly, some water management practices have GHG emission consequences that may require unique consideration (*e.g.*, reservoir management practices can reduce methane releases, wetlands management practices can enhance carbon sequestration, and water conservation can improve energy efficiency).

In the land and resource management context, how a proposed action and reasonable alternatives (as well as the no-action alternative) affects a net carbon sink or source will depend on multiple factors such as the local or regional climate and environment, the distribution of carbon across carbon pools in the action area, ongoing activities and trends, and the role of natural disturbances in the relevant area.

In NEPA reviews, for actions involving potential changes to biological GHG sources and sinks, agencies should include a comparison of net GHG emissions and carbon stock^[117] changes that are anticipated to occur, with and without implementation of the proposed action and reasonable alternatives. The analysis should consider the estimated GHG emissions (from biogenic and fossil-fuel sources), carbon sequestration potential, and the net change in relevant carbon stocks in light of the proposed actions and timeframes under consideration, and explain the basis for the analysis.

Some actions that involve ecosystem restoration^[118] can generate short-term biogenic emissions while resulting in overall long-term net reductions of atmospheric GHG concentrations through increases in carbon stocks or reduced risks of future emissions. One example is certain vegetation management practices that affect the risk of wildfire, insect and disease outbreak, or other disturbance. Some resource management activities, such as a prescribed burn or certain non-commercial thinning of forests or grasslands conducted to reduce wildfire risk or insect infestations, might result in short-term GHG emissions or loss of stored carbon but greater long-term ecosystem health, including an overall net increase in carbon sequestration and storage. However, other types of land-use changes, such as permanent deforestation, can adversely alter ecosystem long-term carbon dynamics, resulting in net emissions. Agencies can use relevant tools to analyze the anticipated long-term GHG emissions implications from proposed ecosystem restoration actions.

Federal land and resource management agencies should consider developing and maintaining agency-specific principles and guidance for considering biological carbon in management and planning decisions.^[119] Such guidance can help address the importance of considering biogenic carbon fluxes and storage within the context of other management objectives and ecosystem service goals, and integrating carbon considerations as part of a balanced and comprehensive program of sustainable management, climate change mitigation, and climate change adaptation.

V. Considering the Effects of Climate Change on a Proposed Action

According to the USGCRP and others, GHGs already in the atmosphere will continue altering the climate system into the future, even with current or future emissions control efforts.^[120] To illustrate how climate change may impact proposed actions and alternatives and to consider climate resilience, NEPA reviews should consider the ongoing impacts of climate change and the foreseeable state of the environment, especially when evaluating project design, siting, and reasonable alternatives. In addition, climate change resilience^[121] and adaptation^[122] are important □ considerations for agencies contemplating and planning actions.^[123]

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A. Affected Environment

Agencies should identify the affected environment to provide a basis for comparing the current and future state of the environment as affected by the proposed action or its reasonable alternatives.^[124] As discussed in Section IV(D), the current and projected future state of the environment without the proposed action (*i.e.*, the no action alternative) represents the reasonably foreseeable affected environment. In considering the effects of climate change on a proposed action, the agency should describe the affected environment for the proposed action based on the best available climate change reports,^[125] which often project at least two possible future emissions scenarios.^[126] The temporal bounds for the description of the affected environment are determined by the projected initiation of implementation and the expected life of the proposed action and its effects.^[127]

B. Effects

The analysis of climate change effects should focus on those aspects of the human environment that are impacted by the agency's potential action (*i.e.*, the proposed action or its alternatives) and climate change. The analysis also should consider how climate change can make a resource, ecosystem, human community, or structure more vulnerable to many types of effects and lessen its resilience to other environmental effects. This increase in vulnerability can exacerbate the environmental effects of potential actions, including environmental justice impacts. For example, a proposed action or its alternatives may require water from a stream that has diminishing quantities of available water because of decreased snow pack in the mountains,

or add heat to a water body that is already warming due to increasing atmospheric temperatures. Such considerations are squarely within the scope of NEPA and can inform decisions on siting, whether to proceed with and how to design potential actions and reasonable alternatives, and to eliminate or mitigate effects exacerbated by climate change. They also can inform possible adaptation measures to address the effects of climate change, ultimately enabling the selection of smarter, more resilient actions.

C. Using Available Assessments and Scenarios To Assess Present and Future Impacts

In accordance with NEPA's rule of reason and standards for obtaining information regarding reasonably foreseeable effects on the human environment, agencies may summarize and incorporate by reference relevant scientific literature concerning the physical effects of climate change.^[128] For example, agencies may summarize and incorporate by reference the relevant chapters of the most recent national climate assessments or reports from the USGCRP and the IPCC.^[129] Particularly relevant to some proposed actions and reasonable alternatives are the most current reports on climate change effects on water resources, ecosystems, vulnerable communities, agriculture and forestry, health, coastlines, and ocean and arctic regions in the United States.^[130]

Agencies should remain aware of the evolving body of scientific information as more refined estimates of the effects of climate change, both globally and at a localized level, become available.^[131] Agencies should use the most up-to-date scientific projections available, identify any methodologies and sources used, and where relevant, disclose any relevant limitations of studies, climate models, or projections they rely on.^[132]

In addition to considering climate change effects at the relevant global and national levels, agencies should identify and use information on future projected GHG emissions scenarios to evaluate potential future impacts (such as flooding, high winds, extreme heat, and other climate change-related impacts) and what those impacts will mean for the physical and other relevant conditions in the affected area. Such information should help inform development of the proposed action and alternatives, including by ensuring that proposed actions and alternatives consider appropriate resilience measures, environmental justice issues, and existing State, Tribal, or local adaptation plans. When relying on a single study or projection, agencies should consider any relevant limitations and discuss them.^[133]

D. Resilience and Adaptation

As discussed in Section III(B), climate change presents risks to a wide array of potential actions across a range of sectors. Agencies should consider climate change effects on the environment and on proposed actions in assessing vulnerabilities and resilience to the effects of climate change such as increasing sea level, drought, high intensity precipitation events, increased fire risk, or ecological change. Consistent with NEPA, environmental reviews should provide relevant information that agencies can use to consider siting issues, the initial project design and consistency with existing State, Tribal, and local adaptation plans, as well as reasonable alternatives with preferable overall environmental outcomes and improved resilience to climate effects.^[134] Climate resilience and adaptation may be particularly relevant to the description of a proposed action, the alternatives analysis, and the description of environmental consequences. For instance, agencies should consider increased risks associated with development in floodplains, avoiding such development wherever there is a practicable alternative, as required by Executive Orders 11988 and 13690.^[135] Agencies also should consider the likelihood of increased temperatures and more frequent or severe storm events over the lifetime of the proposed action, and reasonable alternatives (as well as the ☐ no-action alternative).^[136] For example, an agency considering a proposed development of transportation infrastructure on a coastal barrier island should consider climate change effects on the environment and, as applicable, consequences of rebuilding where sea level rise and more intense storms will shorten the projected life of the project and change its effects on the environment.^[137]

Agencies should integrate the NEPA review process with the agency's planning, siting, and design efforts at the earliest possible time that would allow for a meaningful analysis.^[138] Agencies may incorporate information developed during early planning processes that precede a NEPA review into the NEPA review.

Decades of NEPA practice have shown that integrating environmental considerations with the planning processes provides useful information that program and project planners can consider in designing the proposed action, alternatives, and potential mitigation measures.

Agencies also may consider co-benefits of the proposed action, alternatives, and potential mitigation measures for human health, economic and social stability, ecosystem services, or other benefits that increase climate change preparedness or resilience. Individual agency adaptation plans and interagency adaptation strategies, such as agency Climate Adaptation Plans, the National Fish, Wildlife and Plants Climate Adaptation Strategy, and the National Action Plan: Priorities for Managing Freshwater Resources in a Changing Climate, provide other good examples of the type of relevant and useful information that agencies can consider.^[139]

Considering the effects of climate change on a proposed action, and reasonable alternatives (as well as the no-action alternative), also helps to develop potential mitigation measures to reduce climate risks and promote resilience and adaptation. Where the analysis identifies climate-related risks to a proposed action or to the area affected by the proposed action, the agency should consider possible resilience and adaptation measures—including measures consistent with State, Tribal, or local adaptation plans—that could be employed to manage those effects. For example, where one or more climate effects could impair the operation of the proposed action, the agency should identify possible adaptation measures to enhance the action's climate resilience. The agency should indicate whether the proposed action includes measures to adapt to climate change and, if so, describe those measures and the climate projections that informed them. The agency also should consider whether any potential measures undertaken to address a proposed action's climate risk could result in any undesirable or unintended consequences.^[140]

In addition, agencies should consider their ongoing efforts to incorporate environmental justice principles into their programs, policies, actions, and activities, including the environmental justice strategies required by Executive Orders 12898 and 14008, and consider whether the effects of climate change in association with the effects of the proposed action may result in disproportionately high and adverse effects on communities with environmental justice concerns, which often include communities of color, low-income communities, and Tribal Nations and Indigenous communities, in the area affected by the proposed action.^[141] Federal agencies should identify any communities with environmental justice concerns, including communities of color, low-income communities, and Tribal Nations and Indigenous communities, impacted by the proposed action, and consider how impacts from the proposed action could potentially amplify climate change-related hazards such as storm surge, heat waves, drought, flooding, and sea level change.^[142] Moreover, Executive Order 13985 (/executive-order/13985) calls for an all-of-government approach to advancing equity for underserved populations, including rural communities and persons with disabilities. Agencies should meaningfully engage with affected communities regarding their proposed actions and consider the effects of climate change on vulnerable communities in designing the action or selection of alternatives, including alternatives that can reduce disproportionate effects on such communities. For example, chemical facilities located near the coastline could have increased risk of spills or leaks due to sea level rise or increased storm surges, putting local communities and environmental resources at greater risk. Increased resilience could minimize such potential future effects. Finally, considering climate change preparedness and resilience can help ensure that agencies evaluate the potential for generating additional GHGs if a project has to be replaced, repaired, or modified, and minimize the risk of expending additional time and funds in the future.

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VI. Traditional NEPA Tools and Practices

A. Scoping and Framing the NEPA Review

Scoping helps agencies integrate decision making, avoid duplication, and focus NEPA reviews.^[143] In scoping, the agency determines the issues that the NEPA review will address and identifies the effects related to the proposed action that the analysis will consider.^[144] An agency can use the scoping process to help it determine whether analysis is relevant and, if so, the extent of analysis appropriate for a proposed action.^[145] When scoping for the climate change issues associated with the proposed action, and reasonable alternatives

(as well as the no-action alternative), the nature, location, timeframe, and type of the proposed action and the extent of its effects will help determine the degree to which to consider climate projections, including whether climate change considerations warrant emphasis, detailed analysis, and disclosure.^[146]

Consistent with this guidance, agencies may develop their own agency-specific practices and guidance for framing NEPA reviews. Grounded in the principles of proportionality and the rule of reason, such practices and guidance can help an agency determine the extent to which it should explore climate change effects in its decision-making processes and will assist in the analysis of the no action and proposed alternatives and mitigation.^[147] The agency should explain such a framing process and its application to the proposed action to the decision makers and the public during the NEPA review and in the EA or EIS document.

B. Incorporation by Reference

Agencies should consider using incorporation by reference in considering GHG emissions or where an agency is considering the implications of climate change for the proposed action and its environmental effects. The NEPA review for a specific action can incorporate by reference earlier programmatic studies or information such as management plans, inventories, assessments, and research, as well as any relevant programmatic or other NEPA reviews.^[148] Agencies should identify situations where prior studies or NEPA analyses are likely to cover emissions or adaptation issues, in whole or in part, and incorporate them by reference in NEPA documents (including tiered NEPA documents) where appropriate. Agencies should confirm that prior studies or programmatic documents were conducted within a reasonable timeframe of the proposed action under consideration such that underlying assumptions are still applicable. Incorporation by reference may be helpful when larger scale analyses have considered climate change effects and GHG emissions, and calculating GHG emissions for a specific action would provide only limited information beyond the information already collected and considered in the larger scale analyses.

Agencies should use the scoping process to consider whether they should incorporate by reference GHG analyses from other programmatic studies, action specific NEPA reviews, or programmatic NEPA reviews to avoid duplication of effort. Furthermore, agencies should engage other agencies and stakeholders with knowledge of related actions to participate in the scoping process to identify relevant GHG and adaptation analyses from other actions or programmatic NEPA documents. In addition, agencies are encouraged to use searchable databases, websites, GIS tools, and other technology to share NEPA reviews with relevant agencies, stakeholders, and the public.

C. Programmatic or Broad-Based Studies and NEPA Reviews

In the context of long-range energy, transportation, resource management, or similar programs or strategies, an agency may decide that it would be useful and efficient to provide an aggregate analysis of GHG emissions or climate change effects in a programmatic analysis and then incorporate it by reference into future NEPA reviews. These broad analyses may occur through programmatic NEPA documents, or they may occur through other processes by which agencies conduct analyses or studies at the national or other broad scale level (*e.g.*, landscape, regional, or watershed) to assess the status of one or more resources or to determine trends in changing environmental conditions.^[149] In appropriate circumstances, agencies may rely on programmatic analyses to make project-level NEPA reviews more efficient by evaluating and analyzing effects at an earlier stage and at a broader level than project-specific actions. Agencies also can use programmatic analysis to analyze emissions from related activities in a given region or sector, or to serve as benchmark against which agencies can measure site-specific actions.^[150]

A tiered, analytical decision-making approach using a programmatic NEPA review is used for many types of Federal actions and can be particularly relevant to addressing proposed land, aquatic, and other resource management plans. Under such an approach, an agency conducts a broad-scale programmatic NEPA analysis for decisions such as establishing or revising the USDA Forest Service land management plans, Bureau of Land Management resource management plans, or Natural Resources Conservation Service conservation programs. Subsequent NEPA analyses for proposed site-specific decisions—such as proposed actions that are consistent with land, aquatic, and other resource management plans—may be tiered from the broader programmatic analysis, drawing upon its basic framework analysis to avoid repeating analytical

efforts for each tiered decision. Examples of project- or site-specific actions that may benefit from being able to tier to a programmatic NEPA review include: siting and constructing transmission lines; siting and constructing wind, solar or geothermal projects; conducting wildfire risk reduction activities such as prescribed burns or hazardous fuels reduction; approving grazing leases; granting rights-of-way; and approving site-specific resilience or climate adaptation actions.

A programmatic NEPA review also may serve as an efficient mechanism in which to assess Federal agency efforts to adopt broad-scale sustainable practices for energy efficiency, GHG emissions avoidance and emissions reduction measures, petroleum product use reduction, and renewable energy use, as well as other sustainability practices.^[151] While broad department- or agency-wide goals may be of a far larger scale than a particular program, policy, or proposed action, an analysis that informs how a particular action affects that broader goal can be of value.

D. Using Available Information

Agencies should make decisions using current scientific information and methodologies. CEQ does not necessarily expect agencies to fund and conduct original climate change research to support their NEPA analyses or for agencies to require project proponents to do so. Agencies should exercise their discretion to select and use the tools, methodologies, and scientific and research information that are of high quality and available to assess relevant effects, alternatives, and mitigation.^[152]

E. Environmental Justice Considerations

Numerous studies have found that environmental hazards (including those driven by climate change) are more prevalent in and pose particular risks to areas where people of color and low-income populations represent a higher fraction of the population compared with the general population.^[153] The NEPA process calls for identifying potential environmental justice-related issues and meaningfully engaging with communities that proposed actions and reasonable alternatives (as well as the no-action alternative) may affect.

Agencies should be aware of the ongoing efforts to address the effects of climate change on human health and vulnerable communities.^[154] Certain groups, including children, the elderly, communities with environmental justice concerns, which often include communities of color, low-income communities, Tribal Nations and Indigenous communities, and underserved communities are more vulnerable to climate-related health effects and may face barriers to engaging on issues that disproportionately affect them. CEQ recommends that agencies regularly engage environmental justice experts and leverage the expertise of the White House Environmental Justice Interagency Council^[155] to identify approaches to avoid or minimize adverse effects on communities of color and low-income communities.^[156]

When assessing environmental justice considerations in NEPA analyses, agencies should use the scoping process to identify potentially affected communities and provide early notice of opportunities for public engagement. This is important for all members of the public and stakeholders, but especially for communities of color and low-income communities, including those who have suffered disproportionate public health or environmental harms and those who are at increased risk for climate change-related harms. Agencies should engage such communities early in the scoping and project planning process to understand any unique climate-related risks and concerns. Agencies also should use the NEPA process to identify and analyze reasonably foreseeable effects, reasonable alternatives, and measures to avoid or minimize any such effects.

F. Monetizing Costs and Benefits

NEPA does not require a cost-benefit analysis where all monetized benefits and costs are directly compared. In a NEPA review, the weighing of the merits and drawbacks of the various alternatives need not be displayed using a monetary cost-benefit analysis and should not be when there are important qualitative considerations.^[157] Using the SC-GHG to provide an estimate of the cost to society from GHG emissions—or otherwise monetizing discrete costs or benefits of a proposed Federal action—does not necessitate conducting a benefit-cost analysis in NEPA documents. As described in Section IV(B), the SC-GHG estimates

are useful information disclosure metrics that can help decision makers and the public understand and contextualize GHG emissions and climate damages. Agencies can use the SC-GHG to provide information on climate impacts even if other costs and benefits cannot be quantified or monetized.

If an agency determines that a monetary cost-benefit analysis is appropriate and relevant to the choice among different alternatives the agency is considering, the agency may include the analysis in or append it to the NEPA document, or incorporate it by reference ^[158] as an aid in evaluating the environmental consequences. For example, a rulemaking could have useful information for the NEPA review in an associated regulatory impact analysis, which the agency could incorporate by reference in a NEPA document. ^[159]

When using a monetary cost-benefit analysis, just as with tools to quantify emissions, an agency should disclose the assumptions, alternative inputs, and □ levels of uncertainty associated with such analysis. Finally, if an agency chooses to monetize some but not all effects of an action, the agency providing this additional information should explain its rationale for doing so. ^[160]

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VII. Conclusions and Effective Date

Agencies should use this guidance to inform the NEPA review for all new proposed actions. Agencies should exercise judgment when considering whether to apply this guidance to the extent practicable to an on-going NEPA process. CEQ does not expect agencies to apply this guidance to concluded NEPA reviews and actions for which a final EIS or EA has been issued. Agencies should consider applying this guidance to actions in the EIS or EA preparation stage if this would inform the consideration of alternatives or help address comments raised through the public comment process.

Dated: January 4, 2023.

Brenda Mallory,

Chair.

Footnotes

1. For purposes of this guidance, CEQ defines GHGs consistent with CEQ's Federal Greenhouse Gas Accounting and Reporting Guidance (Jan. 17, 2016), https://www.sustainability.gov/pdfs/federal_ghg%20accounting_reporting-guidance.pdf (https://www.sustainability.gov/pdfs/federal_ghg%20accounting_reporting-guidance.pdf) (carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, nitrogen trifluoride, and sulfur hexafluoride). Also, for purposes of this guidance, "emissions" includes release of stored GHGs as a result of land management activities affecting terrestrial GHG pools such as carbon stocks in forests and soils, as well as actions that affect the future changes in carbon stocks. To facilitate comparisons between emissions of the different GHGs, a common unit of measurement for GHGs is metric tons of CO₂ equivalent (mt CO₂ - e).

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2. 42 U.S.C. 4321 (<https://www.govinfo.gov/link/uscode/42/4321>) et seq.

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3. 40 CFR parts 1500-1508 (<https://www.ecfr.gov/current/title-40/part-1500>).

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4. This guidance is not a rule or regulation, and the recommendations it contains may not apply to a particular situation based upon the individual facts and circumstances. This guidance does not change or substitute for any law, regulation, or other legally binding requirement, and is not legally enforceable. The use of non-mandatory language such as "guidance," "recommend," "may," "should," and "can," describes CEQ policies and recommendations. The use of mandatory terminology such as "must" and "required" describes controlling requirements under the terms of NEPA and the CEQ regulations, but this document does not affect legally binding requirements.

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5. NEPA recognizes “the profound impact of man’s activity on the interrelations of all components of the natural environment . . .” 42 U.S.C. 4331(a) (<https://www.govinfo.gov/link/uscode/42/4331>). Among other things, it was enacted to promote efforts that will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of humans. 42 U.S.C. 4321 (<https://www.govinfo.gov/link/uscode/42/4321>). See also 42 U.S.C. 4332(2)(F) (<https://www.govinfo.gov/link/uscode/42/4332>) (requiring all Federal agencies to “recognize the worldwide and long-range character of environmental problems”).

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6. See 42 U.S.C. 4332(2)(A) (<https://www.govinfo.gov/link/uscode/42/4332>) (directing agencies to ensure the use of “the environmental design arts” in planning and decision making).

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7. See White House Fact Sheet, *President Biden Sets 2030 Greenhouse Gas Pollution Reduction Target* (Apr. 22, 2021), <https://www.whitehouse.gov/briefing-room/statements-releases/2021/04/22/fact-sheet-president-biden-sets-2030-greenhouse-gas-pollution-reduction-target-aimed-at-creating-good-paying-union-jobs-and-securing-u-s-leadership-on-clean-energy-technologies/> (<https://www.whitehouse.gov/briefing-room/statements-releases/2021/04/22/fact-sheet-president-biden-sets-2030-greenhouse-gas-pollution-reduction-target-aimed-at-creating-good-paying-union-jobs-and-securing-u-s-leadership-on-clean-energy-technologies/>); see also Executive Order (E.O.) 14008, *Tackling the Climate Crisis at Home and Abroad*, 86 FR 7619 (/citation/86-FR-7619) (Jan. 25, 2021), <https://www.federalregister.gov/d/2021-02177> (<https://www.federalregister.gov/d/2021-02177>); E.O. 14057 (/executive-order/14057), *Catalyzing Clean Energy Industries and Jobs Through Federal Sustainability*, 86 FR 70935 (/citation/86-FR-70935) (Dec. 13, 2021), <https://www.federalregister.gov/d/2021-27114> (<https://www.federalregister.gov/d/2021-27114>).

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8. The term “NEPA review” as used in this guidance includes the analysis, process, and documentation required under NEPA. While this document focuses on reviews conducted pursuant to NEPA, agencies should analyze GHG emissions and climate-resilient design issues early in the planning and development of proposed actions and projects under their substantive authorities.

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9. For example, the United States has set an economy-wide target of reducing its net GHG emissions by 50 to 52 percent below 2005 levels in 2030. See United Nations Framework Convention on Climate Change (UNFCCC), *U.S. Nationally Determined Contribution* (Apr. 20, 2021), <https://unfccc.int/NDCREG> (<https://unfccc.int/NDCREG>).

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10. Resilience is a priority for Federal agency actions. See, e.g., E.O. 14057 (/executive-order/14057), *supra* note 7; see also E.O. 14008 (/executive-order/14008), *supra* note 7.

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11. See, e.g., Nat’l Intel. Council, *Implications for U.S. National Security of Anticipated Climate Change* (Sept. 21, 2016), NIC WP 2016-01, https://www.dni.gov/files/documents/Newsroom/Reports%20and%20Pubs/Implications_for_US_National_Security_of_Anticipated_Climate_Change.pdf (https://www.dni.gov/files/documents/Newsroom/Reports%20and%20Pubs/Implications_for_US_National_Security_of_Anticipated_Climate_Change.pdf); see also Dep’t of Def., *Directive 4715.21, Climate Change Adaptation and Resilience* (Jan. 14, 2016), <https://dod.defense.gov/Portals/1/Documents/pubs/471521p.pdf> (<https://dod.defense.gov/Portals/1/Documents/pubs/471521p.pdf>).

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12. See 42 U.S.C. 4332(2)(F) (<https://www.govinfo.gov/link/uscode/42/4332>) (requiring all Federal agencies to “recognize the worldwide and long-range character of environmental problems”).

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13. *Infrastructure Investment and Jobs Act*, Public Law 117-58 (<https://www.govinfo.gov/link/plaw/117/public/58>), 135 Stat. 429.

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14. *Public Law 117-169* (<https://www.govinfo.gov/link/plaw/117/public/169>), 136 Stat. 1818.

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15. CEQ is issuing this guidance as interim guidance so that agencies may make use of it immediately while CEQ seeks public comment on the guidance. CEQ may revise the guidance in response to public comments or finalize the interim guidance at a later date.

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16. CEQ, *Final Guidance for Federal Departments and Agencies on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in National Environmental Policy Act Reviews*, 81 FR 51866 (/citation/81-FR-51866) (Aug. 8, 2016), https://ceq.doe.gov/docs/ceq-regulations-and-guidance/nepa_final_ghg_guidance.pdf (https://ceq.doe.gov/docs/ceq-regulations-and-guidance/nepa_final_ghg_guidance.pdf). On April 5, 2017, CEQ withdrew the final 2016 guidance, as directed by E.O. 13783 (/executive-order/13783). 82 FR 16576 (/citation/82-FR-16576) (Apr. 5, 2017). On June 26, 2019, CEQ issued draft GHG guidance. 84 FR 30097 (/citation/84-FR-30097) (June 26, 2019). CEQ rescinded this draft guidance on February 19, 2021, pursuant to E.O. 13990 (/executive-order/13990). 86 FR 10252 (/citation/86-FR-10252) (Feb. 19, 2021). In addition, on April 20, 2022, CEQ issued a Final Rule for its “Phase 1” NEPA rulemaking. 87 FR 23453 (/citation/87-FR-23453). CEQ will be proceeding with updates to the NEPA regulations as set forth in the 2022 Regulatory Agenda.

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17. See 40 CFR 1507.3 (<https://www.ecfr.gov/current/title-40/section-1507.3>). Agencies should review their policies and implementing procedures and revise them as necessary to ensure compliance with NEPA. Agency NEPA implementing procedures can be, but are not required to be, in the form of regulation. Section 1507.3 encourages agencies to publish explanatory guidance, and agencies also should consider whether any updates to explanatory guidance are necessary in light of this guidance.

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18. See *infra* section IV(I).

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19. This updated guidance is also consistent with E.O.s 13990, 14008, and 14057, which set forth commitments to address climate change; direct that Federal infrastructure investment reduce climate pollution; and that Federal permitting decisions consider the effects of GHG emissions and climate change. See E.O. 13990 (/executive-order/13990), 86 FR 7037 (/citation/86-FR-7037) (Jan. 25, 2021); E.O. 14008 (/executive-order/14008), *supra* note 7; E.O. 14057 (/executive-order/14057), *supra* note 7.

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20. Notwithstanding this focus, where appropriate, agencies also should apply this guidance to consider climate impacts and GHG emissions in establishing new categorical exclusions (CEs) and extraordinary circumstances in their agency NEPA procedures. See 40 CFR 1507.3(e)(2)(ii) ([https://www.ecfr.gov/current/title-40/section-1507.3#p-1507.3\(e\)\(2\)\(ii\)](https://www.ecfr.gov/current/title-40/section-1507.3#p-1507.3(e)(2)(ii))); CEQ, *Final Guidance for Federal Departments and Agencies on Establishing, Applying, and Revising Categorical Exclusions Under the National Environmental Policy Act*, 75 FR 75628 (/citation/75-FR-75628) (Dec. 6, 2010).

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21. See 40 CFR 1508.1(q) ([https://www.ecfr.gov/current/title-40/section-1508.1#p-1508.1\(q\)](https://www.ecfr.gov/current/title-40/section-1508.1#p-1508.1(q))).

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22. 42 U.S.C. 4331(a) (<https://www.govinfo.gov/link/uscode/42/4331>) (“[R]ecognizing the profound impact of [human] activity on the interrelations of all components of the natural environment . . .”).

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23. 40 CFR 1501.9(e)(2) ([https://www.ecfr.gov/current/title-40/section-1501.9#p-1501.9\(e\)\(2\)](https://www.ecfr.gov/current/title-40/section-1501.9#p-1501.9(e)(2))) (“Alternatives, which include the no action alternative; other reasonable courses of action; and mitigation measures (not in the proposed action).”).

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24. See 42 U.S.C. 4332 (<https://www.govinfo.gov/link/uscode/42/4332>) and 40 CFR 1501.2 (<https://www.ecfr.gov/current/title-40/section-1501.2>).

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25. See 40 CFR 1502.23 (<https://www.ecfr.gov/current/title-40/section-1502.23>) (methodology and scientific accuracy).

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26. 40 CFR 1505.2(a)(3) ([https://www.ecfr.gov/current/title-40/section-1505.2#p-1505.2\(a\)\(3\)](https://www.ecfr.gov/current/title-40/section-1505.2#p-1505.2(a)(3))).

27. 40 CFR 1500.1(a) ([https://www.ecfr.gov/current/title-40/section-1500.1#p-1500.1\(a\)](https://www.ecfr.gov/current/title-40/section-1500.1#p-1500.1(a))) (“NEPA’s purpose is . . . to provide for informed decision making and foster excellent action.”).

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28. See, e.g., Intergovernmental Panel on Climate Change (IPCC), *Climate Change 2021: The Physical Science Basis* (“The Physical Science Basis”), Summary for Policymakers, SPM-5 (Aug. 7, 2021), <https://www.ipcc.ch/report/ar6/wg1/chapter/summary-for-policymakers/> (<https://www.ipcc.ch/report/ar6/wg1/chapter/summary-for-policymakers/>) (“Observed increases in well-mixed greenhouse gas (GHG) concentrations since around 1750 are unequivocally caused by human activities”); see also id., Technical Summary, TS-45, <https://www.ipcc.ch/report/ar6/wg1/chapter/technical-summary/> (<https://www.ipcc.ch/report/ar6/wg1/chapter/technical-summary/>); United States Global Change Research Program (“USGCRP”), Fourth National Climate Assessment (“Fourth National Climate Assessment”), Volume II: Impacts, Risks, and Adaptation in the United States, 76 (2018), <https://nca2018.globalchange.gov/> (<https://nca2018.globalchange.gov/>) (“Many lines of evidence demonstrate that human activities, especially emissions of greenhouse gases from fossil fuel combustion, deforestation, and land-use change, are primarily responsible for the climate changes observed in the industrial era, especially over the last six decades”); IPCC, *Climate Change 2014 Synthesis Report*, 46 (2014), https://www.ipcc.ch/site/assets/uploads/2018/05/SYR_AR5_FINAL_full_wcover.pdf (https://www.ipcc.ch/site/assets/uploads/2018/05/SYR_AR5_FINAL_full_wcover.pdf) (“Emissions of CO₂ from fossil fuel combustion and industrial processes contributed about 78% of the total GHG emissions increase from 1970 to 2010, with a similar percentage contribution for the increase during the period 2000 to 2010 (high confidence).”). These conclusions are built upon a robust scientific record that has been created with substantial contributions from the USGCRP, which informs the United States’ response to global climate change through coordinated Federal programs of research, education, communication, and decision support. See section 103, Public Law 101-606, 104 Stat. 3096. For additional information on the USGCRP, visit <http://www.globalchange.gov> (<http://www.globalchange.gov>). The USGCRP, formerly the Climate Change Science Program, coordinates and integrates the activities of 13 Federal agencies that conduct research on changes in the global environment and their implications for society. The USGCRP began as a Presidential initiative in 1989 and was codified in the Global Change Research Act of 1990 (Pub. L. 101-606). USGCRP-participating agencies are the Departments of Agriculture, Commerce, Defense, Energy, the Interior, Health and Human Services, State, and Transportation; the U.S. Agency for International Development, the Environmental Protection Agency, NASA, the National Science Foundation, and the Smithsonian Institution.

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29. See CEQ, *Environmental Quality: The First Annual Report*, 93 (Aug. 1970), https://ceq.doe.gov/ceq-reports/annual_environmental_quality_reports.html (https://ceq.doe.gov/ceq-reports/annual_environmental_quality_reports.html).

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30. See USGCRP, *Climate Change Impacts in the United States: The Third National Climate Assessment*, Appendix 3: Climate Science Supplement, 739 (J.M. Melillo et al. eds., 2014) (“Third National Climate Assessment”), U.S. Env’t Protection Agency (EPA), EPA 430-R-15-004, *Inventory of U.S. Greenhouse Gas Emissions and Sinks, 1990-2013* (Apr. 2015), <https://www.epa.gov/sites/default/files/2015-12/documents/us-ghg-inventory-2015-main-text.pdf> (<https://www.epa.gov/sites/default/files/2015-12/documents/us-ghg-inventory-2015-main-text.pdf>); see also D.L. Hartmann et al., *Observations: Atmosphere and Surface*, in *Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* (T.F. Stocker et al. eds., Cambridge Univ. Press 2013), https://archive.ipcc.ch/pdf/assessment-report/ar5/wg1/WG1AR5_Chapter02_FINAL.pdf (https://archive.ipcc.ch/pdf/assessment-report/ar5/wg1/WG1AR5_Chapter02_FINAL.pdf).

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31. Nat’l Oceanic and Atmospheric Admin. (NOAA), *Climate Change: Atmospheric Carbon Dioxide* (June 23, 2022), <https://www.climate.gov/news-features/understanding-climate/climate-change-atmospheric-carbon-dioxide> (<https://www.climate.gov/news-features/understanding-climate/climate-change-atmospheric-carbon-dioxide>).

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32. Although there are different ways to weight methane compared to carbon dioxide, the U.S. nationally determined contribution (NDC) under the Paris Agreement uses the 100-year GWP from the IPCC's Fifth Assessment Report. See IPCC, *Climate Change 2014 Synthesis Report*, supra note 28, at 5. To avoid potential ambiguity, CEQ encourages agencies to use the 100-year GWP when disclosing the GHG emissions impact from an action in their NEPA documents.

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33. See EPA, *Proposed Rule on Standards of Performance for New, Reconstructed, and Modified Sources and Emissions Guidelines for Existing Sources: Oil and Natural Gas Sector Climate Review*, 86 FR 63110 (/citation/86-FR-63110), 63114 (/citation/86-FR-63114) (Nov. 15, 2021), <https://www.federalregister.gov/d/2021-24202> (<https://www.federalregister.gov/d/2021-24202>); see also Climate and Clean Air Coalition and United Nations Environment Programme (UNEP), *Global Methane Assessment*, 18 (2021), <https://www.ccacoalition.org/en/resources/global-methane-assessment-full-report> (<https://www.ccacoalition.org/en/resources/global-methane-assessment-full-report>); USGCRP, *Fourth National Climate Assessment*, supra note 28, Volume I, 82. Methane emissions are responsible for about 20 percent of climate forcing globally. See California Air Resources Board, *Short-Lived Climate Pollutant Reduction Strategy*, 7 (Mar. 2017), https://ww2.arb.ca.gov/sites/default/files/2020-07/final_SLCP_strategy.pdf (https://ww2.arb.ca.gov/sites/default/files/2020-07/final_SLCP_strategy.pdf).

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34. See, e.g., NOAA, *Increase in atmospheric methane set another record during 2021* (Apr. 7, 2022), <https://www.noaa.gov/news-release/increase-in-atmospheric-methane-set-another-record-during-2021> (<https://www.noaa.gov/news-release/increase-in-atmospheric-methane-set-another-record-during-2021>).

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35. See USGCRP, *Fourth National Climate Assessment*, supra note 28, Volume I, 81 (Figure 2.5).

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36. See Nat'l Aeronautics and Space Admin. (NASA) Earth Observatory, *The Carbon Cycle* (June 16, 2011), <http://earthobservatory.nasa.gov/Features/CarbonCycle> (<http://earthobservatory.nasa.gov/Features/CarbonCycle>); Univ. of Cal. Riverside, NASA, and Riverside Unified School District, *Down to Earth Climate Change*, <http://globalclimate.ucr.edu/resources.html> (<http://globalclimate.ucr.edu/resources.html>); USGCRP, *Fourth National Climate Assessment*, supra note 28, Volume II, 1454.

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37. See IPCC, *Climate Change 2022: Impacts, Adaptation, and Vulnerability* ("Climate Change 2022"), Summary for Policymakers, 8 (H.-O. Pörtner et al. eds., 2022), <https://www.ipcc.ch/report/sixth-assessment-report-working-group-ii/> (<https://www.ipcc.ch/report/sixth-assessment-report-working-group-ii/>); USGCRP, *Fourth National Climate Assessment*, supra note 28, Climate Science Special Report, Chapter 7, 207, https://science2017.globalchange.gov/downloads/CSSR_Ch7_Precipitation.pdf (https://science2017.globalchange.gov/downloads/CSSR_Ch7_Precipitation.pdf); NOAA, *Climate Change Increased Chances of Record Rains in Louisiana by at Least 40 Percent* (Sept. 7, 2016), <https://www.noaa.gov/media-release/climate-change-increased-chances-of-record-rains-in-louisiana-by-at-least-40-percent> (<https://www.noaa.gov/media-release/climate-change-increased-chances-of-record-rains-in-louisiana-by-at-least-40-percent>).

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38. See USGCRP, *Fourth National Climate Assessment*, supra note 28; IPCC, *Special Report on the Ocean and Cryosphere in a Changing Climate*, (H.-O. Portner et al., eds., 2019), <https://www.ipcc.ch/srocc/> (<https://www.ipcc.ch/srocc/>); IPCC, *Special Report on Climate Change and Land*, (P.R. Shukla et al., eds., 2019), <https://www.ipcc.ch/srccl/> (<https://www.ipcc.ch/srccl/>); see also USGCRP, <http://www.globalchange.gov> (<http://www.globalchange.gov>); 40 CFR 1508.1(g)(4) ([https://www.ecfr.gov/current/title-40/section-1508.1#p-1508.1\(g\)\(4\)](https://www.ecfr.gov/current/title-40/section-1508.1#p-1508.1(g)(4))) ("effects include 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" effects); USGCRP, *The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment* (2016), <https://health2016.globalchange.gov/> (<https://health2016.globalchange.gov/>).

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39. See generally *EPA, Endangerment and Cause or Contribute Findings for Greenhouse Gases Under Section 202(a) of the Clean Air Act; Final Rule*, 74 FR 66496 (/citation/74-FR-66496) (Dec. 15, 2009) (noting, for example, “[t]he evidence concerning how human-induced climate change may alter extreme weather events also clearly supports a finding of endangerment, given the serious adverse impacts that can result from such events and the increase in risk, even if small, of the occurrence and intensity of events such as hurricanes and floods. Additionally, public health is expected to be adversely affected by an increase in the severity of coastal storm events due to rising sea levels,” *id.* at 66497-98).

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40. See *EPA, Final Rule for Phasedown of Hydrofluorocarbons: Establishing the Allowance Allocation and Trading Program Under the American Innovation and Manufacturing Act*, 86 FR 55124 (/citation/86-FR-55124) (Oct. 5, 2021), <https://www.federalregister.gov/d/2021-21030> (<https://www.federalregister.gov/d/2021-21030>).

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41. See *EPA, Final Rule for Carbon Pollution Emission Guidelines for Existing Stationary Sources Electric Utility Generating Units*, 80 FR 64661 (/citation/80-FR-64661), 64647 (/citation/80-FR-64647) (Oct. 23, 2015), <https://www.federalregister.gov/d/2015-22842> (<https://www.federalregister.gov/d/2015-22842>) (“[c]ertain groups, including children, the elderly, and the poor, are most vulnerable to climate-related effects.” Recent studies also find that certain communities, including low-income communities and some communities of color . . . are disproportionately affected by certain climate change related impacts—including heat waves, degraded air quality, and extreme weather events—which are associated with increased deaths, illnesses, and economic challenges. Studies also find that climate change poses particular threats to the health, well-being, and ways of life of indigenous peoples in the U.S.); see also *EPA, EPA 430-R-21-003, Climate Change and Social Vulnerability in the United States: A Focus on Six Impacts (“Six Impacts”)* (Sept. 2021), https://www.epa.gov/system/files/documents/2021-09/climate-vulnerability_september-2021_508.pdf (https://www.epa.gov/system/files/documents/2021-09/climate-vulnerability_september-2021_508.pdf).

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42. See 80 FR 64647 (/citation/80-FR-64647), *supra* note 41; see also USGCRP, *Fourth National Climate Assessment*, *supra* note 28, Volume II, Chapters 2-12 (Sectors) and Chapters 18-27 (Regions); Thomas R. Knutson et. al., *Global Projections of Intense Tropical Cyclone Activity for the Late Twenty-First Century from Dynamical Downscaling of CMIP5/RCP4.5 Scenarios*, 7221 (Sep. 15, 2015), <https://journals.ametsoc.org/view/journals/clim/28/18/jcli-d-15-0129.1.xml> (<https://journals.ametsoc.org/view/journals/clim/28/18/jcli-d-15-0129.1.xml>); Ashley E. Payne et. al., *Responses and Impacts of Atmospheric Rivers to Climate Change*, 143, 154 (Mar. 9, 2020), <https://www.nature.com/articles/s43017-020-0030-5> (<https://www.nature.com/articles/s43017-020-0030-5>); IPCC, *Climate Change 2022*, *supra* note 37; IPCC, *Special Report on Climate Change and Land*, *supra* note 38, at 270-72; U.S. Nat’l Park Service (NPS), *Wildlife and Climate Change* (last updated Dec. 8, 2021), <https://www.nps.gov/articles/000/wildlife-climateimpact.htm> (<https://www.nps.gov/articles/000/wildlife-climateimpact.htm>).

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43. See IPCC, *Climate Change 2022*, *supra* note 37, Summary for Policymakers.

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44. See, e.g., *EPA, Six Impacts*, *supra* note 41.

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45. See 40 CFR 1502.16 (<https://www.ecfr.gov/current/title-40/section-1502.16>).

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46. Some sources emit GHGs in quantities that are orders of magnitude greater than others. See *EPA, Greenhouse Gas Reporting Program, 2021 Reported Data, Figure 1: Direct GHG Emissions Reported by Sector (2021)*, <https://www.epa.gov/ghgreporting/ghgrp-reported-data> (<https://www.epa.gov/ghgreporting/ghgrp-reported-data>) (showing amounts of GHG emissions by sector).

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47. In addition to NEPA’s requirement to describe the environmental impacts of the proposed action and any adverse environmental effects that cannot be avoided should the proposal be implemented, 42 U.S.C. 4332(2)(C) (<https://www.govinfo.gov/link/uscode/42/4332>)), NEPA also articulates a policy to use all

practicable means and measures “to foster and promote the general welfare, to create and maintain conditions under which [humans] and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans,” including by “attain[ing] the widest range of beneficial uses of the environment without degradation, risk to health or safety, or other undesirable and unintended consequences.” 42 U.S.C. 4331(a)-(b) (<https://www.govinfo.gov/link/uscode/42/4331>).

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48. See 40 CFR 1502.23 (<https://www.ecfr.gov/current/title-40/section-1502.23>) (requiring agencies to ensure the professional and scientific integrity of the discussions and analyses in environmental impact statements).

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49. Note that agencies should be guided by a rule of reason and the concept of proportionality in undertaking this analysis, particularly for proposed actions with net beneficial climate effects, as described in Section IV(A).

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50. See, e.g., *Sierra Club v. Fed. Energy Regul. Comm’n*, 867 F.3d 1357, 1374 (D.C. Cir. 2017); *San Juan Citizens Alliance v. Bureau of Land Mgmt.*, 326 F. Supp. 3d 1227, 1241-44 (D.N.M. 2018); see generally *Scientists’ Inst. for Pub. Info., Inc. v. Atomic Energy Comm’n*, 481 F.2d 1079, 1092 (D.C. Cir 1973) (“Reasonable forecasting and speculation is thus implicit in NEPA, and we must reject any attempt by agencies to shirk their responsibilities under NEPA by labeling any and all discussion of future environmental effects as ‘crystal ball inquiry.’”).

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51. This is typically expressed in metric tons of CO₂ equivalent, or mt CO₂ -e.

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52. As discussed above, methane is a potent GHG. See *supra* note 32.

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53. Net emissions can be calculated by totaling gross emissions (all reasonably foreseeable direct and indirect GHG emissions from the proposed action) and subtracting any gross emissions reductions from the proposed action, such as renewable energy generation that will displace more carbon intensive energy sources or the addition of carbon sinks. The resulting net value may be either a net increase in total GHG emissions or a net decrease in emissions. In rare circumstances, agencies should consider whether a significant delay between increased emissions and decreased emissions could undermine the value of a net emissions calculation as a metric of climate impact.

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54. See *infra* section IV(D).

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55. For example, certain types of actions may involve construction emissions in their first year or two, followed by operational emissions increases in a few years prior to achieving net emissions reductions in later years.

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56. See CEQ, GHG Tools and Resources, <https://ceq.doe.gov/guidance/ghg-tools-and-resources.html> (<https://ceq.doe.gov/guidance/ghg-tools-and-resources.html>).

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57. Carbon sequestration is the long-term carbon storage in plants, soils, geologic formations, and oceans.

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58. For example, the U.S. Department of Agriculture’s (USDA’s) Forest Inventory and Analysis tool can be used to assess the carbon sequestration of existing forestry activities along with the reduction in carbon sequestration (emissions) of project-level activities. See USDA, Forest Inventory Data & Tools (FIA), <https://www.fs.usda.gov/research/products/dataandtools/forestinventorydata> (<https://www.fs.usda.gov/research/products/dataandtools/forestinventorydata>).

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59. See 40 CFR 1502.21 (<https://www.ecfr.gov/current/title-40/section-1502.21>).

60. See 40 CFR 1502.2(b) ([https://www.ecfr.gov/current/title-40/section-1502.2#p-1502.2\(b\)](https://www.ecfr.gov/current/title-40/section-1502.2#p-1502.2(b))) (environmental impact statements shall discuss impacts in proportion to their significance); 40 CFR 1502.15 (<https://www.ecfr.gov/current/title-40/section-1502.15>) (data and analyses in a statement shall be commensurate with the importance of the impact).

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61. The SC-GHG estimates provide an aggregated monetary measure (in U.S. dollars) of the future stream of damages associated with an incremental metric ton of emissions and associated physical damages (e.g., temperature increase, sea-level rise, infrastructure damage, human health effects) in a particular year. The “Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide Interim Estimates under Executive Order 13990 (/executive-order/13990)” released by the Interagency Working Group on Social Cost of Greenhouse Gases (IWG SC-GHG) in February 2021 presents interim estimates of the social cost of carbon, methane, and nitrous oxide, which are the same as those developed by the IWG in 2013 and 2016 (updated to 2020 dollars). See IWG SC-GHG, U.S. Gov’t, Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide Interim Estimates under Executive Order 13990 (/executive-order/13990) (Feb. 2021), https://www.whitehouse.gov/wp-content/uploads/2021/02/TechnicalSupportDocument_SocialCostofCarbonMethaneNitrousOxide.pdf (https://www.whitehouse.gov/wp-content/uploads/2021/02/TechnicalSupportDocument_SocialCostofCarbonMethaneNitrousOxide.pdf). The Technical Support Document notes that estimates of the SC-GHG have been used in NEPA analysis.

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62. Note that applying the specific social cost of each individual GHG to the quantifications of that GHG is more accurate than transforming the gases into CO₂-equivalents and then multiplying the CO₂-equivalents by the social cost of CO₂. See IWG SC-GHG, U.S. Gov’t, Addendum to Technical Support Document on Social Cost of Carbon for Regulatory Impact Analysis under Executive Order 12866: Application of the Methodology to Estimate the Social Cost of Methane and the Social Cost of Nitrous Oxide, 2 (Aug. 2016), https://www.epa.gov/sites/default/files/2016-12/documents/addendum_to_sc-ghg_tsd_august_2016.pdf (https://www.epa.gov/sites/default/files/2016-12/documents/addendum_to_sc-ghg_tsd_august_2016.pdf).

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63. See IWG SC-GHG, Technical Support Document, *supra* note 61. Agencies should typically apply the best available estimates of the SC-GHG to the incremental metric tons of GHG emissions expected from a proposed action and its alternatives. In uncommon circumstances, an agency may choose not to do so if doing so would be confusing, there are no available estimates for the GHG at issue, or, consistent with the concept of proportionality, an agency does not produce a quantitative estimate of GHG emissions because the emissions at issue are de minimis.

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64. Estimates of SC-HFCs have been developed and are available for use in NEPA analysis. See, e.g., EPA, Regulatory Impact Analysis for Phasing Down Production and Consumption of Hydrofluorocarbons (HFCs) (June 2022), <https://www.epa.gov/system/files/documents/2022-07/RIA%20for%20Phasing%20Down%20Production%20and%20Consumption%20of%20Hydrofluorocarbons%20%28HFCs%29.pdf> (<https://www.epa.gov/system/files/documents/2022-07/RIA%20for%20Phasing%20Down%20Production%20and%20Consumption%20of%20Hydrofluorocarbons%20%28HFCs%29.pdf>).

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65. EPA, EPA 430-R-22-003, Inventory of U.S. Greenhouse Gas Emissions and Sinks, 1990-2020 (Apr. 2022), <https://www.epa.gov/system/files/documents/2022-04/us-ghg-inventory-2022-main-text.pdf> (<https://www.epa.gov/system/files/documents/2022-04/us-ghg-inventory-2022-main-text.pdf>).

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66. As described in section VI(F), NEPA does not require a cost-benefit analysis in which all monetized benefits and costs are directly compared.

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67. For example, if alternatives or mitigation strategies would result in varying emissions or reductions of carbon dioxide, methane, and nitrous oxide over time, presenting emissions estimates in metric tons of each gas, or in metric tons of CO₂e, alone cannot fully illustrate the differences in the temporal pathways

of these pollutants' impacts on society. The SC-GHG estimates can capture these differences when estimating the damages from the emission of each specific pollutant in a common unit of measurement, i.e., the U.S. Dollar.

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68. See, e.g., NEPA's direction that agencies shall consider the "worldwide and long-range character of environmental problems." 42 U.S.C. 4332(2)(F) (<https://www.govinfo.gov/link/uscode/42/4332>).

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69. For example, the U.S. Department of the Interior's Bureau of Land Management (BLM) has discussed how agency actions in California, especially joint projects with the State, may or may not facilitate California reaching its GHG emission reduction goals, including goals under the State's Assembly Bill 32 (Global Warming Solutions Act) and related legislation. See, e.g., BLM, Desert Renewable Energy Conservation Plan Proposed Land Use Plan Amendment and Final Environmental Impact Statement, Vol. I, section I.3.3.2, 12 (Oct. 2015), https://eplanning.blm.gov/public_projects/lup/66459/20012403/250016887/I.3_Planning_Process.pdf (https://eplanning.blm.gov/public_projects/lup/66459/20012403/250016887/I.3_Planning_Process.pdf); see also 40 CFR 1506.2(d) ([https://www.ecfr.gov/current/title-40/section-1506.2#p-1506.2\(d\)](https://www.ecfr.gov/current/title-40/section-1506.2#p-1506.2(d))) (directing agencies to discuss any inconsistency of a proposed action with an approved State, Tribal, or local plan or law); BLM, Environmental Assessment for Oberon Renewable Energy Project, 33-34 (Aug. 2021), https://eplanning.blm.gov/public_projects/2001226/200478716/20043975/250050165/Environmental%20Assessment%201-Main%20Text.pdf (https://eplanning.blm.gov/public_projects/2001226/200478716/20043975/250050165/Environmental%20Assessment%201-Main%20Text.pdf).

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70. U.S. Dep't of State (DOS) & U.S. Exec. Off. of the President (EOP), *The Long-Term Strategy of the United States: Pathways to Net-Zero Greenhouse Gas Emissions by 2050* (Nov. 2021), <https://www.whitehouse.gov/wp-content/uploads/2021/10/US-Long-Term-Strategy.pdf> (<https://www.whitehouse.gov/wp-content/uploads/2021/10/US-Long-Term-Strategy.pdf>).

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71. For example, see the scientific studies referenced in section III(B).

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72. In addition, newer tools or modelling may enable agencies in some cases to provide information on localized or "downscaled" climate effects in addition to global effects. See, e.g., Romany M. Webb et al., *Evaluating Climate Risk in NEPA Reviews: Current Practices and Recommendations for Reform*, 29, <https://blogs.edf.org/climate411/files/2022/02/Evaluating-Climate-Risk-in-NEPA-Reviews-Full-Report.pdf> (<https://blogs.edf.org/climate411/files/2022/02/Evaluating-Climate-Risk-in-NEPA-Reviews-Full-Report.pdf>).

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73. See EPA's equivalency calculator, <https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator> (<https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator>).

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74. See 42 U.S.C. 4332(2)(C) (<https://www.govinfo.gov/link/uscode/42/4332>) and (2)(E) (<https://www.govinfo.gov/link/uscode/42/4332>).

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75. See 42 U.S.C. 4332(2)(C)(iii) (<https://www.govinfo.gov/link/uscode/42/4332>); 40 CFR 1502.1 (<https://www.ecfr.gov/current/title-40/section-1502.1>), 1502.14 (<https://www.ecfr.gov/current/title-40/section-1502.14>).

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76. See 42 U.S.C. 4332(2)(C) (<https://www.govinfo.gov/link/uscode/42/4332>), 4332(2)(E) (<https://www.govinfo.gov/link/uscode/42/4332>), and 40 CFR 1502.14(e) ([https://www.ecfr.gov/current/title-40/section-1502.14#p-1502.14\(e\)](https://www.ecfr.gov/current/title-40/section-1502.14#p-1502.14(e))), 1501.5(c)(2) ([https://www.ecfr.gov/current/title-40/section-1501.5#p-1501.5\(c\)\(2\)](https://www.ecfr.gov/current/title-40/section-1501.5#p-1501.5(c)(2))). The purpose and need for action usually reflects both the extent of the agency's statutory authority and its policies.

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77. See 40 CFR 1502.15 (<https://www.ecfr.gov/current/title-40/section-1502.15>) (providing that environmental impact statements shall succinctly describe the environmental impacts on the area(s) to be affected or created by the alternatives under consideration).

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78. See, e.g., CEQ, Memorandum to Agencies: Forty Most Asked Questions Concerning CEQ's NEPA Regulations, Question 3, “No-Action Alternative” (1986) (“This analysis provides a benchmark, enabling decisionmakers to compare the magnitude of environmental effects of the action alternatives”).

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79. CEQ, *Considering Cumulative Effects Under the National Environmental Policy Act* (1997), https://ceq.doe.gov/publications/cumulative_effects.html (https://ceq.doe.gov/publications/cumulative_effects.html). Agencies also should consider proposed actions pursuant to E.O. 13653 ([/executive-order/13653](https://www.federalregister.gov/doc/2013/11/06/2013-22817)), *Preparing the United States for the Impacts of Climate Change*, 78 FR 66817 ([/citation/78-FR-66817](https://www.federalregister.gov/doc/2013/11/06/2013-22817)) (Nov. 6, 2013), which considers how capital investments will be affected by a changing climate over time.

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80. Elevated concentrations of carbon dioxide will persist in the atmosphere for hundreds or thousands of years, so the earth will continue to warm in the coming decades. The warmer it gets, the greater the risk for more severe changes to the climate and the earth's system. EPA, *Impacts of Climate Change*, <https://www.epa.gov/climatechange-science/impacts-climate-change> (<https://www.epa.gov/climatechange-science/impacts-climate-change>) (last updated Aug. 19, 2022); EPA, *Understanding Global Warming Potentials*, <https://www.epa.gov/ghgemissions/understanding-global-warming-potentials> (<https://www.epa.gov/ghgemissions/understanding-global-warming-potentials>) (last updated May 5, 2022).

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81. 42 U.S.C. 4332(2)(C)(i) (<https://www.govinfo.gov/link/uscode/42/4332>); 40 CFR 1508.1(g) ([https://www.ecfr.gov/current/title-40/section-1508.1#p-1508.1\(g\)](https://www.ecfr.gov/current/title-40/section-1508.1#p-1508.1(g))).

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82. 40 CFR 1508.1(g)(1) ([https://www.ecfr.gov/current/title-40/section-1508.1#p-1508.1\(g\)\(1\)](https://www.ecfr.gov/current/title-40/section-1508.1#p-1508.1(g)(1))).

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83. 40 CFR 1508.1(g)(2) ([https://www.ecfr.gov/current/title-40/section-1508.1#p-1508.1\(g\)\(2\)](https://www.ecfr.gov/current/title-40/section-1508.1#p-1508.1(g)(2))); see also *Birkhead v. Fed. Energy Regul. Comm'n*, 925 F.3d 510, 516 (D.C. Cir. 2019).

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84. These indirect emissions are sometimes referred to as “upstream” or “downstream emissions,” described in relation to where in the causal chain they fall relative to the proposed action.

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85. As used in this guidance, “indirect emissions” refers to emissions that are indirect effects of the proposed action.

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86. For example, natural gas pipeline infrastructure creates the economic conditions for additional natural gas production and consumption, including both domestically and internationally, which produce indirect (both upstream and downstream) GHG emissions that contribute to climate change.

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87. See 40 CFR 1502.21 (<https://www.ecfr.gov/current/title-40/section-1502.21>).

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88. For example, agencies may consider consulting information available from the U.S. Energy Information Administration, the International Energy Agency, the Federal Energy Management Program, or the Department of Energy. See, e.g., U.S. Energy Info. Admin., *Annual Energy Outlook 2022* (Mar. 3, 2022), <https://www.eia.gov/outlooks/aeo/> (<https://www.eia.gov/outlooks/aeo/>); International Energy Agency (IEA), *Net Zero by 2050*, (May 2021), <https://www.iea.org/reports/net-zero-by-2050> (<https://www.iea.org/reports/net-zero-by-2050>).

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89. For example, as noted in section (IV)(A)(1), for proposed actions that involve net GHG emission reductions (such as renewable energy projects), agencies should attempt to quantify net GHG emission reductions, but may apply the rule of reason when determining the appropriate depth of analysis such that precision regarding emission reduction benefits does not come at the expense of efficient and accessible analysis.

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90. See 40 CFR 1502.21(b) ([https://www.ecfr.gov/current/title-40/section-1502.21#p-1502.21\(b\)](https://www.ecfr.gov/current/title-40/section-1502.21#p-1502.21(b))); see also *Birckhead*, 925 F.3d at 520; *Barnes v. U.S. Dep't of Transp.*, 655 F.3d 1124 (9th Cir. 2011). Agencies also may consider amendments to their regulations, where appropriate, to ensure they are able to gather from applicants the information needed to analyze the climate change effects of proposed actions.

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91. See, e.g., Jayni Hein, Jason Schwartz, and Avi Zevin, *Pipeline Approvals and Greenhouse Gas Emissions*, 29-30 (Apr. 2019), discussing availability of tools for quantifying substitution effects and noting the need for further modeling tool development.

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92. A full burn assumption is consistent with analyses prepared by some agencies. See BLM, *Environmental Assessment, DOI-BLM-CO-So10-2011-0074-EA*, 81 (2017), https://eplanning.blm.gov/public_projects/nepa/70895/127910/155610/King_II_Lease_Mod_Final_EA_2017-1012.pdf (https://eplanning.blm.gov/public_projects/nepa/70895/127910/155610/King_II_Lease_Mod_Final_EA_2017-1012.pdf) (stating that the agency “assume[d] that the remaining portion of the maximum year coal to be shipped . . . is eventually combusted.”).

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93. See, e.g., *WildEarth Guardians v. BLM.*, 870 F.3d 1222, 1235 (10th Cir. 2017) (“[W]hen coal carries a higher price, for whatever reason that may be, the nation burns less coal in favor of other sources. A force that drives up the cost of coal could thus drive down coal consumption.”); see also Jayni Hein and Natalie Jacewicz, *Implementing NEPA in the Age of Climate Change*, 10 Mich. J. Envtl L. 1, 40-43 (2020) (describing energy substitution analysis and how agencies can conduct it for NEPA analysis).

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94. See Hein & Jacewicz, *supra* note 93, at 42 (citing B.D. Hong & E.R. Slatick, *U.S. Energy Info. Admin., Carbon Dioxide Emission Factors for Coal*, https://www.eia.gov/coal/production/quarterly/co2_article/co2.html (https://www.eia.gov/coal/production/quarterly/co2_article/co2.html)).

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95. See, e.g., Peter Howard, *Inst. for Pol'y Integrity, N.Y.U. Sch. of L., The Bureau of Land Management's Modeling Choice for the Federal Coal Programmatic Review* (June 2016), https://policyintegrity.org/files/publications/BLM_Model_Choice.pdf (https://policyintegrity.org/files/publications/BLM_Model_Choice.pdf) (describing multiple power sector models available to Federal agencies for use in NEPA analysis); see also *WildEarth Guardians*, 870 F.3d at 1235 (holding that an agency's “blanket assertion that coal would be substituted from other sources, unsupported by hard data, does not provide ‘information sufficient to permit a reasoned choice’ between the preferred alternative and no action alternative.”).

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96. Hein & Jacewicz, *supra* note 93, at 43-44 (describing the fallacy of perfect substitution); *id.* at 51-52 (describing litigation concerning the Wright Area coal leases).

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97. See, e.g., *WildEarth Guardians*, 870 F.3d at 1235-37.

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98. Available models include the Bureau of Ocean Energy Management's Revised Market Simulation Model, the U.S. Energy Information Administration's National Energy Modeling System, and ICF International's Integrated Planning Model.

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99. DOS & EOP, *supra* note 70; see also Hein & Jacewicz, *supra* note 93, at 48 (stating, “[a] far more rational approach would be to model at least two policy scenarios: one taking the ‘constant demand’ approach, and the other based on fossil fuel consumption consistent with meeting the 1.5 or 2 degrees Celsius warming targets laid out in the Paris Accord.”).

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100. Note that the concepts of “connected actions” and “indirect effects” bear some similarities but are analytically distinct. “Connected actions” are actions related to a proposed action that an agency must consider in the same environmental impact statement. See 40 CFR 1501.9(e)(1) ([https://www.ecfr.gov/current/title-40/section-1501.9#p-1501.9\(e\)\(1\)](https://www.ecfr.gov/current/title-40/section-1501.9#p-1501.9(e)(1))). “Indirect effects” are not actions in themselves, but rather reasonably foreseeable effects that are caused by the proposed action.

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101. 40 CFR 1501.9(e)(1) ([https://www.ecfr.gov/current/title-40/section-1501.9#p-1501.9\(e\)\(1\)](https://www.ecfr.gov/current/title-40/section-1501.9#p-1501.9(e)(1))).

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102. See 40 CFR 1502.16 (<https://www.ecfr.gov/current/title-40/section-1502.16>), 1508.1(g)(3) ([https://www.ecfr.gov/current/title-40/section-1508.1#p-1508.1\(g\)\(3\)](https://www.ecfr.gov/current/title-40/section-1508.1#p-1508.1(g)(3))).

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103. 40 CFR 1508.1(g)(3) ([https://www.ecfr.gov/current/title-40/section-1508.1#p-1508.1\(g\)\(3\)](https://www.ecfr.gov/current/title-40/section-1508.1#p-1508.1(g)(3))).

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104. See *infra* section VI(E).

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105. See 42 U.S.C. 4332(2)(C) (<https://www.govinfo.gov/link/uscode/42/4332>) (requiring consideration of mitigation measures in impact statements by requiring the consideration of “any adverse environmental effects which cannot be avoided”).

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106. See 40 CFR 1508.1(s) ([https://www.ecfr.gov/current/title-40/section-1508.1#p-1508.1\(s\)](https://www.ecfr.gov/current/title-40/section-1508.1#p-1508.1(s))), 1501.9(e)(2) ([https://www.ecfr.gov/current/title-40/section-1501.9#p-1501.9\(e\)\(2\)](https://www.ecfr.gov/current/title-40/section-1501.9#p-1501.9(e)(2))) (alternatives include mitigation measures not included in the proposed action); see generally 10 CFR 900.3 (<https://www.ecfr.gov/current/title-10/section-900.3>) (2019) (identifying “mitigation hierarchy” as “first seeking to avoid, then minimize impacts, then, when necessary, compensate for residual impacts”); U.S. Fish and Wildlife Service (FWS) Mitigation Policy (Nov. 21, 2016), <https://www.federalregister.gov/d/2016-27751> (<https://www.federalregister.gov/d/2016-27751>).

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107. See CEQ, Memorandum to Heads of Federal Agencies, *Appropriate Use of Mitigation and Monitoring and Clarifying the Appropriate Use of Mitigated Findings of No Significant Impact* (“Appropriate Use of Mitigation and FONSI Memo”), 8-9, 76 FR 3843 (/citation/76-FR-3843) (Jan. 21, 2011), https://ceq.doe.gov/docs/ceq-regulations-and-guidance/Mitigation_and_Monitoring_Guidance_14Jan2011.pdf (https://ceq.doe.gov/docs/ceq-regulations-and-guidance/Mitigation_and_Monitoring_Guidance_14Jan2011.pdf).

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108. See *id.*; see also U.S. Army Corps of Engineers and EPA, *Final Rule, Compensatory Mitigation for Losses of Aquatic Resources*, 73 FR 19593 (/citation/73-FR-19593) (Apr. 10, 2008) (discussing verifiable and enforceable performance standards for mitigation).

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109. See 40 CFR 1501.6(c) ([https://www.ecfr.gov/current/title-40/section-1501.6#p-1501.6\(c\)](https://www.ecfr.gov/current/title-40/section-1501.6#p-1501.6(c))).

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110. See *id.* (The finding of no significant impact shall state the authority for any mitigation that the agency has adopted and any applicable monitoring or enforcement provisions. If the agency finds no significant impacts based on mitigation, the mitigated finding of no significant impact shall state any enforceable mitigation requirements or commitments that will be undertaken to avoid significant impacts.); see also CEQ, *Appropriate Use of Mitigation and FONSI Memo*, *supra* note 107, at 7 (“Mitigation commitments needed to lower the level of impacts so that they are not significant should be clearly described in the mitigated FONSI document and in any other relevant decision documents related to the proposed action.”).

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111. See CEQ, *Appropriate Use of Mitigation and FONSI Memo*, *supra* note 107, at 13-14.

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112. See 40 CFR 1505.2(a)(3) ([https://www.ecfr.gov/current/title-40/section-1505.2#p-1505.2\(a\)\(3\)](https://www.ecfr.gov/current/title-40/section-1505.2#p-1505.2(a)(3))), 1505.3 (<https://www.ecfr.gov/current/title-40/section-1505.3>); see also CEQ, *Appropriate Use of Mitigation and FONSI Memo*, *supra* note 107.

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113. Burning fossil fuels (such as oil, coal, and natural gas), wood, and other forms of carbon releases stored carbon into the atmosphere, where it becomes a GHG. GHGs are gases in the atmosphere that absorb and release heat. Dep't of Energy, Off. of Science, *DOE Explains...the Carbon Cycle*, <https://www.energy.gov/science/doe-explainsthe-carbon-cycle> (<https://www.energy.gov/science/doe-explainsthe-carbon-cycle>).

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114. The carbon cycle is the process that moves carbon between plants, animals, and microbes; minerals in the earth; and the atmosphere. Most carbon on Earth is stored in rocks and sediments. The rest is in the ocean, atmosphere, and in living organisms. Scientists use the term “carbon sinks” to refer to places where carbon is stored away from the atmosphere. *Id.*

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115. Fossil fuels are not considered biologically based materials. See, e.g., EPA, *Framework for Assessing Biogenic CO₂ Emissions from Stationary Sources*, 5 (Nov. 2014), <https://www.epa.gov/sites/default/files/2016-08/documents/framework-for-assessing-biogenic-co2-emissions.pdf> (<https://www.epa.gov/sites/default/files/2016-08/documents/framework-for-assessing-biogenic-co2-emissions.pdf>) (“In contrast to the relatively short timescale of the biological carbon cycle, carbon in fossil fuel reservoirs, such as coal seams and oil and gas deposits, was removed from the atmosphere by plants over millions of years but was not returned to the atmosphere through the natural processes described above. Instead, because of geologic processes, the carbon that accumulated in these deposits has been isolated from the active biological cycling of carbon to and from the atmosphere. Without human intervention, carbon in fossil fuel reservoirs could remain isolated from the biogeochemical cycling of carbon long into the future.”)

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116. EPA, *Carbon Dioxide Emissions Associated with Bioenergy and Other Biogenic Sources*, https://19january2017snapshot.epa.gov/climatechange/carbon-dioxide-emissions-associated-bioenergy-and-other-biogenic-sources_.html (https://19january2017snapshot.epa.gov/climatechange/carbon-dioxide-emissions-associated-bioenergy-and-other-biogenic-sources_.html); see also Merriam-Webster Dictionary, *Biogenic* (Online Ed., last updated Oct. 21, 2022), <https://www.merriam-webster.com/dictionary/biogenic> (<https://www.merriam-webster.com/dictionary/biogenic>) (defining “biogenic” as “produced by living organisms”).

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117. See, e.g., 10 CFR 300.2 (<https://www.ecfr.gov/current/title-10/section-300.2>) (“Carbon stocks mean the quantity of carbon stored in biological and physical systems including: trees, products of harvested trees, agricultural crops, plants, wood and paper products and other terrestrial biosphere sinks, soils, oceans, and sedimentary and geological sinks.”).

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118. For example, Federal agencies sometimes consider actions that would benefit ecosystems by restoring degraded lands or restoring shoreline.

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119. See, e.g., USDA Forest Service, *Considering Forest and Grassland Carbon in Land Management* (2017), <https://www.fs.usda.gov/research/treesearch/54316> (<https://www.fs.usda.gov/research/treesearch/54316>); see also U.S. Dep't of the Interior, Order No. 3399, *Department-Wide Approach to the Climate Crisis and Restoring Transparency and Integrity to the Decision-Making Process* (Apr. 16, 2021), https://www.doi.gov/sites/doi.gov/files/elips/documents/so-3399-508_0.pdf (https://www.doi.gov/sites/doi.gov/files/elips/documents/so-3399-508_0.pdf).

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120. See USGCRP, *Fourth National Climate Assessment*, *supra* note 28, Chapter 2, *Our Changing Climate*, <https://nca2018.globalchange.gov/chapter/2/> (<https://nca2018.globalchange.gov/chapter/2/>).

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121. Resilience refers to the ability to prepare for and adapt to changing conditions and withstand and recover rapidly from disruption. U.S. Dep't of Commerce Nat'l Inst. of Standards and Tech. (NIST), SP 800-160 Vol. 2, Rev. 1, 76, [https://csrc.nist.gov/glossary/term/resilience#:~:text=with%20omission%20needs-,Source\(s\)%3A,naturally%20occurring%20threats%20or%20incidents](https://csrc.nist.gov/glossary/term/resilience#:~:text=with%20omission%20needs-,Source(s)%3A,naturally%20occurring%20threats%20or%20incidents) ([https://csrc.nist.gov/glossary/term/resilience#:~:text=with%20omission%20needs-,Source\(s\)%3A,naturally%20occurring%20threats%20](https://csrc.nist.gov/glossary/term/resilience#:~:text=with%20omission%20needs-,Source(s)%3A,naturally%20occurring%20threats%20)Back to Citation

122. Adaptation refers to actions taken at the individual, local, regional, and national levels to reduce risks from even today's changed climate conditions and to prepare for impacts from additional changes projected for the future. USGCRP, Fourth National Climate Assessment, *supra* note 28, Chapter 28, Reducing Risks Through Adaptation Actions, <https://nca2018.globalchange.gov/chapter/28/> (<https://nca2018.globalchange.gov/chapter/28/>).
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123. See E.O. 14008 (</executive-order/14008>), *supra* note 7 and E.O. 14057 (</executive-order/14057>), *supra* note 7.
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124. See 40 CFR 1502.15 (<https://www.ecfr.gov/current/title-40/section-1502.15>) (providing that environmental impact statements shall succinctly describe the environmental impacts on the area(s) to be affected or created by the alternatives under consideration). Note, however, that GHG emissions have effects that are global in scale.
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125. See, e.g., USGCRP, Fourth National Climate Assessment, *supra* note 28 (regional impacts chapters).
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126. See, e.g., *id.* (considering a low future global emissions scenario and a high emissions scenario).
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127. CEQ, Considering Cumulative Effects Under the National Environmental Policy Act, *supra* note 79. Agencies also should consider their work under relevant executive orders. See E.O. 13990 (</executive-order/13990>), *supra* note 16; E.O. 14008 (</executive-order/14008>), *supra* note 7; E.O. 14057 (</executive-order/14057>), *supra* note 7. Note that the effects of GHG emissions by their nature can be very long-lasting.
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128. See 40 CFR 1501.12 (<https://www.ecfr.gov/current/title-40/section-1501.12>) (material may be incorporated by reference if it is reasonably available for inspection by potentially interested persons during public review and comment).
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129. See USGCRP, Fourth National Climate Assessment, *supra* note 28; IPCC, *The Physical Science Basis*, *supra* note 28.
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130. See USGCRP, Fourth National Climate Assessment, *supra* note 28. Agencies should consider the latest final assessments and reports as they are updated.
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131. See, e.g., *id.*
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132. See 40 CFR 1502.23 (<https://www.ecfr.gov/current/title-40/section-1502.23>). Agencies can consult www.data.gov/climate/portals (<http://www.data.gov/climate/portals>) for model data archives, visualization tools, and downscaling results.
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133. *Id.*
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134. See 40 CFR 1502.16(a)(5) ([https://www.ecfr.gov/current/title-40/section-1502.16#p-1502.16\(a\)\(5\)](https://www.ecfr.gov/current/title-40/section-1502.16#p-1502.16(a)(5))), 1506.2(d) ([https://www.ecfr.gov/current/title-40/section-1506.2#p-1506.2\(d\)](https://www.ecfr.gov/current/title-40/section-1506.2#p-1506.2(d))).
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135. See E.O. 11988, *Floodplain Management*, 42 FR 26951 (/citation/42-FR-26951) (May 24, 1977), <http://www.archives.gov/federal-register/codification/executive-order/11988.html> (<http://www.archives.gov/federal-register/codification/executive-order/11988.html>); E.O. 13690 (/executive-order/13690), *Establishing a Federal Flood Risk Management Standard and a Process for Further Soliciting and Considering Stakeholder Input*, 80 FR 6425 (/citation/80-FR-6425) (Jan. 30, 2015), <https://www.federalregister.gov/d/2015-02379> (<https://www.federalregister.gov/d/2015-02379>) (reinstated by E.O. 14030 (/executive-order/14030), *Climate-Related Financial Risk*, 86 FR 27967 (/citation/86-FR-27967) (May 20, 2021), <https://www.federalregister.gov/d/2021-11168> (<https://www.federalregister.gov/d/2021-11168>)).

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136. See, e.g., E.O. 14030 (/executive-order/14030), *supra* note 135.

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137. See U.S. Dep't of Transp., *FHWA-HEP-15-007, Assessing Transportation Vulnerability to Climate Change Synthesis of Lessons Learned and Methods Applied, Gulf Coast Study, Phase 2* (Oct. 2014), http://www.fhwa.dot.gov/environment/climate_change/adaptation/ongoing_and_current_research/gulf_coast_study/phase2_task6/fhwahep15007.pdf (http://www.fhwa.dot.gov/environment/climate_change/adaptation/ongoing_and_current_research/gulf_coast_study/phase2_task6/fhwahep15007.pdf) (focusing on the Mobile, Alabama region); U.S. Climate Change Science Program, *Impacts of Climate Change and Variability on Transportation Systems and Infrastructure, Gulf Coast Study, Phase I* (Mar. 2008), <https://downloads.globalchange.gov/sap/sap4-7/sap4-7-final-all.pdf> (<https://downloads.globalchange.gov/sap/sap4-7/sap4-7-final-all.pdf>) (focusing on a regional scale in the central Gulf Coast). Information about the Gulf Coast Study is available at https://www.fhwa.dot.gov/environment/sustainability/resilience/ongoing_and_current_research/gulf_coast_study/index.cfm (https://www.fhwa.dot.gov/environment/sustainability/resilience/ongoing_and_current_research/gulf_coast_study/index.cfm); see also *Third National Climate Assessment*, *supra* note 30, Chapter 28, *Adaptation*, 675, <http://nca2014.globalchange.gov/report/response-strategies/adaptation#intro-section-2> (<http://nca2014.globalchange.gov/report/response-strategies/adaptation#intro-section-2>) (noting that Federal agencies in particular can facilitate climate adaptation by “ensuring the establishment of [F]ederal policies that allow for ‘flexible’ adaptation efforts and take steps to avoid unintended consequences”).

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138. See 42 U.S.C. 4332 (<https://www.govinfo.gov/link/uscode/42/4332>) (“agencies of the Federal Government shall . . . utilize a systematic, interdisciplinary approach which will insure the integrated use of the natural and social sciences and the environmental design arts in planning and in decision-making”); 40 CFR 1501.2 (<https://www.ecfr.gov/current/title-40/section-1501.2>) (“Agencies should integrate the NEPA process with other planning and authorization processes at the earliest reasonable time. . . .”); see also CEQ, *Memorandum for Heads of Federal Departments and Agencies, Improving the Process for Preparing Efficient and Timely Environmental Reviews under the National Environmental Policy Act* (“Efficient Environmental Reviews”), 77 FR 14473 (/citation/77-FR-14473) (Mar. 12, 2012), https://ceq.doe.gov/docs/ceq-regulations-and-guidance/Improving_NEPA_Efficiencies_06Mar2012.pdf (https://ceq.doe.gov/docs/ceq-regulations-and-guidance/Improving_NEPA_Efficiencies_06Mar2012.pdf).

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139. See <https://www.sustainability.gov/progress.html> (<https://www.sustainability.gov/progress.html>) for agency sustainability plans and agency adaptation plans; see also U.S. Climate Resilience Tool Kit, *National Fish, Wildlife, and Plants Climate Adaptation Strategy*, <https://toolkit.climate.gov/tool/national-fish-wildlife-and-plants-climate-adaptation-strategy> (<https://toolkit.climate.gov/tool/national-fish-wildlife-and-plants-climate-adaptation-strategy>); Interagency Climate Adaptation Task Force, *National Action Plan: Priorities for Managing Freshwater Resources in a Changing Climate* (Oct. 2011), https://www.epa.gov/sites/default/files/2016-12/documents/2011_national_action_plan_1.pdf (https://www.epa.gov/sites/default/files/2016-12/documents/2011_national_action_plan_1.pdf); and CEQ, *Off. of the Federal Chief Sustainability Officer, Climate Resilient Infrastructure and Operations*, <https://www.sustainability.gov/adaptation/> (<https://www.sustainability.gov/adaptation/>).

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140. See, e.g., Jane Ebinger & Walter Vergara, *World Bank, Climate Impacts on Energy Systems: Key Issues for Energy Sector Adaptation*, 89-90 (2011), <https://openknowledge.worldbank.org/bitstream/handle/10986/2271/600510PUBO181impacts09780821386972.pdf?sequence=1&isAllowed=y> (<https://openknowledge.worldbank.org/bitstream/handle/10986/2271/600510PUBO181impacts09780821386972.pdf?sequence=1&isAllowed=y>).

sequence=1&isAllowed=y) (describing the potential for adaptation-related decision errors including “maladaptation,” in which actions are taken that constrain the ability of other decision makers to manage the impacts of climate change).

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141. See *infra* Section VI(E); E.O. 12898 (/executive-order/12898), Federal Actions to Address Environmental Justice in Minority and Low-Income Populations, 59 FR 7629 (/citation/59-FR-7629) (Feb. 16, 1994), <https://www.archives.gov/files/federal-register/executive-orders/pdf/12898.pdf> (<https://www.archives.gov/files/federal-register/executive-orders/pdf/12898.pdf>), as amended by E.O. 14008 (/executive-order/14008), *supra* note 7, section 219 (“Agencies shall make achieving environmental justice part of their missions by developing programs, policies, and activities to address the disproportionately high and adverse human health, environmental, climate-related and other cumulative impacts on disadvantaged communities, as well as the accompanying economic challenges of such impacts.”); CEQ, *Environmental Justice Guidance Under the National Environmental Policy Act* (Dec. 1997), <https://ceq.doe.gov/docs/ceq-regulations-and-guidance/regs/ej/justice.pdf> (<https://ceq.doe.gov/docs/ceq-regulations-and-guidance/regs/ej/justice.pdf>).

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142. See, e.g., Federal Interagency Working Group on Environmental Justice & NEPA Committee, *Promising Practices for EJ Methodologies in NEPA Reviews* (Mar. 2016), https://www.epa.gov/sites/default/files/2016-08/documents/nepa_promising_practices_document_2016.pdf (https://www.epa.gov/sites/default/files/2016-08/documents/nepa_promising_practices_document_2016.pdf).

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143. See 40 CFR 1501.9 (<https://www.ecfr.gov/current/title-40/section-1501.9>) (“Agencies shall use an early and open process to determine the scope of issues for analysis in an environmental impact statement, including identifying the significant issues and eliminating from further study non-significant issues.”); see also CEQ, *Efficient Environmental Reviews*, *supra* note 139 (the CEQ Regulations explicitly require scoping for preparing an EIS; however, agencies also can take advantage of scoping whenever preparing an EA).

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144. See 40 CFR 1500.4(d) ([https://www.ecfr.gov/current/title-40/section-1500.4#p-1500.4\(d\)](https://www.ecfr.gov/current/title-40/section-1500.4#p-1500.4(d))), 1500.4(i) ([https://www.ecfr.gov/current/title-40/section-1500.4#p-1500.4\(i\)](https://www.ecfr.gov/current/title-40/section-1500.4#p-1500.4(i))), 1501.9(a) ([https://www.ecfr.gov/current/title-40/section-1501.9#p-1501.9\(a\)](https://www.ecfr.gov/current/title-40/section-1501.9#p-1501.9(a))) and (e) ([https://www.ecfr.gov/current/title-40/section-1501.9#p-1501.9\(e\)](https://www.ecfr.gov/current/title-40/section-1501.9#p-1501.9(e))).

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145. See 40 CFR 1501.9 (<https://www.ecfr.gov/current/title-40/section-1501.9>) (The agency preparing the NEPA analysis must use the scoping process to, among other things, determine the scope and identify the significant issues to be analyzed in depth); CEQ, *Memorandum for General Counsels, NEPA Liaisons, and Participants in Scoping* (Apr. 30, 1981), https://www.energy.gov/sites/default/files/nepapub/nepa_documents/RedDont/G-CEQ-scopingguidance.pdf (https://www.energy.gov/sites/default/files/nepapub/nepa_documents/RedDont/G-CEQ-scopingguidance.pdf).

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146. As noted *infra* in section VI(E), to address environmental justice concerns, agencies should use the scoping process to identify potentially affected communities and provide early notice of opportunities for public engagement.

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147. See, e.g., U.S. Forest Service, *The Science of Decisionmaking: Applications for Sustainable Forest and Grassland Management in the National Forest System* (2013), <https://www.fs.usda.gov/research/treesearch/44326> (<https://www.fs.usda.gov/research/treesearch/44326>); U.S. Forest Service, *The Comparative Risk Assessment Framework and Tools* (2010), <https://www.fs.usda.gov/treesearch/pubs/34561> (<https://www.fs.usda.gov/treesearch/pubs/34561>); Julien Martin, et al., *Structured decision making as a conceptual framework to identify thresholds for conservation and management*, 19 *Ecological Applications* 1079-90 (2009), <https://pubs.er.usgs.gov/publication/70036878> (<https://pubs.er.usgs.gov/publication/70036878>).

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148. See 40 CFR 1502.4(b) ([https://www.ecfr.gov/current/title-40/section-1502.4#p-1502.4\(b\)](https://www.ecfr.gov/current/title-40/section-1502.4#p-1502.4(b))), 1501.12 (<https://www.ecfr.gov/current/title-40/section-1501.12>).

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149. Programmatic studies may be distinct from programmatic NEPA reviews in which the programmatic action itself is subject to NEPA requirements. See CEQ, *Memorandum for Heads of Federal Departments and Agencies, Effective Use of Programmatic NEPA Reviews*, section I(A), 9 (Dec. 18, 2014), https://ceq.doe.gov/docs/ceq-regulations-and-guidance/Effective_Use_of_Programmatic_NEPA_Reviews_Final_Dec2014_searchable.pdf (https://ceq.doe.gov/docs/ceq-regulations-and-guidance/Effective_Use_of_Programmatic_NEPA_Reviews_Final_Dec2014_searchable.pdf) (discussing non-NEPA types of programmatic analyses such as data collection, assessments, and research, which previous NEPA guidance described as joint inventories or planning studies).

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150. For instance, where a planning level programmatic review of GHG emissions indicates that a collection of individual actions will collectively reduce GHG emissions, the NEPA analyses for the individual actions can demonstrate that the action is consistent with the emission reductions examined in the programmatic review.

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151. See E.O. 14057 (</executive-order/14057>), *supra* note 7 (establishing government-wide and agency GHG reduction goals and targets).

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152. See 40 CFR 1502.23 (<https://www.ecfr.gov/current/title-40/section-1502.23>) (requiring agencies to ensure the professional and scientific integrity of the discussions and analyses in environmental impact statements).

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153. See, e.g., USGCRP, *Fourth National Climate Assessment*, *supra* note 28, Volume II, 342 and 1077-78; USGCRP, *The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment* (Apr. 2016), <https://health2016.globalchange.gov/downloads> (<https://health2016.globalchange.gov/downloads>); EPA, *Six Impacts*, *supra* note 41, at 8 (Figure ES.2), https://www.epa.gov/system/files/documents/2021-09/climate-vulnerability_september-2021_508.pdf (https://www.epa.gov/system/files/documents/2021-09/climate-vulnerability_september-2021_508.pdf).

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154. USGCRP, *The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment*, *supra* note 153.

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155. For more information on the White House Environmental Justice Interagency Council, see <https://www.energy.gov/lm/white-house-environmental-justice-interagency-council-resources> (<https://www.energy.gov/lm/white-house-environmental-justice-interagency-council-resources>).

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156. President's Memorandum for the Heads of All Departments and Agencies, *Executive Order on Federal Actions to Address Environmental Justice in Minority and Low-Income Populations* (Feb. 11, 1994), https://www.epa.gov/sites/production/files/2015-02/documents/clinton_memo_12898.pdf (https://www.epa.gov/sites/production/files/2015-02/documents/clinton_memo_12898.pdf); CEQ, *Environmental Justice Guidance Under the National Environmental Policy Act* (Dec. 10, 1997), <https://ceq.doe.gov/docs/ceq-regulations-and-guidance/regs/ej/justice.pdf> (<https://ceq.doe.gov/docs/ceq-regulations-and-guidance/regs/ej/justice.pdf>).

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157. See 40 CFR 1502.22 (<https://www.ecfr.gov/current/title-40/section-1502.22>).

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158. See 40 CFR 1501.12 (<https://www.ecfr.gov/current/title-40/section-1501.12>) (material may be cited if it is reasonably available for inspection by potentially interested persons within the time allowed for public review and comment).

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159. For example, the regulatory impact analysis was used as a source of information and aligned with the NEPA review for Corporate Average Fuel Economy (CAFE) standards. See Nat'l Highway Traffic Safety Admin., Corporate Average Fuel Economy Standards, Passenger Cars and Light Trucks, Model Years 2017-2025, Final Environmental Impact Statement, Docket No. NHTSA-2011-0056, section 5.3.2 (July 2012), <https://www.nhtsa.gov/corporate-average-fuel-economy/environmental-impact-statement-cafe-standards-2017-2025> (<https://www.nhtsa.gov/corporate-average-fuel-economy/environmental-impact-statement-cafe-standards-2017-2025>).

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160. For example, the information may be responsive to public comments or useful to the decision maker in further distinguishing between alternatives and mitigation measures. In all cases, the agency should ensure that its consideration of the information and other factors relevant to its decision is consistent with applicable statutory or other authorities, including requirements for the use of cost-benefit analysis.

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