

CLIMATE SCIENCE AND LAW FOR JUDGES

Government Action and
Climate Science



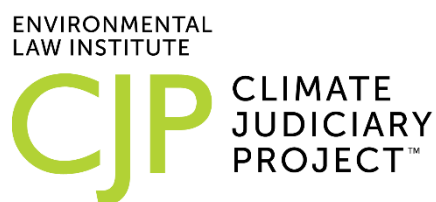
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by Jessica Wentz

Table of Contents

I.	Introduction	1
II.	Standing to Sue Over Climate Injuries in Administrative Law Cases.....	2
III.	Cases Involving Regulation of GHG Emissions Under Climate and Air Pollution Statutes	5
IV.	Consideration of Climate Science in Environmental Review, Permitting, and Land Use Litigation	7
A.	Obligations to Assess GHG Emissions From Project Authorizations and Land Use Decisions.....	8
B.	Obligations to Assess the Effects of Climate Change on Projects and Land Uses.....	10
V.	Consideration of Climate Science in Natural Resource and Public Land Management Litigation	16
VI.	Consideration of Climate Science in Endangered Species Litigation	18
A.	Endangered and Threatened Species Listing Decisions.....	19
B.	Critical Habitat Designations.....	21
C.	Biological Assessments, Jeopardy Determinations, and Recovery Plans.....	23
VII.	Conclusion.....	25

I. Introduction

This module examines how climate science informs judicial review of government regulations and administrative decisions. It explains how courts can use scientific data to evaluate legal obligations related to pollution control, environmental impact assessment, permitting, land use decisions, natural resource management, and endangered species protection.

As discussed in other modules, the United States will need to reduce its greenhouse gas (GHG) emissions in order to limit global warming to well below 2 degrees Celsius (°C) or preferably 1.5°C, consistent with the goals of the Paris Agreement. This will require action from federal, state, and local lawmakers, all of which share authority over the regulation of GHG emissions and land uses that contribute to climate change. Climate science can help resolve legal questions about the adequacy and reasonableness of administrative action (or inaction) with respect to the control of GHG emissions and other contributions to climate change.

Climate science also factors into litigation involving other types of administrative decisions and planning actions. In particular, courts often confront questions about whether government agencies have adequately accounted for climate science in environmental reviews, permitting and land use decisions, natural resource management planning, and endangered species protection. There are two types of climate-related considerations that may arise in these contexts: (i) whether the action will generate GHG emissions, thus contributing to global climate change, (ii) whether and to what extent the action will be affected by climate change (e.g., whether climate change will exacerbate environmental or public health risks associated with the proposed action). Government agencies may have legal obligations to address such considerations as a result of procedural mandates, such as those found in environmental review statutes, or substantive mandates, such as those pertaining to the protection of water resources, the sustainable use of public lands, and the conservation of endangered species.

The Administrative Procedure Act (APA) governs federal judicial review of regulations and administrative actions. The APA directs courts to invalidate agency actions if they are arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with the law.¹ Under this standard, a court may not substitute its judgment for that of the agency. Rather, the court must determine whether the agency’s decision was based on a consideration of relevant factors or whether there has been a clear error of judgment.² The court may invalidate an action if the agency has “relied on factors which Congress has not intended it to consider, entirely failed to consider an important aspect of the problem, offered an explanation for its decision that runs counter to the evidence before the agency, or is so implausible that it could not be ascribed to a difference in view or the

¹ 5 U.S.C. § 706(2)(A); APA § 706(2)(A) (A different test—the “substantial evidence” standard of review—is required for formal rulemaking and formal adjudication, but the vast majority of administrative actions are reviewed under the arbitrary and capricious standard.) *Id.* at (2)(E). The failure to address material public comments is also grounds for invalidation. 5 U.S.C. § 553(c).

² *See Marsh v. Oregon Natural Res. Council*, 490 U.S. 360, 376 (1989).

product of agency expertise.”³ States also have administrative procedure laws with similar requirements for non-arbitrary decisionmaking and deference in judicial review.⁴

Nongovernmental litigants play an important role in the implementation and enforcement of administrative law requirements pertaining to climate change mitigation, adaptation, and disclosure. Many environmental laws contain provisions allowing persons to submit petitions for regulation and to sue agencies where they either fail to fulfill non-discretionary statutory duties or exercise authorities in an arbitrary fashion. These cases can present important issues related to the integration of scientific understanding with administration of legal requirements.

Courts may confront questions about climate science across a broad array of administrative law cases arising under federal, state, and local law. A comprehensive overview of legal issues that may arise at the state and local levels would be impracticable; accordingly, this module focuses principally on litigation involving federal environmental and land use planning laws. It is believed that the scientific issues in those cases are broadly illustrative of the scientific issues that judges will confront in cases involving state and local laws.

II. Standing to Sue Over Climate Injuries in Administrative Law Cases

One issue that frequently arises in administrative litigation involving climate-related claims is whether plaintiffs can establish standing on the basis of climate change-related injuries. For Article III standing in federal courts, plaintiffs must demonstrate that they have suffered or will suffer a concrete and imminent injury due to the defendant’s conduct and that the injury is at least partially redressable through favorable court decision. States have similar standing requirements.

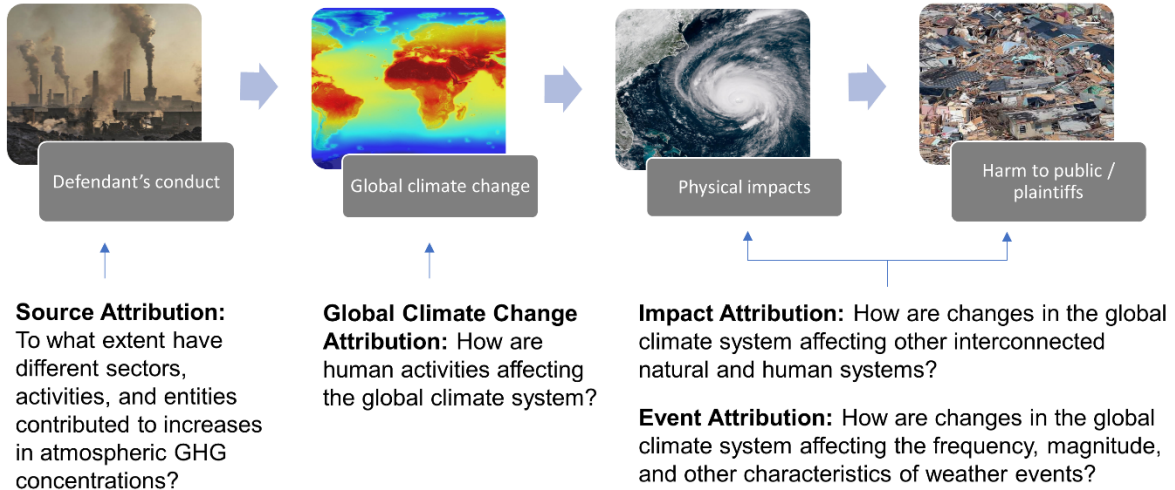
Courts can use climate science to determine: (i) whether a plaintiff has suffered an injury that can be fairly traced to climate change, and (ii) whether that climate change-related injury can be fairly traced to the administrative action (or inaction) at issue in the case. Two types of research can be used to flesh out this causal chain:

- **Detection and attribution research** provides information on how GHG emissions are already contributing to observed changes in the global climate system and other interconnected systems (see Figure 1).
- **Predictive research**, based on climate models and statistical analysis, provides information on the future trajectory and magnitude of climate change impacts.

³ Motor Vehicle Mfrs. Ass’n of U.S., Inc. v. State Farm Mut. Auto. Ins. Co., 463 U.S. 29, 43 (1983).

⁴ See Administrative State Project, https://ballotpedia.org/The_Administrative_State_Project.

Figure 1: Detection and attribution research is used to establish a causal link between a defendant's contributions to climate change and injuries to the public or plaintiffs. In cases where plaintiffs are suing governments for inadequate control of GHG emissions, the "contribution" at issue may arise from affirmative policies, such as fossil fuel subsidies, or the failure to regulate GHG sources. Different types of attribution research are used to flesh out different links in the causal chain.



Box 1: The Role of Climate Science in Standing Determinations

In *Massachusetts v. EPA*, the Supreme Court relied on climate science in finding that the state of Massachusetts had satisfied all three elements of standing (injury, causation, and redressability).

Injury: Plaintiffs demonstrated that they would suffer a sufficiently imminent and concrete injury by presenting evidence of numerous harms associated with climate change, including: (i) loss of state-owned property to rising sea levels, (ii) added costs to deal with emergency response measures caused by more frequent intense storm surge flooding events, (iii) damage to state-owned historic, archeological, and natural resources; (iv) damage to state-owned facilities and infrastructure along the coast. Plaintiffs relied on detection and attribution research to show that they were already experiencing harm as a result of climate change, as well as predictive science indicating that these impacts would worsen over time.

Causation and remedy: EPA argued that the plaintiffs lacked standing because its decision not to regulate would contribute “so insignificantly to petitioners’ injuries” that there was “no realistic possibility that the relief sought would . . . remedy petitioners’ injuries.” (549 U.S. at 523-24). However, the Supreme Court held that the emissions from U.S. motor vehicles were a “meaningful contribution” to global GHG concentrations by any metric. In reaching this conclusion, the Court cited source attribution data indicating that U.S. motor vehicle emissions generated 1.7 billion metric tons of carbon dioxide in 1999—more than 6% of worldwide emissions. The Court also relied on Intergovernmental Panel on Climate Change (IPCC) assessment reports and expert testimony from climate scientists to find a causal link between emissions and injury to Massachusetts. The Court acknowledged that CAA regulation would not fully mitigate the problem, but the prospect of partial redress was sufficient to provide standing for plaintiffs.

In *Massachusetts v. EPA*, the U.S. Supreme Court made clear that it is possible for state plaintiffs to establish standing based on climate change-related harms. EPA had rejected a petition to regulate GHG emissions from motor vehicles under the Clean Air Act, in part due to its determination that GHGs did not qualify as “air pollutants” within the meaning of the Act. Twelve states and several cities sued, alleging that EPA’s regulatory inaction was arbitrary and capricious. The Supreme Court held that: (i) Massachusetts had standing to sue based on climate change-related injuries, (ii) GHG emissions clearly fit within the Act’s “capacious definition of air pollutant,” and (iii) EPA’s other justifications for not regulating GHG emissions were impermissible under the Act.⁵ Climate science was integral to the Court’s decision on standing. In particular, the Court relied on the science in determining that GHG emissions from motor vehicles represented a “substantial contribution” to global climate change, and that global climate change was causing actual and imminent harm to the state of Massachusetts (Box 1).

Since *Massachusetts v. EPA* was decided, courts have grappled with the question of what constitutes a “meaningful contribution” to global climate change for standing purposes. Some decisions have cast doubt on whether the GHG impacts of smaller regulatory decisions are sufficiently large to establish standing.⁶ Other courts have held that questions about GHG contributions and causation are factual inquiries so closely linked to the merits of plaintiffs’ claims that they should be addressed at trial rather than during the threshold standing stage of litigation.⁷ This approach gives plaintiffs the opportunity to flesh out causation arguments with detailed factual evidence. To determine whether GHG emissions rise to the “meaningful contribution” threshold, courts may look at: (i) source attribution data on the GHG contributions of different source categories, and (ii) attribution research which links GHG contributions from specific source categories to impacts such as sea-level rise.⁸

Because the scope of interests affected by climate change may be smaller for non-state plaintiffs, particularly individual citizens, it may be more challenging to establish that they have suffered or will suffer an imminent injury as a result of climate change. However, the evolving scientific research on climate impacts provides an increasingly robust evidentiary basis for linking many types of local and individual harm to global climate change.⁹ Recognizing this, some federal and state courts have granted standing to nongovernmental organizations and individual citizens on the basis of climate change injury, particularly where plaintiffs pursue a procedural theory of standing.¹⁰ Plaintiffs that

⁵ *Massachusetts v. EPA*, 549 U.S. 497, 500 (2007).

⁶ *See, e.g.*, *Wash. Env’t Council v. Bellon*, 732 F.3d 1131, 1135 (9th Cir. 2013) (emissions from Washington power plants amounting to 6% of state’s total GHG emissions not a “meaningful contribution” to climate change), *reh’g en banc denied*, 741 F.3d 1075 (9th Cir. 2014); *Amigos Bravos v. U.S. Bureau of Land Mgmt.*, 816 F. Supp. 2d 1118, 1136 (D.N.M. 2011) (254,730 metric tons of GHGs per year that might result from the approval of 92 oil and gas leases were not a “meaningful contribution” to global climate change).

⁷ *See, e.g.*, *Comer v. Murphy Oil USA*, 585 F.3d 855, 864 (5th Cir. 2009); *Juliana v. United States*, 339 F. Supp. 3d 1062, 1096 (D. Or. 2018) (rejecting a motion for summary judgment because there were genuine issues of fact, including whether plaintiffs had suffered injury-in-fact and whether the harm was redressable). *But cf.* *Juliana v. United States*, 947 F.3d 1159 (9th Cir. 2020) (dismissing case because relief sought was not within power of Article III courts).

⁸ *See, e.g.*, Brenda Ekwurzel et al., *The Rise in Global Atmospheric CO₂, Surface Temperature, and Sea Level From Emissions Traced to Major Carbon Producers*, 144 CLIMATIC CHANGE 179 (2017); Rachel Licker et al., *Tracing Fossil Fuel Companies’ Contribution to Climate Change and Ocean Acidification* (UCS 2019).

⁹ *See* Michael Burger et al., *The Law and Science of Climate Change Attribution*, 5 COLUM. J. ENV’T L. 57 (2020).

¹⁰ *See, e.g.*, *Ctr. for Biological Diversity v. U.S. Dep’t of Interior*, 563 F.3d 466, 479 (D.C. Cir. 2009) (petitioners had procedural standing for both their OCSLA- and NEPA-based climate change claims); *Funk v. Wolf*, 144 A.3d 228, 247

are pursuing multiple claims can also establish standing to sue based on other types of injuries, such as local pollution impacts or loss of recreational opportunities, and then raise their climate claims in the same case.¹¹

III. Cases Involving Regulation of GHG Emissions Under Climate and Air Pollution Statutes

At the federal level, GHG emissions are currently regulated as air pollutants under the Clean Air Act. At the state level, GHG emissions may be regulated under administrative frameworks explicitly aimed at addressing climate change or other air pollution laws.¹² Some local governments have also enacted laws aimed at controlling GHG emissions, although these laws primarily deal with land uses rather than pollution control requirements for stationary or mobile sources. The Clean Air Act does not preempt state or local regulation of GHG emissions from stationary sources or land uses; it merely creates a regulatory “floor” for such sources. However, the Act does preempt states from regulating motor vehicle emissions unless California is granted a waiver for more stringent controls.¹³

When courts are reviewing agency obligations under climate and air pollution statutes, they may encounter arguments about climate science in two contexts:

- **Government defense of GHG regulations:** Agency obligations to regulate pollutants may be triggered by an administrative finding of public harm or endangerment. In regulatory documentation, agencies will often justify GHG pollution controls by using climate science to demonstrate a causal link between emissions from the regulated source category and public endangerment.
- **Plaintiffs seeking GHG regulations:** Plaintiffs may use climate science to establish that unregulated GHG emissions are causing public endangerment and thus that a government agency has a legal obligation to regulate GHG emissions from a source category.

In either context, courts will confront the same scientific issue: is there evidence that GHG emissions from the source category are causing or contributing to public endangerment or another

(Pa. Commw. Ct. 2016), *aff'd*, 638 Pa. 726, 158 A.3d 642 (2017) (individuals had standing to sue Public Utility Commission for inadequate CO₂ regulation based on climate-related injuries); *Kanuk ex rel. Kanuk v. State*, Dep’t of Nat. Res., 335 P.3d 1088, 1092 (Alaska 2014) (youth plaintiffs had standing to sue over inadequate GHG regulation because they had alleged injuries from climate change that were both specific and personal); *Juliana v. United States*, 339 F. Supp. 3d 1062, 1096 (D. Or. 2018) (plaintiffs were able to establish standing to survive motions to dismiss and for summary judgment, but the case was dismissed on appeal due to separation-of-powers concerns). *But cf.* *Juliana v. United States*, 947 F.3d 1159 (9th Cir. 2020) (dismissing case on separation-of-powers grounds, but noting that plaintiffs also failed to establish redressability for standing because the relief sought was not within the power of the court).

¹¹ *See, e.g.*, *WildEarth Guardians v. Jewell*, 738 F.3d 298 (D.C. Cir. 2013) (plaintiffs had standing to challenge inadequate NEPA analysis of climate change impacts based on their members’ aesthetic and recreational injuries caused by local pollution); *High Country Conservation Advocs. v. United States Forest Serv.*, 52 F. Supp. 3d 1174, 1187 (D. Colo. 2014) (plaintiffs had standing to challenge coal mining action based on injury to recreational interests); *WildEarth Guardians v. United States Bureau of Land Mgmt.*, 870 F.3d 1222, 1231 (10th Cir. 2017) (plaintiffs had standing to sue over mining leases based on aesthetic and recreational interests).

¹² *See, e.g.*, California Global Warming Solutions Act (2006), Massachusetts Global Warming Solutions Act (2008); New York Climate Leadership and Community Protection Act (2019).

¹³ Clean Air Act § 209, 42 U.S.C. § 7543. If the waiver is granted, other states may adopt California’s motor vehicle emission standards under § 177.

cognizable harm under the statute? This analysis is similar to that which is performed for standing, although the procedural posture is different.

Massachusetts v. EPA provides an example of how plaintiffs used climate science to argue for regulating GHG emissions under the federal Clean Air Act (see Box 1, above). As governments have made progress with regulating GHG emissions, there have been more lawsuits involving government defense of GHG control measures.¹⁴ For example, EPA relied on climate science and source attribution data in order to defend its determination that GHG emissions from motor vehicles endangered public health and welfare (Box 2).

Where statutes require government agencies to establish emission standards that reflect available pollution control measures, climate science may factor into a court's assessment of whether those standards have a rational basis. For this purpose, courts may refer to research on the availability, efficacy, cost, and feasibility of GHG mitigation techniques for various source categories. Climate attribution research and predictive science may also provide insight on the efficacy and impact of control measures.¹⁵

¹⁴ See, e.g., *Coalition for Responsible Regulation v. EPA*, 684 F.3d 102 (D.C. Cir. 2012) (upholding EPA's 2009 GHG endangerment finding); *Green Mountain Chrysler Plymouth Dodge Jeep v. Crombie*, 508 F. Supp. 2d 295, 320 (D. Vt. 2007) (court relied on expert testimony on the nature and risks of global warming in upholding Vermont's adoption of CA motor vehicle emissions standards).

¹⁵ See, e.g., *Am. Lung Ass'n v. Env't Prot. Agency*, 985 F.3d 914, 935-36 (D.C. Cir. 2021) (vacating EPA's "Affordable Clean Energy Rule" because it did not reflect the "best system" of GHG mitigation and was therefore insufficiently protective of public health).

Box 2: The Role of Climate Science in Justifying EPA’s GHG Endangerment Finding

In 2009, EPA issued an “endangerment finding” in which it concluded that GHG emissions threaten the public health and welfare of current and future generations. It also issued a “cause or contribute” finding in which it determined that GHG emissions from motor vehicles contributed to dangerous concentrations of GHGs in the atmosphere. These two findings provided the foundation for EPA to regulate GHGs from motor vehicles under § 202 of the Clean Air Act.

The U.S. Court of Appeals for the District of Columbia (D.C.) Circuit upheld both determinations in 2012, finding that they were supported by “substantial” evidence amassed through decades of scientific research on climate change. *Coalition for Responsible Regulation v. EPA*, 684 F.3d 102 (D.C. Cir. 2012). EPA’s finding was supported by data demonstrating a link between motor vehicle emissions and climate change impacts such as:

- Increases in extreme heat and heat-related mortality
- Increases in the frequency and severity of extreme precipitation, severe storms, and flooding
- Air quality effects, including increases in ground-level ozone pollution (smog)
- Increases in the spread of food- and waterborne illnesses and insect-borne diseases
- Adverse impacts on agriculture, forestry, and food production
- Adverse impacts on water quality and supply
- Sea-level rise, higher storm surge, and flooding

The court upheld EPA’s reliance on assessment reports issued by the IPCC, U.S. Global Change Research Program, and the National Research Council, finding that these “peer-reviewed assessments synthesized thousands of individual studies on various aspects of greenhouse gases and climate change” and thus provided valuable evidence to support EPA’s determination. The court found that it was reasonable for EPA to rely on IPCC assessments even though some of the studies referenced therein were not peer-reviewed because: (i) the IPCC assessment relied on around 18,000 studies that *were* peer-reviewed, (ii) petitioners had not “uncovered a ‘pattern’ of flawed science” which undermined the endangerment finding. The court also rejected petitioners’ argument that there was too much uncertainty about the harms of climate change to support EPA’s determination.

IV. Consideration of Climate Science in Environmental Review, Permitting, and Land Use Litigation

Courts frequently confront questions about government obligations to account for climate science in cases involving environmental reviews, permitting, and land use decisions. These cases typically deal with one or both of the following questions: (i) whether the government has adequately assessed GHG emissions from the project under review, and (ii) whether the government has considered how climate change is affecting or will affect local environmental conditions where the project is located (and how this may influence the project and its environmental impacts). These issues most often arise in litigation involving environmental impact assessment (EIA) laws, particularly the National Environmental Policy Act (NEPA), and so this section focuses on EIA cases. But climate science can also play a very similar role in permitting and land use litigation.

A. Obligations to Assess GHG Emissions From Project Authorizations and Land Use Decisions

NEPA and state EIA laws require government agencies to assess the direct, indirect, and cumulative environmental effects of proposals undergoing environmental review.¹⁶ Agencies may also have comparable review requirements under other planning and permitting laws.

Courts have consistently held that GHG emissions qualify as an “effect” that must be disclosed in federal NEPA reviews (Box 3, next page). NEPA requires federal agencies to take a “hard look” at the GHG emissions from the proposed action as well as reasonable alternatives considered in NEPA documentation.¹⁷ GHG impacts are to be considered in proportion to their significance—e.g., the NEPA documentation for a project with a sizeable GHG contribution, such as the expansion of a coal mine, should include a meaningful assessment of projected emissions impacts and available GHG mitigation measures, and a comparative evaluation of GHG impacts from the preferred action and reasonable alternatives, including a “no action” alternative. The agency’s

¹⁶ 87 Fed. Reg. 23453 (Apr. 20, 2022).

¹⁷ For more on NEPA requirements related to climate change, see CEQ, *Final Guidance on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change* (issued Aug. 1, 2016; withdrawn Apr. 5, 2017; under review Feb. 19, 2021, for revision and update).

Box 3: Government Obligations to Assess GHG Emissions Under NEPA

In 2008, the U.S. Court of Appeals for the Ninth Circuit found inadequate an environmental assessment prepared by the National Highway Traffic Safety Administration (NHTSA) for failing to adequately analyze GHG contributions from proposed fuel economy standards. *Ctr. for Biological Diversity v. Nat'l Highway Traffic Safety Admin.*, 538 F.3d 1172 (9th Cir. 2008). The court held that an analysis of GHG emissions and their contribution to climate change was “precisely the kind of cumulative impacts analysis that NEPA requires agencies to conduct.” *Id.* at 1217.

Since then, courts have made it clear that the analysis and disclosure of GHG emissions is required across a broad range of proposed actions. Many such decisions have been issued in the context of proposed fossil fuel leasing and transportation projects due to the magnitude of the GHG impacts from these projects. For fossil fuel projects, courts have required disclosure of both direct emissions (e.g., from coal mining or pipeline construction) as well as indirect or “downstream” emissions from the combustion of fuels that will be produced or transported as a result of the proposed project. *See, e.g., Sierra Club v. FERC*, 867 F.3d 1357, 1374 (D.C. Cir. 2017); *WildEarth Guardians v. U.S. Bureau of Land Mgmt.*, 870 F.3d 1222 (10th Cir. 2017); *Mid States Coalition for Progress v. Surface Transportation Board*, 345 F.3d 520 (8th Cir. 2003).

Courts have also required agencies to quantify the costs of GHG emissions from fossil fuel production or other projects where they have monetized benefits. *See, e.g., Ctr. For Biological Diversity*, 538 F.3d at 1198; *High Country Conservation Advocates v. U.S. Forest Serv.*, 52 F. Supp. 3d 1174, 1191 (D. Colo. 2014).

Examples of climate science and data relevant to these cases include:

- Physical climate science linking GHG emissions from fossil fuel production, transportation, and consumption to climate change-related harms.
- GHG emissions data for specific projects, typically compiled by agencies.
- Economic research on fossil fuel production and energy markets (often used to estimate net emissions from fossil fuel projects).
- Federal estimates of the social cost of carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O), which are based on climate attribution research and predictive science. For more on the social cost of carbon, see the Risks and Costs of Climate Change Module.

analysis should be sufficiently robust and comprehensive to facilitate a reasoned determination regarding the significance of GHG emissions and climate impacts.¹⁸

There has been relatively less litigation involving obligations to evaluate and disclose GHG emissions under state EIA laws. However, the same general principles that apply in NEPA reviews typically apply to those states with robust EIA frameworks as well. Some states have also introduced more targeted regulations or guidance on the consideration of GHG emissions and climate change impacts under their EIA laws. For example, California, New York, and Massachusetts have adopted guidance explicitly requiring disclosure of direct and indirect GHG emissions from proposals

¹⁸ For a more in-depth discussion of EIA laws and climate change, see Jessica Wentz, *Environmental Impact Assessment*, GLOBAL CLIMATE CHANGE AND U.S. LAW (Michael Gerrard et al. eds, forthcoming 2022). For more on requirements for fossil fuel projects, see Michael Burger & Jessica Wentz, *Downstream and Upstream Emissions: The Proper Scope of NEPA Review*, 109 HARV. ENV'T L. REV. 109 (2017); Michael Burger & Jessica Wentz, *Evaluating the Effects of Fossil Fuel Supply Projects on Greenhouse Gas Emissions and Climate Change Under NEPA*, 44 WILLIAM & MARY ENV'T L. & POL'Y REV. 423 (2020).

undergoing EIA.¹⁹ California and Massachusetts also require agencies to adopt mitigation measures for significant GHG impacts.

For many projects, the disclosure of GHG emissions will occur pursuant to EIA laws. However, agencies may also have an obligation to disclose GHG emissions when permitting smaller projects for which a full environmental review is not required. The state of New Jersey recently enacted a law which goes a step farther, to explicitly consider whether adding a new facility will have a disproportionately negative impact on already overburdened communities. Most commonly low-income and communities of color, these are often known as environmental justice communities. The NJ law requires agencies to reject the permit application if the cumulative harm to an overburdened community is “higher than those borne by other communities” unless there is a compelling public need for the project.²⁰ The cumulative impact analysis required under this statute would presumably include GHG impacts, since climate change will act as a threat multiplier in communities that are disproportionately burdened by environmentally harmful land uses and facilities.

Climate science plays two important roles in judicial review of GHG analyses and disclosures in EIA and permitting documents. First, source attribution data and GHG estimation techniques can be used to evaluate whether it is feasible for an agency to quantify GHG emissions from a particular source or activity. Such evidence is particularly relevant in litigation involving environmental reviews where government defendants may argue that they lacked the necessary tools or data for a quantitative analysis. Second, physical climate science can be used to demonstrate the feasibility of evaluating the cumulative effects of GHG emissions on global climate change and corresponding impacts on human and natural systems. Such evidence would be relevant in cases where plaintiffs are arguing that agencies have an obligation to not only disclose GHG emissions but also evaluate how those emissions contribute to impacts such as rising temperatures and sea-level rise.

B. Obligations to Assess the Effects of Climate Change on Projects and Land Uses

Government agencies may also need to account for the effects of climate change on proposed projects and land uses when conducting environmental, permit, and plan reviews. Some of the considerations that agencies may need to address include: (i) whether and to what extent climate change will affect the environmental impacts of the proposed action, (ii) whether the proposed action will exacerbate risks or harms associated with climate change, and (iii) whether the action will be resilient to climate impacts. Box 4 (next page) illustrates how these considerations may influence agency review of specific types of projects and land use decisions.

The obligation to consider climate impacts in the environmental review context is linked to the requirement that agencies must consider both present and foreseeable future conditions in the affected environment of the proposal.²¹ This analysis of foreseeable future conditions should generally coincide with the anticipated duration of the federal action. Agencies must then use this

¹⁹ CEQA Guidelines, Cal. Code Regs. tit. 14, § 15064.4; MEPA Greenhouse Gas Emissions Policy and Protocol (2010); 6 CRR-NY 617.9(b)(5)(iii).

²⁰ N.J. STAT. ANN. § 13:1D-160.

²¹ 43 C.F.R. § 46.30.

analysis to inform their evaluation of environmental impacts from the proposal and reasonable alternatives.

Box 4: Examples of Climate Impacts Relevant to Agency Reviews of Projects and Land Uses	
Proposed Action	Considerations re: Climate Impacts
Residential development	<ul style="list-style-type: none"> • Will climate change increase the likelihood or severity of natural disasters in or near the proposed development (e.g., wildfires, floods, storms, heat waves)? • Will climate change affect the availability of water required for the development? • Will the development be exposed to sea-level rise or storm surge? • What measures can be taken to reduce risk to residents and homes? Is this an appropriate location for new residential construction?
Wastewater treatment plants/hazardous waste storage facilities	<ul style="list-style-type: none"> • Will climate change increase the risk of flooding at the facility (e.g., due to more extreme rainfall, sea-level rise, and/or storm surge)? Could this result in a release of hazardous substances into the ambient environment? • Will climate change affect other environmental conditions relevant to safe operation of the facility (e.g., heat impacts)? • What measures can be taken to reduce risk of harmful substance releases?
Electricity transmission and distribution facilities	<ul style="list-style-type: none"> • Is the infrastructure vulnerable to extreme cold, extreme heat, extreme winds, or other potential climate impacts? • Could the infrastructure exacerbate the potential for wildfire ignition (e.g., if vulnerable to extreme winds)? • What measures can be taken to make the infrastructure more resilient to extreme conditions?

The Council on Environmental Quality (CEQ) and some state agencies have adopted explicit guidance calling for consideration of climate effects and adaptation.²² For example, Massachusetts has adopted an Interim Protocol on Climate Change Adaptation and Resiliency for reviews conducted pursuant to the Massachusetts Environmental Policy Act (MEPA) which calls for the use of “the best available climate science data and projections for Massachusetts in evaluating risks and impacts associated with sea level rise, the amount, frequency and timing of precipitation, and increases in average temperature including frequency of extreme temperature events.”²³

²² See, e.g., CEQ, Final guidance (2016, *supra* note 28); New York SEQRA regulations, 6 CRR-NY 617.9(b)(5)(iii).

²³ MEPA Interim Protocol on Climate Change Adaptation and Resiliency (2021).

Courts have also begun to weigh in on the scope of agency obligations to address climate impacts and adaptation measures. Generally speaking, courts have recognized that an analysis of how climate change may affect a project and its affected environment falls within the scope of issues that should be considered under NEPA, but courts have often deferred to agencies about the proper scope and depth of this analysis (Box 5).

Box 5: Government Obligations to Assess the Effects of Climate Change on Projects Undergoing NEPA Review: Examples From the Ninth Circuit

District courts in the Ninth Circuit have remanded some NEPA documents for failure to adequately consider climate impacts. For example:

AquaAlliance v. Bureau of Reclamation: The Bureau of Reclamation violated NEPA by failing to meaningfully assess the effects of ongoing climate change on a water management project and its environmental outcomes. Although the EIS did discuss climate change, the Bureau concluded that any effects on the project would be “minimal” due to the short-term duration of the project (10 years) and therefore relied on historical conditions in its quantitative analysis of water effects. The court held that this was arbitrary and capricious based on evidence that climate change would have immediate and near-term effects on California’s water supply. 287 F. Supp. 3d 969, 1023-24 (E.D. Cal. 2018).

Conservation Congress v. U.S. Forest Service: USFS had failed to adequately evaluate alternatives that would mitigate cumulative harms to the northern spotted owl in its EA for a proposed fuel and vegetation treatment project. 235 F. Supp. 3d 1189, 1204 (E.D. Cal. 2017), *aff’d*, 775 F. App’x 298 (9th Cir. 2019). Plaintiffs asserted that “Northern spotted owl populations in the Mendocino National Forest are particularly vulnerable to population declines associated with climate change, as these populations exist at the southern-most inland portion—the hottest and the driest portion—of the species’ range.” On remand, the district court upheld USFS’s supplemental analysis of alternatives in part because it accounted for the potential effects of climate change on wildfire conditions in the project area. No. 2:13-CV-01977-JAM-DB, 2018 WL 1142199, at *6 (E.D. Cal. Mar. 2, 2018).

However, courts are often deferential to agencies about how to conduct this analysis:

Kunaknana v. U.S. Army Corps of Engineers: The Corps was required to consider whether to prepare a supplemental EIS for a Clean Water Act § 404 permit to fill certain wetlands in the National Petroleum Reserve in light of new information on how climate change would affect the project site. 23 F. Supp. 3d 1063, 44 ELR 20127 (D. Alaska 2014). On remand, the Corps prepared a supplemental information report in which it concluded that a supplemental EIS was not necessary. The district court upheld this decision on the grounds that plaintiffs had not identified any specific climate change impacts that would be relevant to the drilling pad and its environmental effects. No. 3:13-CV-00044-SLG, 2015 WL 3397150 (D. Alaska May 26, 2015).

Idaho Rivers United v. U.S. Army Corps of Engineers: The Corps had adequately evaluated how climate change would affect sediment loading in an EIS for dredge and fill work in the Lower Snake River, despite plaintiffs’ concerns that the Corps had not gone far enough in terms of evaluating the implications for the environmental effects of the proposed project. No. 2:2014cv01800 (W.D. Wash. Feb. 9, 2016).

Central Oregon Land Watch v. Connaughton: It was reasonable for USFS to conduct a qualitative analysis of the effect of climate change on stream flows in an EIS for a proposed water intake facility, despite plaintiffs’ assertion that USFS should have conducted a quantitative analysis to better inform its analysis of environmental outcomes from the facility. 696 F. App’x 816, 819 (9th Cir. 2017).

Government agencies may also need to account for the effects of climate change when issuing certain types of permits, even if a full environmental review is not required for the permitted activity. More specifically, agencies would need to consider whether climate change could affect the ability of a responsible party to comply with permit conditions (e.g., requirements pertaining to safety or environmental quality). For example:

- **Hazardous Waste Permits:** In order to obtain a hazardous waste permit under the Resource Conservation and Recovery Act (RCRA),²⁴ facility operators must demonstrate that they can meet federal safety standards pertaining to the storage and management of hazardous waste. They must also typically submit an emergency plan to ensure that hazardous waste is not released to the environment during a natural disaster or other emergency. RCRA permits and emergency plans should reflect potential risks associated with climate change, such as the increased risk of coastal flooding from sea levels, storm surge, and storm severity for facilities located on coastlines. Some states have also adopted criteria for hazardous waste permitting which explicitly recognizes the importance of accounting for climate impacts.²⁵ Like most of the statutes described in this article, RCRA includes a citizen suit provisions that could be used to ensure that government agencies account for climate risk when issuing RCRA permits.²⁶
- **Clean Water Act Permits:** The National Permit Discharge Elimination System (NPDES) program governs the issuance of permits for stormwater discharges from municipal separate storm sewer systems (“MS4s”), construction activities, and industrial activities.²⁷ These permits set effluent limitations aimed at helping to achieve and maintain water quality standards. Government agencies should account for the effects of climate change—and in particular, the extent to which climate change will exacerbate runoff pollution problems—when issuing such permits. Agencies should also account for climate impacts on hydrology when issuing § 404 permits for dredge and fill projects.²⁸

There are many other permitting contexts where an analysis of climate change impact and risks would be relevant, including but not limited to: spill prevention plans required as a condition of permits for oil and gas activities²⁹; permits for drinking water systems³⁰; and permits for land uses and development projects in areas at risk from natural hazards that will be exacerbated by climate change. In addition to suing agencies for failing to comply with statutory provisions related to the issuance of such permits, plaintiffs can also utilize citizen suit provisions to directly sue facility owners and operations for failing to account for climate risks (Box 6, next page).

²⁴ 42 U.S.C. §§ 6901-6991i.

²⁵ See, e.g., California Department of Toxic Substances Control, Hazardous Waste Permitting Criteria (2017).

²⁶ *RCRA as a Tool for Environmental Justice Communities and Others to Compel Climate Change Adaptation*, 131 HARV. L. REV. 2409 (2018).

²⁷ 33 U.S.C. § 1342 (commonly called § 402 in reference to its section in the Clean Water Act).

²⁸ See Channing Jones, *Legal Tools for Climate Adaptation Advocacy: Clean Water Act Permitting and Funding Programs* (Sabin Center for Climate Change Law 2015), for more on this topic.

²⁹ U.S. EPA, *Oil Spills Prevention and Preparedness Regulations*, <https://www.epa.gov/oil-spills-prevention-and-preparedness-regulations>.

³⁰ California Water Boards, *Climate Change*, <https://www.waterboards.ca.gov/climate/>.

Climate science plays a critical role in petitions and litigation involving these types of climate impact analyses and risk disclosures as it is used to demonstrate that the effects of climate change on a particular area, activity, or facility are reasonably foreseeable. The research may show that there is considerable uncertainty about future climate change impacts, but agencies have an obligation to

Box 6: Obligations to Assess Climate Risks and Adaptation Under the Clean Water Act and RCRA

In *Conservation Law Foundation v. ExxonMobil*, an environmental group filed a citizen suit under RCRA and the Clean Water Act against ExxonMobil and two related companies alleging that the defendants had failed to account for how climate change would affect the operation of the Everett Terminal, a marine distribution terminal in Massachusetts. No. 1:16-cv-11950 (D. Mass. 2016). The complaint asserted that ExxonMobil had not taken action to address vulnerabilities against foreseeable risks including sea-level rise, increased precipitation, increased magnitude and frequency of storm events, and higher storm surge.

- **RCRA violations:** Plaintiffs alleged the failure to prepare the Everett Terminal for these impacts created an “imminent and substantial endangerment” to public health and the environment because coastal storms and flooding could result in the release of substantial quantities of hazardous and solid wastes.
- **Clean Water Act violations:** Plaintiffs alleged that the facility was violating its NPDES permit because discharges from the facility were occurring more frequently than allowed under the permit and numeric effluent limitations were exceeded. In addition, the complaint alleged that discharges from the facility violated state water quality standards and that the facility’s stormwater pollution prevention plan and spill prevention, control, and countermeasures plan were inadequate because they failed to address climate change impacts.

As of October 2022, case is still in discovery but the pleadings illustrate how plaintiffs can use climate science in lawsuits aimed at compelling climate risk analyses and adaptation at the facility level. In their briefs, plaintiffs have relied on IPCC reports and other scientific studies as well as Exxon’s own internal documents acknowledging the risks of climate change.

account for foreseeable trends (e.g., sea-level rise) even where the precise magnitude or other characteristics of future impacts are unknown.³¹

As climate impacts become more pronounced, courts will likely confront more cases involving government obligations to evaluate and prepare for the impacts of climate change across a broad array of project approvals and land use decisions. Questions about climate impacts and resiliency may arise in judicial review of decisions about the location of transportation infrastructure, housing developments, water treatment plants, industrial facilities, and many other land uses.

³¹ NEPA requires agencies to use “[r]easonable forecasting and speculation” to evaluate impacts even when there is uncertainty about the nature and timing of those impacts. *Scientists’ Inst. for Pub. Info., Inc. v. U.S. Atomic Energy Comm’n*, 481 F.2d 1079, 1092 (D.C. Cir. 1973) (noting that the courts must therefore “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’”). *See also* *City of Davis v. Coleman*, 521 F.2d 661, 675 (9th Cir. 1975).

V. Consideration of Climate Science in Natural Resource and Public Land Management Litigation

Courts may also confront questions about climate science when reviewing the legality of government decisions involving public lands and natural resource management. As with environmental impact assessments, two types of considerations that are relevant:

- **Effect of management decisions on global climate change:** Land and resource management decisions can contribute positively or negatively to global climate change. For example, authorizations for fossil fuel extraction, timber production, and cattle grazing on public lands can cause increases in GHG emissions and/or changes in the carbon sequestration capacity of lands.³²
- **Effects of climate change on public lands and resources:** Climate change is affecting lands and natural resources across the United States. Changes in temperatures, precipitation patterns, and other climate variables are altering the biophysical characteristics of habitats; the composition, range, and health of species; and the timing of critical biological events such as spring bud burst. These changes can affect ecological integrity, resource productivity, and the delivery of critical ecosystem services.³³

Many government agencies have already begun to integrate GHG disclosures, climate change impact assessments, and adaptive management techniques into their existing planning processes. Some agencies have promulgated specific regulations or guidelines aimed at ensuring climate change-related considerations are adequately addressed in natural resource and land management plans.³⁴ But even in the absence of climate-specific rules or guidance, agencies will frequently need to account for climate change in order to satisfy other statutory mandates—particularly those pertaining to the sustainable use of lands and resources.

This is apparent when looking at the federal statutory requirements for natural resource and public lands management in the United States. Most of the natural resource management statutes do not explicitly mention “climate change.”³⁵ However, these statutes contain management directives which often cannot be fulfilled without record evidence of the agencies’ consideration of climate change. For example, the U.S. Forest Service (USFS), the Bureau of Land Management (BLM), and the National Marine Fisheries Service (NMFS) must manage resources under their jurisdiction in accordance with the principle of sustained yield—i.e., forests, rangelands, fisheries, and other resources should be used in a manner that will not impair their use and enjoyment by future generations.³⁶ Similarly, the conservation of natural resources is the primary management directive for the U.S. Fish and Wildlife Service (FWS), in its role as manager of national wildlife refuges, and

³² See, e.g., BLM Specialist Report on Annual Greenhouse Gas Emissions and Climate Trends (2020).

³³ For a detailed discussion of agency obligations to account for such impacts in natural resource management, see Jessica Wentz, *Planning for the Effects of Climate Change on Natural Resources*, 47 ELR 10220 (Mar. 2017). See also Elaine M. Brice et al., *Impacts of Climate Change on Multiple Use Management of Bureau of Land Management Land in the Intermountain West, USA*, 11 ECOSPHERE 1 (2020).

³⁴ See, e.g., USFS, *Climate Change Considerations in Land Management Plan Revisions* (2010).

³⁵ One exception is the National Forest Management Act (NFMA), which was amended in 1990 to require the U.S. Forest Service (USFS) to account for the effects of climate change when assessing the status of resources under its jurisdiction and developing recommendations for their management. 16 U.S.C. §§ 1601(a)(5), 1602(5)(F).

³⁶ 16 U.S.C. §§ 529, 742f, 1600(6); 43 U.S.C. § 1701(a)(8); 43 U.S.C. § 1732(b); 16 U.S.C. § 1802(33).

the National Park Service (NPS).³⁷ In addition, some statutes and implementing regulations explicitly require agencies to account for the future condition of resources or long-term trends in resource conditions when preparing management plans.³⁸

Climate change will affect the sustainable yield of many resources and the ability of ecosystems to recover from human disturbances and other shocks. It may also affect the efficacy of resource management and conservation methods. For example, climate change can reduce the carrying capacity of rangelands, particularly in warmer regions like the Southwest United States, and grazing practices can also contribute to GHG emissions and changes in carbon sequestration.³⁹ Similar considerations arise for other resources. Thus, in order for agencies to assess the sustainability or conservation value of management actions, they must consider the long-term effects of climate change on the resources affected by those actions as well as the potential for those actions to further exacerbate global climate change. When plaintiffs sue federal agencies for inadequate consideration of climate change in natural resource and land management decisions, they often cite violations of NEPA (or state EIA laws) as well as the statutes containing substantive management directives. Courts have adjudicated many NEPA disputes regarding agency obligations to assess the GHG impacts of fossil fuel leasing on public lands. Some lawsuits have also challenged agency failures to adequately assess GHG emissions from other types of land uses, such as timber harvests.⁴⁰

There are far fewer cases dealing with agency obligations to account for the effects of climate change on natural resources and management actions, but these types of lawsuits are becoming more common. At least four of these lawsuits have been recently filed in federal courts (Box 7, next page). The claims raised therein are similar to those raised in NEPA litigation involving disclosures of climate effects.⁴¹

Courts adjudicating these cases will be tasked with evaluating whether agencies are meaningfully engaging with climate science, consistent with the agency's obligations under NEPA and the relevant resource management statute(s). Key questions include whether agencies are giving adequate weight to climate change detection and attribution research and climate trends that are already underway,⁴² and whether agencies are paying sufficiently close attention to predictions of future climate change

³⁷ 54 U.S.C. § 100101(a); 16 U.S.C. § 668dd(a)(2).

³⁸ *See, e.g.*, 16 U.S.C. § 1853(a)(3) (fishery management plans must include an assessment of the “present and probable future condition of, and the maximum sustainable yield and optimal yield from, the fishery”); 36 C.F.R. § 219.5(a)(1) (2012) (USFS assessments must “consider and evaluate existing and possible future conditions and trends of the plan area”); 54 U.S.C. § 100704 (directing NPS to “undertake a program of inventory and monitoring of System resources to establish baseline information and to provide information on the long-term trends in the condition of System resources”).

³⁹ Jerry L. Holechek et al., *Climate Change, Rangelands, and Sustainability of Ranching in the Western United States*, 12 SUSTAINABILITY 4942 (2020).

⁴⁰ *See, e.g.*, *Conservation Nw. v. Rey*, 674 F. Supp. 2d 1232, 1253 (W.D. Wash. 2009); *Forest Pres. Soc’y v. Dep’t of Forestry & Fire Prot.*, No. A148182, 2018 WL 4091010 (Cal. Ct. App. Aug. 28, 2018); *Bark v. United States Forest Serv.*, 958 F.3d 865, 871-72 (9th Cir. 2020).

⁴¹ *See supra* Box 4.

⁴² *See, e.g.*, A. Park Williams et al., *Rapid Intensification of the Emerging Southwestern North American Megadrought in 2020–2021*, 12 NATURE CLIMATE CHANGE 232 (2022).

and the potential effects on resources (e.g., hydrologic models can be used to ascertain future effects on specific resources and management implications).⁴³

Box 7: Pending Lawsuits Involving Federal Obligations to Account for the Effects of Climate Change on Public Lands and Natural Resources

As climate change has intensified, there has been an increase in litigation aimed at compelling agencies to account for the effects of climate change when developing resource management plans and authorizing land uses. Some examples from federal land management decisions include:

- BLM and NPS have been sued for authorizing grazing activities without accounting for the effects of climate change (including drought conditions) on future water supply and rangeland capacity.⁴⁴
- BLM and FWS have been sued for failing to account for climate change when approving a land management project which included timber harvesting, and in particular, failing to consider how the timber harvest might exacerbate wildfire risk in the context of a changing climate.⁴⁵
- BLM has been sued for approving grazing activities and an off-highway vehicle use project in the Mojave Desert without adequately assessing the cumulative risk of these activities and climate change on the endangered desert tortoise.⁴⁶

BLM has been sued for authorizing expanded oil and gas leasing, in part due to inadequate analysis of GHG emissions and in part due to “BLM’s failure to define or take action to prevent the unnecessary or undue degradation of lands in the context of recognized climate impacts.”⁴⁷

VI. Consideration of Climate Science in Endangered Species Litigation

Some of the most detailed disputes regarding the use of climate science in administrative decisionmaking have occurred in the context of Endangered Species Act (ESA) litigation. Climate change poses an enormous risk to plant and animal species,⁴⁸ and thus agencies need to consider climate science when fulfilling their obligations under the ESA.⁴⁹

Both attribution science and predictive science are integral to ESA decisionmaking. Attribution science provides insights on how climate change is affecting species and habitats, the extent to which specific species are already imperiled as a result of climate change, and whether species can

⁴³ See, e.g., U.S. Bureau of Reclamation, General Modeling Information—Lower Colorado Region, <https://www.usbr.gov/lc/region/g4000/riverops/model-info.html>.

⁴⁴ See, e.g., Resource Renewal Institute v. National Park Service, No. 4:22-cv-00145 (N.D. Cal. 2022); Western Watersheds Project v. U.S. Bureau of Land Management, No. 2:21-cv-01126 (D. Ariz. 2021).

⁴⁵ Klamath-Siskiyou Wildlands Center v. U.S. Bureau of Land Management, No. 1:19-cv-01810 (D. Or. 2019).

⁴⁶ Center for Biological Diversity v. U.S. Bureau of Land Management, No. 3:21-cv-7171 (N.D. Cal. 2021).

⁴⁷ Citizens for a Healthy Community v. U.S. Bureau of Land Management, No. 1:20-cv-2484 (D. Colo. 2020).

⁴⁸ IPBES, GLOBAL ASSESSMENT REPORT ON BIODIVERSITY AND ECOSYSTEM SERVICES (2019), <https://ipbes.net/global-assessment>.

⁴⁹ For more on this topic, see Jessica Wentz, *Climate Attribution Science and the Endangered Species Act*, 39(2) YALE J. ON REG. 1042 (2022).

survive and recover within current habitat boundaries.⁵⁰ Predictive science provides insights on future climate trends and the long-term viability of species in light of those trends.⁵¹ This type of information can help support a variety of ESA management actions, including:

- Determinations as to whether a species is threatened or endangered⁵² as a result of climate change and other stressors, and estimating the population size and characteristics needed for species survival and recovery;
- Defining critical habitat boundaries, including newly occupied areas as well as unoccupied habitat for species that may need to disperse geographically in order to adapt to climate change;
- Identifying conservation and mitigation measures for species recovery plans, habitat conservation plans, and incidental take permits; and justifying protections and proactive interventions such as captive breeding and assisted migration programs for species that are at the greatest risk of extinction.

In ESA litigation, courts may confront questions about the scientific integrity of listing decisions (or denials of listing petitions), critical habitat designations, biological assessments, jeopardy determinations, and recovery plans. Courts should thoroughly evaluate the record evidence to determine whether agency conclusions are reasonable, based on a thorough examination of all relevant factors, and consistent with the “best available science” requirements of the ESA. In past litigation, courts have consistently upheld ESA protections that are predicated on climate risks (e.g., threatened species designation for the polar bear), finding that these protections reflect the best available science on climate change. Courts have also vacated some agency decisions (e.g., denials of listing petitions) where the agency has ignored climate science or failed to justify the decision in light of climate science.

A. Endangered and Threatened Species Listing Decisions

Courts have established important parameters for the use of climate science in listing decisions:

- When assessing threats to a species, the services may find “likely” risk of endangerment where climate trends are clear, even where there is significant uncertainty about the actual magnitude of future impacts. The services are not required to use a quantitative threshold for likelihood, nor do they need to use the IPCC definition of “likely” ($\geq 66\%$) even if the assessment uses data from IPCC reports.

⁵⁰ See, e.g., Cristian Román-Palacios & John J. Wiens, *Recent Responses to Climate Change Reveal the Drivers of Species Extinction and Survival*, 117(8) PNAS 4211 (2020); Abigail Cahill et al., *How Does Climate Change Cause Extinction?* PROC. R. SOC. (2013); Peter Soroye et al., *Climate Change Contributes to Widespread Declines Among Bumble Bees Across Continents*, 367 SCI. 685 (2020); Natalie Waller et al., *The Bramble Cay Melomys Melomys Rubicola (Rodentia: Muridae): A First Mammalian Extinction Caused by Human-Induced Climate Change?* 44 WILDLIFE RSCH. 9 (2017).

⁵¹ Stephano Mammola et al., *Climate Change May Drive Cave Spiders to Extinction*, 41 ECOGRAPHY 233 (2018); Péter K. Molnár et al., *Predicting Survival, Reproduction and Abundance of Polar Bears Under Climate Change*, 143(7) BIOLOGICAL CONSERVATION 1612 (2010).

⁵² An “endangered species” is “any species which is in danger of extinction throughout all or a significant portion of its range” and a “threatened species” is “any species which is likely to become an endangered species within the foreseeable future.” 16 U.S.C. § 1532(6), (20). Listing decisions must be based solely upon the species’ survival prospects and must reflect the “best scientific and commercial data available.” 16 U.S.C. § 1533(b)(1), (2).

- There is no set time frame that services must use when defining the “foreseeable” future in a threatened species listing decision; this time frame depends on available data and confidence in predictions. Courts have found sufficient data to support predictions through the second half of the 20th century (through 2100).
- Where the best available science indicates that there is a probable risk of threat to the species, the services must issue ESA protections. The services may rely on imperfect or uncertain predictions in their analysis so long as any limitations are disclosed and do not undermine the validity of technical conclusions.
- A listing of “threatened” rather than “endangered” can likely be justified, even in the face of severe climate-related threats, if the species has not yet been restricted to a critically small range or critically low numbers.

Box 8 describes some of the lawsuits that have given rise to these standards.

Box 8: The Use of Climate Science in ESA Listing Decisions

Polar bear: In 2008, FWS listed the polar bear as “threatened” due to the effects of climate change on the bear and its habitat. A lawsuit alleged that FWS’s analysis of climate impacts was too speculative and the time frame for analysis differed from the time frame used in other listing decisions. The D.C. Circuit upheld the decision, finding that: (i) it was reasonable for FWS to define the “foreseeable future” as a 45-year time frame between 2005 and 2050 based on available climate data, (ii) FWS did not need to use the numeric standard of “likelihood” used in IPCC AR4 (67-90% certainty) as the basis for its listing decision, and (iii) it was reasonable for FWS to rely on limited or imperfect models where such limitations were disclosed and did not undermine the validity of FWS’s final determination. *In re Polar Bear Endangered Species Act Listing & Section 4(d) Rule Litig.*, MDL No. 1993, 709 F.3d 1 (D.C. Cir. 2013).

Grizzly bears: In 2007, FWS removed the Yellowstone population segment of grizzly bears from the threatened species list. In its decision, FWS acknowledged that climate change had the “potential to impact several of the Yellowstone grizzly bear’s food sources” but it dismissed these risks because “the extent and rate to which each of these food sources will be impacted is difficult to foresee with any level of confidence.” On review, the Ninth Circuit found that FWS had required too high a level of scientific certainty and had failed to articulate a rational connection between the data before it—which showed that climate change could cause a serious decline in one key food source (white bark pine)—and its conclusion that such declines were not likely to threaten the Yellowstone grizzly bear. The court recognized that “scientific uncertainty generally calls for deference to agency expertise” but explained that it was insufficient for an agency to merely invoke “scientific uncertainty” to justify an action such as a delisting decision, particularly where there is evidence—however uncertain—of a threat to the species. *Greater Yellowstone Coalition, Inc. v. Servheen*, 665 F.3d 1015 (9th Cir. 2011).

Wolverines: In its proposed rule to delist a population segment of the North American wolverine, FWS asserted that it could not determine whether climate change would impact wolverine denning because: (i) the scale of future snowpack decline models was too coarse, (ii) and it was impossible to predict how the wolverine would react to changes in snow depth because the precise reason why wolverines den in deep snow is unknown. A district court held that FWS could not simply ignore the threat of declining snowpack due to imprecision, and that FWS “sought certainty beyond what is required by the ESA.” *Def. of Wildlife v. Jewell*, 176 F. Supp. 3d 975, 1002-03 (D. Mont. 2016).

B. Critical Habitat Designations

Climate science has factored into several lawsuits involving critical habitat designations, and courts often use the science to evaluate claims about the reasonableness or necessity of designating critical habitat in areas that are not presently occupied by the species. Data on how bioclimatic conditions are changing can be used to assess whether the species will be able to survive within its current range, to ascertain the short- and long-term conservation value of specific habitat areas, and to identify areas which could serve as migratory corridors or refugia for species imperiled by climate change.

Some key findings related to the use of climate science in critical habitat designations and litigation include:

- Climate science plays a key role in supporting determinations that geographic areas are “essential to the conservation of [a] species” (a statutory requirement for designation) because they contain physical or biological features that will support the long-term survival and recovery of a species as bioclimatic envelopes shift and habitat conditions change. Such areas may be located within or outside of the species’ historical range.
- Courts have held that it is legal for the services to designate unoccupied areas as critical habitat to provide for species adaptation where the data indicates that a species’ range is shifting as a result of climate change. For example, the services may designate unoccupied areas to serve as future migratory corridors and refugia. Such designations are reasonable even where it is unclear exactly how or where the species will migrate in response to climate change.⁵³
- There is an open question as to whether the services may designate unoccupied areas as critical habitat if those areas are not presently habitable by the species.⁵⁴ If “habitat” is limited to areas that are currently habitable by a species, this could constrain the services’ ability to account for future climate threats in habitat designations. However, attribution research could be used to identify areas of habitat outside of a species’ current or historical range that meet this habitability requirement while also providing long-term conservation benefits in the context of climate change.⁵⁵

Box 9 describes several lawsuits giving rise to these standards.

⁵³ See *infra* § II(B)(3) (Jaguar).

⁵⁴ See *Weyerhaeuser Co. v. FWS*, 139 S. Ct. 361 (2018) (holding that unoccupied areas must qualify as “habitat” and remanding the case for further consideration of whether unoccupied areas meet that definition).

⁵⁵ For example, attribution research can be used to evaluate whether new conditions which would make an area suitable as habitat are anomalous or part of a long-term trend that can be expected to continue.

Box 9: The Use of Climate Science in Critical Habitat Designations

Polar bear: In 2010, FWS issued a critical habitat designation for the polar bear which included a 5-mile buffer of coastal zone and land outside of known denning areas—one key goal being to give the bears more room to roam and den in light of coastal erosion and sea ice loss caused by climate change. The Ninth Circuit upheld the habitat designation, finding that FWS’s findings on climate change-related risks were reasonable in light of both observational evidence and predictive models. *Alaska Oil & Gas Ass’n v. Jewell*, 815 F.3d 544 (9th Cir. 2016).

Canada lynx: In 2009, FWS issued a revised critical habitat designation for the Canada lynx in which it recognized that “lynx distribution and habitat is likely to shift upward in elevation” due to climate change, but it declined to designate habitat in presently unoccupied areas to facilitate this range shift. A district court in Montana found that FWS had adequately supported its conclusion that the available science did not allow for climate predictions at the “appropriate scale” to enable it to designate unoccupied habitat because the science did not “provide the specificity needed to identify the location of lynx habitat in the future.” *All. for Wild Rockies v. Lyder*, 728 F. Supp. 2d 1126, 1140–43 (D. Mont. 2010).

Sage grouse: In 2014, FWS designated critical habitat for the greater sage-grouse which included unoccupied areas that would “offer[] the potential for range expansion and migration, whether associated with environmental (e.g., climate change), demographic (e.g., population growth), or catastrophic (e.g., large fires) factors.” 79 Fed. Reg. 69337 (Nov. 20, 2014). A significant portion of the habitat designation—forty-three percent—consisted of unoccupied areas. A district court in Colorado upheld the designation of critical habitat even in areas that had not been shown to be presently habitable, as it found FWS had presented adequate evidence that such areas would be essential to the future conservation of the species. *Colorado by & Through Colorado Dep’t of Nat. Res. v. FWS*, 362 F. Supp. 3d 951, 970 (D. Colo. 2018). However, the precedential effect of this case is uncertain in light of a subsequent decision from the Supreme Court. *See Weyerhaeuser Co. v. FWS*, 139 S. Ct. 361, 369 (2018) (holding that “critical habitat” must qualify as “habitat” and remanding the case for interpretation of that term).

C. Biological Assessments, Jeopardy Determinations, and Recovery Plans

The ESA contains a number of additional protections aimed at promoting the survival and recovery of species listed as endangered and threatened. These include requirements for federal agencies to ensure that their activities will not jeopardize a listed species’ survival prospects, in part through preparation of a biological opinion (BiOp) which assesses the threat to the species; a prohibition on any private activities which would result in a “taking” (i.e., harm) to species, unless they obtain an incidental take permit; and directives to FWS and NMFS to develop and implement recovery plans for species.

Litigation involving BiOps, incidental take permits, and recovery plans illustrates how attribution science can factor into judicial analyses of how specific projects and management actions may either help or harm species that are also affected by climate change. There are clear parallels to NEPA litigation: courts will evaluate whether agencies have adequately accounted for direct, indirect, and cumulative effects, including climate change, when assessing threats to species. In these cases, courts have held that:

- Agencies cannot predicate jeopardy determinations or management decisions on historical conditions where climate data suggests that conditions are changing—these determinations must reflect changing environmental baselines; and
- Agencies cannot simply dismiss climate data due to uncertainty; rather, they must consider different plausible scenarios/outcomes when justifying a federal project or a private take permit.

Box 10: Obligations to Address Climate Science in ESA BiOps and Jeopardy Determinations

NRDC v. Kempthorne, 506 F. Supp. 2d 322 (E.D. Cal. 2007): FWS’s 2005 BiOp evaluating the effects of a major water management project on the Delta smelt was remanded due to FWS’s failure to meaningfully engage with climate science. The BiOp briefly mentioned climate change, but “[did] not gauge the potential effect of various climate change scenarios on Delta hydrology” and there was “no discussion of when and how climate change impacts will be addressed, whether existing take limits will remain, and the probable impacts on CVP–SWP operations.” The court noted that there were “at least half a dozen models” for predicting climate impacts in California and these “sophisticated regional climate models” constituted the “best available scientific data” under the ESA.

Oceana, Inc. v. Pritzker, 125 F. Supp. 3d 232 (D.D.C. 2015): NMFS’s 2014 BiOp evaluating the effect of operating seven fisheries on loggerhead sea turtles was remanded due to NMFS’s arbitrary conclusions regarding the implications of short-term climate impact. NMFS had argued that the effects of climate change would be seen primarily on a “century scale” and concluded that “it is unlikely that climate related impacts will have a significant effect on the status of . . . sea turtles . . . in the short-term future.” The court found that the BiOp contradicted NMFS’s position, as it contained “clear evidence that climate change is exerting significant environmental impacts right now, as well as evidence that these impacts will persist or accelerate in the immediately approaching decades.” The court specifically noted that the loggerheads would be affected in both the present and near future by sea-level rise, which would “result in increased erosion rates along nesting beaches.”

Nat’l Wildlife Fed’n v. NMFS, 184 F. Supp. 3d 861 (D. Or. 2016): NMFS’s 2014 BiOp evaluating the effects of the Federal Columbia River Power System on sockeye and chinook salmon was remanded because NMFS had failed to discuss the “additive harm” of climate change, how it may reduce the effectiveness of habitat conservation measures that were not expected to achieve full benefits for decades, and how it may increase the probability of events that would be “catastrophic” for the survival of affected endangered and threatened species. The court also found that NMFS had dismissed a “warm ocean scenario” without adequate explanation as to why it was not representative of expected future climate conditions, particularly in light of comments suggesting that even the warm scenario may underestimate future temperature increases.

- Agencies cannot limit their analysis to the direct effects of climate change on the species. They must consider how climate change will affect the specific project or action under review and whether this has implications for how the action will then affect the species—e.g., by exacerbating harmful impacts or undermining mitigation measures used to justify a no jeopardy determination.

Box 10 illustrates how courts have handled claims related to climate science in cases involving BiOps and jeopardy determinations.

VII. Conclusion

There are many contexts in which government agencies have obligations to account for climate science in administrative decisionmaking. It is increasingly difficult for agencies to survive judicial review when they ignore or devalue climate change-related considerations on the basis of uncertainty about climate impacts. As illustrated throughout this module, scientific research has provided important data that can be used to inform a wide array of administrative decisions and disclosures. And even where there is considerable uncertainty about the future trajectory or magnitude of climate impacts, agencies have tools such as scenario planning available to evaluate plausible futures and the reasonableness of administrative decisions under different scenarios.

When courts are reviewing agency action, they apply the appropriate level of deference to agencies' scientific analyses and technical conclusions. However, courts also play a key role in determining whether an agency has meaningfully engaged with climate science and whether the agency's interpretation of the science is reasonable. Courts have already played an important role in promoting the sound utilization of climate science by government agencies, particularly in the context of NEPA disclosures and ESA actions. In the future, as climate change becomes more severe, courts are likely to confront climate science-related claims across an even broader array of government actions.