Summary of Sabin Center Comments on the Draft Fifth National Climate Assessment
January 27, 2023

On January 27, 2023, the Sabin Center submitted comments on the draft Fifth National Climate Assessment. Those comments, which are attached as Exhibits A-E, highlighted key gaps in the draft Assessment and suggested additions and changes to address those gaps. Below is a brief description of (A) the purpose and scope of the National Climate Assessment and (B) the substance of the Sabin Center's comments.

A. Scope and Purpose of the National Climate Assessment

The Global Climate Change Research Act of 1990 established the U.S. Global Change Research Program (the "Program") for the purpose of "developing and coordinating a comprehensive and integrated United States research program which will assist the Nation and the world to understand, assess, predict, and respond to human-induced and natural processes of global change." *See* Public Law 101-606 (11/16/90) 104 Stat. 3096-3104, § 101(b). Thirteen federal entities participate in the Program. Participating entities include the U.S. Department of Agriculture, Department of Defense, Department of Energy, Department of the Interior, Environmental Protection Agency, National Science Foundation, and the Smithsonian Institution, among others.

The Global Change Research Act requires the Program to prepare and submit to the President and Congress a National Climate Assessment at least once every four years that:

> "1. Integrates, evaluates, and interprets the findings of the Program and discusses the scientific uncertainties associated with such findings
>
> "2. Analyzes the effects of global change on the natural environment, agriculture, energy production and use, land and water resources, transportation, human health and welfare, human social systems, and biological diversity
>
> "3. Analyzes current trends in global change, both human-induced and natural, and projects major trends for the subsequent 25 to 100 years."

Id. § 106. The Fourth National Climate Assessment was published in November 2018. The Fifth National Climate Assessment is currently in development and is expected to be finalized later this year.

B. The Sabin Center's Comments on the Draft Fifth National Climate Assessment

The Sabin Center submitted 10 sets of comments on the draft Fifth National Climate Assessment. Those comments focused on the five topics described below and included the following highlights:

- **Climate Change Resilience Planning in the Energy Sector**: In one set of comments on Chapter 5 (Energy), we explained that costly investments are not the only tool for enhancing climate change resilience; rather, there are many non-capital-intensive actions, such as operational changes, planning updates, and/or design modifications with important resilience benefits. We explained that effective planning is essential to ensure that actions to enhance resilience are pursued in the most cost effective and efficient manner. We specifically urged the authors to acknowledge the need for effective climate resilience planning and to discuss the limited extent of such planning today by electric utilities, system operators, and others in the energy industry. *See* Cmt. No. 175564, which is attached as Exhibit A.

- **Carbon Dioxide Removal (CDR)**: In four sets of interrelated comments on Chapter 10 (Oceans) and Chapter 32 (Mitigation), we offered suggestions for improving the discussion of CDR techniques, including by: (1) proposing academic literature on political and legal considerations for inclusion in the report; (2) urging the authors to note the need for additional research into political considerations and public acceptance; and (3) urging the authors to acknowledge the urgency of the need for research into ocean-based CDR in light of the growing scientific consensus that carbon management—and specifically CDR—will need to be deployed to stabilize Earth's climate. *See* Cmt. Nos. 175565, 175566, 175567, and 175572, which are attached as Exhibit B.

- **Barriers to Climate Action by Local Governments**: In one set of comments on Chapter 12 (Built Environment), we noted that the subsection on opportunities for climate mitigation and adaptation in urban areas was lacking analysis of the very concrete ways that local governments face legal barriers to climate policy adoption and implementation, including: (1) by state preemption and shaping of local law; (2) fear of litigation and protracted controversy; and (3) limited staff legal capacity. We explained that each of these factors makes it less likely that local governments will undertake the ambitious climate policies described throughout the chapter. *See* Cmt. No. 175577, which is attached as Exhibit C.

- **Legal Mechanisms for Overcoming Obstacles to Siting Renewable Energy Facilities**. In one set of comments on Chapter 32 (Mitigation), we noted the discussion of strategies to overcome local opposition to renewable energy facilities was incomplete. In particular the authors identified community engagement as a way to overcome opposition but did not address the actions that states or the federal government could take. For example, state legislatures can circumvent obstacles to siting renewable energy facilities by enacting legislation that includes one or more of the following features: (1) vesting state government entities rather than local governments with decision-making authority over siting decisions; (2) vesting state government entities with authority to set aside unreasonable local restrictions; (3) setting limits on the restrictions that local governments can impose on renewable energy facilities; and (4) imposing statutory deadlines for government decision-makers to reach decisions throughout the permitting process. We further noted that the federal government can impose limits on local restrictions, similar to how the Telecommunications Act of 1996 limited (but did not eliminate) the ability of local governments to block cell phone towers. *See* Cmt. No. 175568, which is attached as Exhibit D.

- **Relative Land Use Requirements and Climate Change Benefits of Solar Energy and Biofuels**: In three sets of interrelated comments on Chapter 6 (Land Cover and Land-Use Change), Chapter 11 (Agriculture, Food Systems, and Rural Communities), and Chapter 32 (Mitigation), we offered recommendations for supplementing the analysis of the purported "competition for land between renewables and agriculture." In particular, we suggested the authors note that: (1) solar and wind energy projects use relatively little agricultural land compared to the production of biofuels; (2) photovoltaic solar delivers far more energy per acre than corn ethanol; (3) corn ethanol delivers few, if any, climate change benefits; (4) any competition between renewables and agricultural uses can be mitigated by deploying systems that produce energy and agricultural products on the same land (*e.g.*, agrivoltaics); and (5) despite the relative efficiency of solar energy projects, certain state and local governments have taken legislative action to limit or exclude large-scale solar energy projects from some or all agricultural land within their respective jurisdictions.[1] *See* Cmt. Nos. 175569, 175570, and 175571, which are attached as Exhibit E.

Please see the following pages for the complete collection of comments.

[1] There is considerable overlap among these three sets of comments, which is primarily due to the fact that the commenting platform does not permit cross references among comments.

EXHIBIT A

Sabin Center Comments on Climate Change Resilience Planning

Cmt. No. 175564

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Comment ID: 175564 **User ID:** 54368

Chapter: 05. Energy
Pages: 12 - 14 **Lines:** 1 - 5

The summary of "Key Message 5.3" concludes that "[i]nvestments are being made to increase the resilience of the energy system, and opportunities exist to build upon these efforts (likely, high confidence)." The summary and following subsections note that a wide variety of actions can be taken to enhance energy system resilience. While some such actions require "investments," there are also a range of non-capital-intensive actions, such as operational changes, planning updates, and/or design modifications that can have important resilience benefits. Pursuing these approaches can have significant benefits for end-consumers, enabling resilience measures to be implemented more quickly and at lower cost. See e.g., Alison Silverstein et al., A Customer-focused Framework for Electric System Resilience (2018), https://media.rff.org/documents/RFF20R20Street20Resilience20Workshop20Silverstein20Slides.pdf. This should be noted in Chapter 5.

Effective planning is essential to ensure that actions to enhance resilience are pursued in the most cost effective and efficient manner. The subsection on “Planning for Energy System Resilience” notes that "[m]odeling advances are improving understanding of climate change impacts" on the energy system. Energy industry participants increasingly have access to datasets, tools, and other resources that can be used in planning for the impacts of climate change on their systems. There are, for example, a number of publicly accessible repositories of downscaled probabilistic data on key climate parameters relevant to electric system planning (e.g., temperature and precipitation). See e.g., Climate Mapping for Resilience and Adaptation, https://resilience.climate.gov/; Regional Climate Change Viewer, https://www.usgs.gov/tools/national-climate-change-viewer-nccv; Cal-Adapt, https://cal-adapt.org/; Great Lakes Regional Climate Change Maps, https://glisa.umich.edu/great-lakes-regional-climate-change-maps/.

Notwithstanding the above, many in the energy industry are still not using available datasets and other resources and tools to plan for the impacts of climate change. Consider the electric sector, for example. The Department of Energy and others have recommended that electric utilities engage in a process of climate resilience planning. This is a two-step process involving: (1) a climate vulnerability assessment which uses forward-looking climate projections to assess where and under what conditions utility assets and operations are at risk from climate change, and (2) development of a climate resilience plan which evaluates measures to mitigate the risk to vulnerable assets. See generally, U.S. Department of Energy, Climate Change and the Electricity Sector: Guide for Climate Resilience Planning (2016), https://toolkit.climate.gov/sites/default/files/Climate%20Change%20and%20the%20Electricity%20Sector%20Guide%20for%20Climate%20Change%20Resilience%20Planning%20September%202016_0.pdf; California Public Utilities Commission, Climate Adaptation in the Electric Sector: Vulnerability Assessments and Resilience Plans (2016), http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId=%7B5C0800F7-8853-4AAF-947D-9C26AA98FE0C%7D; Justin Gundlach and Romany Webb, Climate Change Impacts on the Bulk Power System: Assessing Vulnerabilities and Planning for Resilience (2018), https://climate.law.columbia.edu/sites/default/files/content/docs/Gundlach-Webb-2018-02-CC-Bulk-Power-System.pdf.

There are relatively few examples of electric utilities preparing comprehensive climate vulnerability assessments and resilience plans. See generally, Romany M. Webb et al., Climate Risks in the Electricity Sector: Legal Obligations to Advance Climate Resilience Planning by Electric Utilities, 51 Environmental Law Review 577, 594-599 (2021). Many electric utilities have rejected calls for them to engage in climate resilience planning, often on the basis that local climate impacts are too speculative or uncertain to plan for. See id. at 595-596. Of course, there is some uncertainty in future climate projections, but that is not a reason to avoid climate resilience planning. On the contrary, it makes it all the more important. In this regard, it is important to note that while electric utilities have always had to deal with weather- and environment-related risks, climate change presents fundamentally different challenges to those encountered in the past. The impacts of climate change are likely to affect the electric system in multiple, compounding, and synergistic ways that will be more difficult for electric utilities and system operators to manage. Preparing for these impacts thus requires a new approach to planning. See id. at 592-593.

The subsection on "Planning for Energy System Resilience" does not include any discussion of the need for effective climate resilience planning. Nor does it discuss the limited extent of such planning by electric utilities, system operators, and others in the energy industry. This should be added.

It should also be noted that some regulatory bodies have recognized the need for improved climate resilience planning in the energy sector and taken steps to require or encourage such planning. One example is the California Public Utilities Commission, which, in August 2020, directed the state's investor-owned energy utilities to prepare and regularly update "climate vulnerability assessments" evaluating risks to their assets, operations, and services from changing temperatures and precipitation patterns, sea level rise, wildfire, and "cascading impacts / compounding incidents." See California Public Utilities Commission, Decision on Energy Utility Climate Change Vulnerability Assessments and Climate Adaptation in Disadvantaged Communities (Phase 1, Topics 4 and 5), Rulemaking 18-04-019 (Aug. 27, 2020). More recently, in June 2022, the Federal Energy Regulatory Commission proposed to require electricity transmission providers to file one-time informational reports describing their current or planned policies and processes for conducting extreme weather vulnerability assessments. See Federal Energy Regulatory Commission, One-Time Informational Reports on Extreme Weather Vulnerability Assessments, Docket Nos. RM22-16-000 and AD21-13-000 (June 16, 2022). These actions could provide a model for other regulators to follow.

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EXHIBIT B

Sabin Center Comments on Carbon Dioxide Removal (CDR)

Cmt. Nos. 175565, 175566, 175567, and 175572

NCA5 Third Order Draft: Public Review

Comment ID: 175565 **User ID:** 54368

Chapter: 32. Mitigation
Page: 18 **Lines:** 9 - 17

The title of Key Message 32.3 correctly notes that additional climate mitigation options, including carbon capture and removal, need to be explored. The body of text does not address this point, however. Instead, the text emphasizes the uncertainty of technological progress, public acceptance, and other future developments with respect to carbon capture and removal. The text should note the urgent need for research into these issues, particularly given the growing scientific consensus that carbon management, and specifically carbon dioxide removal (CDR), will need to be deployed to stabilize Earth's climate. According to the IPCC, "deployment of CDR to counterbalance hard-to-abate residual emissions is unavoidable if net zero . . . emissions are to be achieved." Jim Skea et al., Climate Change 2022: Mitigation of Climate Change. Working Group III Contribution to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change SPM-27 (Intergovernmental Panel on Climate Change, 2022), https://www.ipcc.ch/report/ar6/wg3/downloads/report/IPCC_AR6_WGIII_SPM.pdf. The following is possible language for inclusion: Because carbon management is necessary to achieve net-zero emissions, technological, scientific, policy, and legal research is needed to reduce these uncertainties.

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Comment ID: 175566 **User ID:** 54368

Chapter: 32. Mitigation
Pages: 21 - 23 **Lines:** 7 - 9

This section needs additional information on public acceptance and political considerations. The introduction paragraph correctly identifies that "[t]he degree and form of CDR deployment . . . remain highly uncertain, though, and depend on technological readiness, economics, public acceptance, and political considerations (Box 32.2)." However, Box 32.2 focuses mostly on technological readiness and economics and devotes no text to public acceptance and political considerations.

The authors should add text on political considerations that require more research. In particular, text should be added on the need for further research into the legal context for CDR, including which level of government is best suited to govern CDR, see, e.g., Korey Silverman-Roati et al., Removing Carbon Dioxide Through Seaweed Cultivation: Legal Challenges and Opportunities (2021), https://scholarship.law.columbia.edu/faculty_scholarship/2980/, whether / how existing laws may constrain and/or facilitate development of CDR, and new legal frameworks that might be needed. While some research has explored these and other legal issues, significant questions remain. See, e.g., Romany Webb, The Law of Enhanced Weathering for Carbon Dioxide Removal (2020), https://scholarship.law.columbia.edu/sabin_climate_change/46/; Korey Silverman-Roati et al., Removing Carbon Dioxide Through Ocean Fertilization: Legal Challenges and Opportunities (2022), https://scholarship.law.columbia.edu/faculty_scholarship/3637/; Romany M. Webb et. al., Removing Carbon Dioxide Through Artificial Upwelling and Downwelling: Legal Challenges and Opportunities (2022), https://scholarship.law.columbia.edu/faculty_scholarship/3337/.

The authors should also add text on the need for better understanding of public acceptance of CDR, including the need for consultations with local communities, see, e.g., Jacob A.E. Nielsen, Community acceptance and social impacts of carbon capture, utilization and storage projects: A systematic meta-narrative literature review, 17 PLoS One (2022), https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9345485/, and the impact social acceptance can have on the development of CDR technology. See, e.g., Emily Cox et al., Public perceptions of carbon dioxide removal in the United States and the United Kingdom, 10 Nature Climate Change 744 (2020), https://www.nature.com/articles/s41558-020-0823-z. Another missing public acceptance piece is the potential for land use conflicts, especially in regards to bioenergy with carbon capture and storage (BECCS) deployment. See Kevin Anderson and Glen Peters, The trouble with negative emissions, 354 Science (2016), https://www.science.org/doi/10.1126/science.aah4567.

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Chapter: 32. Mitigation
Pages: 22 - 23 **Lines:** 33 - 3

This paragraph should clarify the type of additional research that is needed in order to better understand and prioritize ocean-based CDR. The NASEM Research Strategy for Ocean-based Carbon Dioxide Removal and Sequestration's recommendations provide an excellent starting point. Scott C. Doney et al., A Research Strategy for Ocean-based Carbon Dioxide Removal and Sequestration (National Academy of Sciences, Engineering, and Medicine, 2022), https://nap.nationalacademies.org/read/26278/chapter/1. As the NASEM report notes, most current knowledge of ocean-based CDR comes from laboratory-scale studies, so in-ocean research is needed to better understand the techniques. Id. at 239. Prior studies indicate that, under existing law, some ocean CDR research projects may be subject to multiple overlapping or duplicative permit and other requirements. The time, cost, and complexity associated with navigating those requirements could hinder or entirely prevent some needed ocean CDR research. See, e.g., Korey Silverman-Roati et al., Removing Carbon Dioxide Through Seaweed Cultivation: Legal Challenges and Opportunities (2021), https://scholarship.law.columbia.edu/faculty_scholarship/2980/. Conversely, other ocean CDR research may not be adequately regulated under existing law, with prior studies identifying key gaps and shortcomings that could create opportunities for "rogue actors" to pursue projects that are not scientifically sound and/or present unacceptable risks to the environment or communities. Romany M. Webb et al., Removing Carbon Dioxide Through Ocean Alkalinity Enhancement: Legal Challenges and Opportunities (2021), https://scholarship.law.columbia.edu/faculty_scholarship/2739/; Korey Silverman-Roati et al., Removing Carbon Dioxide Through Ocean Fertilization: Legal Challenges and Opportunities (2022), https://scholarship.law.columbia.edu/faculty_scholarship/3637/. As the NASEM report notes, "[f]urther study is needed to identify and analyze the full range of potentially applicable laws, explore gaps in and barriers created by the application of those laws to ocean CDR, and evaluate possible alternative approaches to regulation." Scott C. Doney et al., A Research Strategy for Ocean-based Carbon Dioxide Removal and Sequestration at 243 (National Academy of Sciences, Engineering, and Medicine, 2022), https://nap.nationalacademies.org/read/26278/chapter/1.

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Comment ID: 175572 **User ID:** 54368

Chapter: 10. Oceans
Pages: 13 - 14 **Lines:** 37 - 2

This paragraph should clarify the type of evaluation that is being done on ocean-based CDR techniques. The authors should clarify that projects are evaluating both the economic and technological feasibility of the techniques (this could use the studies already cited), alongside public acceptance and political considerations. For political consideration research, the authors could cite to research into the legal framework applicable to ocean CDR, see, e.g., Scott C. Doney et al., A Research Strategy for Ocean-based Carbon Dioxide Removal and Sequestration (National Academy of Sciences, Engineering, and Medicine, 2022) https://nap.nationalacademies.org/read/26278/chapter/1, and the varied levels of federal, state, and local regulation of ocean CDR. See, e.g., Korey Silverman-Roati et al., Removing Carbon Dioxide Through Seaweed Cultivation: Legal Challenges and Opportunities (2021), https://scholarship.law.columbia.edu/faculty_scholarship/2980/. For public acceptance, the authors could cite to research on public acceptance of ocean CDR, see, e.g., Christine Bertram and Christine Merk, Public Perceptions of Ocean-Based Carbon Dioxide Removal: The Nature-Engineering Divide?, Frontiers in Climate (2020), https://www.frontiersin.org/articles/10.3389/fclim.2020.594194/full, and model codes of conduct for ocean-CDR research, see, e.g., Rebecca Loomis et al., A Code of Conduct Is Imperative for Ocean Carbon Dioxide Removal Research, Frontiers in Marine Science (2022), https://www.frontiersin.org/articles/10.3389/fmars.2022.872800/full.

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EXHIBIT C

Sabin Center Comments on Barriers to Climate Action by Local Governments

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Comment ID: 175577 **User ID:** 54368

Chapter: 12. Built Environment
Pages: 17 - 18 **Lines:** 23 - 4

The subsection on opportunities for climate mitigation and adaptation in urban areas identifies several barriers to climate action by local governments, including the long duration of planning processes, financial constraints, knowledge gaps, and others. Missing from this analysis are the very concrete ways that local governments can face legal barriers to climate policy adoption and implementation: (1) by state preemption and shaping of local law; (2) fear of litigation and protracted controversy; and (3) limited staff legal capacity. Each of these factors makes it less likely that local governments will undertake the ambitious climate policies described throughout Chapter 12.

With respect to point (1) above, when considering local authority to act on climate, it is important to note that all local governments are merely "creatures of the state" in which they are located. In the words of the Supreme Court, "A municipal corporation is simply a political subdivision of the State, and exists by virtue of the exercise of the power of the State through its legislative department. The legislature could at any time terminate the existence of the corporation itself, and provide other and different means for the government of the district comprised within the limits of the former city. The city is the creature of the State." Trenton v. New Jersey, 262 U.S. 182, 189-90 (1923). In establishing the U.S.'s federalist system, the Constitution allocated certain powers to the federal and state levels of government, but was silent on local governments. States, then, established local subdivisions with their own governing bodies to oversee aspects of governance more appropriate (by whatever measure) for a smaller geographic entity. Before getting to the substance of the state law limitations on local authority, then, it should be acknowledged that this fifty-state multiplicity of jurisdictions gives rise to confusion within local jurisdictions unclear on their authority to adapt climate mitigation policies enacted in municipalities in other states. For example, many local governments are currently considering all-electric building construction requirements, as enacted by dozens of municipalities in California, and building performance standards to regulate existing building energy use and carbon emissions, as in place in New York City, St. Louis, Washington, D.C. and elsewhere. In both instances, local governments in other states face significant questions about how to adapt these policies to their own local legal contexts. For more on the kinds of legal questions local governments can face with respect to authority to enact climate policy, see Amy E. Turner and Michael Burger report Cities Climate Law: A Legal Framework for Local Action in the U.S. (2021), https://scholarship.law.columbia.edu/sabin_climate_change/2/ and Amy Turner, Legal Considerations for Urban Climate MItigation Policies (2019) https://blogs.law.columbia.edu/climatechange/2019/10/29/legal-considerations-for-urban-carbon-mitigation-policies/.

Turning now to the substance of how state law informs local climate policy, some states' laws are particularly restrictive of local government action in the climate space. For example, in many states, local governments do not have the authority to amend or augment building codes, building energy codes, or other construction requirements at the local level. In these places, local governments, with some limited exceptions, must conform to statewide building codes, some of which are outdated when compared to the most energy efficient, and climate-aware provisions of model codes set by independent code-setting organizations. Preemption of local construction standards by a statewide building code can do more than just bar a local government from amending the building code at the local level; it can also be far-reaching enough to knock out local requirements that are not construction requirements, but that a court or other decisionmaker nonetheless determines should be preempted by the statewide building code. For example, the town of Brookline, Massachusetts enacted (1) a prohibition on natural gas connections to new buildings, and (2) zoning provisions incentivizing all-electric construction. Upon review of these local ordinances, the Massachusetts Attorney General's office struck them down due to preemption by various state laws, including the statewide building code. See Amy Turner, Municipal Natural Gas Bans: Round 1 (2020), https://blogs.law.columbia.edu/climatechange/2020/01/09/municipal-natural-gas-bans-round-1/ and Municipal Natural Gas Bans: Round 2 (The Evolution of State Preemption Law), https://blogs.law.columbia.edu/climatechange/2020/07/29/municipal-natural-gas-bans-round-2-the-evolution-of-state-preemption-law/.

Efforts by local governments to decarbonize the built environment have also been caught in the crosshairs of the so-called "new preemption." This is an aggressive form of preemption by state legislatures looking not to harmonize inconsistencies among local requirements and statewide law, but to thwart local efforts to pursue certain kinds of policies -- in this case, building decarbonization. More than 20 states now have laws in place that preempt local governments from enacting all-electric construction requirements for new buildings, even though no such local requirements were ever put in place in any of these states. For a full list of states, see NRDC, Gas Interests Threaten Local Authority (2021-22), https://www.nrdc.org/experts/alejandra-mejia/gas-interests-threaten-local-authority-6-states. The "new preemption" tactic has been used in a number of subject matter areas, including for example, to prevent local governments from banning the handout of free, disposable plastic bags at grocery store checkouts. Broad state preemption efforts like this can leave local governments hesitant to pursue new avenues of climate policy for fear that, even if a requirement is lawful when enacted, a state legislature will move to preempt the local government anyway. See Richard Briffault, The Challenge of the New Preemption, 70 Stan. L. Rev. 1995 (2018), https://scholarship.law.columbia.edu/faculty_scholarship/2090.

(Note that federal law also preempts certain aspects of local law, and while federal law can pose problems for local governments in this regard, the issues are less diffuse than they are vis-a-vis state-local preemption, in which fifty state legal regimes are at play.)

With respect to point (2), a second factor preventing building decarbonization initiatives and other forms of local climate policy from even being introduced in the local legislative process is fear of litigation by well-funded opponents. Local governments often lack the capacity - staffing and funding - to engage in protracted litigation, and the fear of any such litigation can curb local ambition considerably. For example, a local homebuilder separately sued the municipalities of Windsor and Santa Rosa, California, over their all-electric construction codes. While Santa Rosa was successful in having its requirements upheld in a trial court, Windsor opted to rescind its all-electric requirements rather than expend resources on litigation. See Gallaher v. Windsor, SCV-265553 (Cal. Super. 2019), http://climatecasechart.com/case/gallaher-v-town-of-windsor/, and Gallaher v. Santa Rosa, SCV265711 (Cal. Super. Ct. 2020), http://climatecasechart.com/case/gallaher-v-city-of-santa-rosa/, both on the Sabin Center for Climate Change Law's U.S Climate Change Litigation Database. Local governments routinely delay policy announcements or shelve decarbonization policies ideas altogether due to fears of litigation.

With respect to point (3), many local governments have very limited legal capacity to untangle these thorny legal questions. This is a real barrier to pursuing decarbonization of the built environment. While the policy offices within municipalities may have well-developed building decarbonization proposals, local legal departments do not have the capacity to study and greenlight them, meaning that many building decarbonization policies cannot be implemented.

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EXHIBIT D

Sabin Center Comments on Legal Mechanisms for Overcoming Obstacles to Siting Renewable Energy Facilities

Cmt. No. 175568

NCA5 Third Order Draft: Public Review

Comment ID: 175568 **User ID:** 54368

Chapter: 32. Mitigation
Pages: 26 - 27 **Lines:** 14 - 5

The subsection on "Siting and Land Use" notes that "siting may prove a key obstacle for renewables-based net-zero emissions systems" (page 27, lines 3-4). The only recommendation you provide for overcoming these obstacles is "[e]ngagement with community groups and stakeholders early in the planning process" (page 27, lines 4-5). While engagement is vital and can, as noted in the draft report, "prevent project delays and cancellations," other steps may also need to be taken at the state and federal level to facilitate renewable energy siting.

First, state legislatures can help to circumvent obstacles to siting renewable energy facilities by enacting legislation that includes one or more of the following features: (i) vesting state government entities rather than local governments with decision-making authority over siting decisions; (ii) vesting state government entities with authority to set aside unreasonable local restrictions; (iii) setting limits on the restrictions that local governments can impose on renewable energy facilities; and (iv) imposing statutory deadlines for government decision-makers to reach decisions throughout the permitting process. See Michael B. Gerrard & Edward McTiernan, New York's New Statute on Siting Renewable Energy Facilities, 263(93) N.Y.L.J., MAY 14, 2020 (2020), https://scholarship.law.columbia.edu/faculty_scholarship/3026.

Three examples of states where one or more of these mechanisms are in use or in legislation recently passed by legislatures are as follows:

New York: In 2020, New York State adopted the Accelerated Renewable Energy Growth and Community Benefit Act, which created a new Office of Renewable Energy Siting (ORES) to "undertake a coordinated and timely review of proposed major renewable energy facilities to meet the state's renewable energy goals while ensuring the protection of the environment and consideration of all pertinent social, economic and environmental factors in the decision to permit such facilities as more specifically provided in this section." See N.Y. Executive Law section 94-c(1). Under the Act, when evaluating an application for a major renewable energy facility with a nameplate capacity of 20 megawatts (MW) or more, ORES is authorized to "elect not to apply, in whole or in part, any local law or ordinance" that is "unreasonably burdensome in view of the [Climate Leadership and Community Protection Act] targets and the environmental benefits of the proposed major renewable energy facility." See id. section 94-c(5)(e). Finally, to avoid delay, the Act requires ORES to "make a final decision on a siting permit for any major renewable energy project within one year from the date the application was deemed complete" or within six months for certain brownfields projects. See id. section 94-c(5)(f).

California: In 2022, California enacted A.B. 205, which: (i) gives the California Energy Commission (CEC) authority over permitting of renewable energy generation facilities with a capacity of 50 MW or greater and storage facilities with storage capacity of 200 MWh or greater, see California Public Resources Code sections 25545(b), 25545.1(a); (ii) supersedes any local restrictions or permitting requirements, see id. section 25545.1(b); and (iii) sets statutory deadlines on the CEC to issue a permitting decision within 270 days of an application being deemed complete, see id. section 25545.4(e)(1). See "California's Law Superseding Local Permitting Obstacles for Renewable Energy Projects (AB 205, 2022)," Legal Pathways for Deep Decarbonization, https://lpdd.org/resources/californias-sb-205-2022/.

Illinois: As of January 27, 2023, a bill titled HB4412 had passed both houses of Illinois's legislature and was awaiting the governor's signature. If signed into law, HB4412 would set limits on the restrictions that county governments could impose, including by setting maximum setback requirements, restrictions on blade tip height, and sound limitations.

Second, the federal government can impose federal limits on local restrictions. A model of federal legislation to overcome local siting obstacles is the portion of the Telecommunications Act of 1996 that limited (but did not eliminate) the ability of local governments to block cell phone towers. See Michael Gerrard, Legal Pathways for a Massive Increase in Utility-Scale Renewable Generation Capacity, 47 Envtl. L. Rep. 10591, 10608 (2017), https://scholarship.law.columbia.edu/faculty_scholarship/2045. As Michael Gerrard has explained, the Telecommunications Act "prevented local governments from banning towers entirely, while still allowing localities to determine where the towers would go." Id. In addition, the Act imposed time limits on municipalities' deliberations and required municipalities to provide written explanations of any permit denials. Id. Finally, the Act prohibited municipalities from regulating towers "'on the basis of the environmental effects of radio frequency emissions to the extent that such facilities comply with [Federal Communications Commission] regulations.'" Id. (quoting 42 U.S.C. section 332(c)(7)(B)(iv)).

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EXHIBIT E

Sabin Center Comments on the Relative Land Use Requirements and Climate Change Benefits of Solar Energy and Biofuels

Cmt. Nos. 175569, 175570, and 175571

NCA5 Third Order Draft: Public Review

Comment ID: 175569 **User ID:** 54368

Chapter: 06. Land Cover and Land-Use Change

The summary of "Key Message 6.3. Future Land-Use Options" states that "[d]ecarbonization will require a large expansion of solar and wind energy generation and transmission infrastructure (high confidence) and may involve large land-use changes toward reforestation or biomass crop cultivation (low confidence)." (See page 15 at lines 3-12.) The evidence supports your assessment that a large expansion of renewables is more likely needed than an expansion of biomass crop cultivation. To further support this point, please consider noting the following: (1) solar and wind energy projects use very little agricultural land compared to growing biomass for the production of biofuels; and (2) photovoltaic (PV) solar delivers far more energy per acre than corn ethanol.

With respect to point (1), approximately 40 million acres of agricultural land is currently being used to grow corn for ethanol, an area the size of Florida. According to the U.S. Department of Agriculture (USDA), 90 million acres of agricultural land in the U.S. are used to grow corn, and 45% of that corn is used for ethanol production. See Claire Hutchins, Feedgrains at a Glance, USDA Economic Research Service (last updated October 3, 2022), https://www.ers.usda.gov/topics/crops/corn-and-other-feedgrains/feedgrains-sector-at-a-glance/. By comparison, solar installations on all types of land (both agricultural and non-agricultural) occupy only 0.5 million acres, while wind turbines occupy only 0.07 million acres. See Dave Merrill, “The U.S. Will Need a Lot of Land for a Zero-Carbon Economy,” Bloomberg (last updated June 3, 2021), https://www.bloomberg.com/graphics/2021-energy-land-use-economy/. To achieve complete decarbonization of the grid and electrification of end uses, the U.S. Department of Energy estimates that approximately 10 million acres of land will be needed for solar PV by 2050, still far less than the amount of land currently being used to grow corn for ethanol production. See U.S. Department of Energy, Office of Energy Efficiency & Renewable Energy, Solar Futures Study (Sep. 2021) at 180, https://www.energy.gov/sites/default/files/2021-09/Solar%20Futures%20Study.pdf. The 10 million acres of solar PV needed for full decarbonization and electrification in 2050 account for just 0.5% of all land in the contiguous U.S., whereas 43% of that land will continue to be used for agricultural production. Id.

With respect to point (2), please note that solar PV produces approximately 40 times more energy than an acre of corn grown for ethanol as measured by heating value. Redeploying the land currently used for corn ethanol production to solar PV would thus greatly increase the amount of energy produced on that land. According to the Lawrence Berkeley National Laboratory, utility-scale solar power produces between 394 and 447 megawatt hours (MWh) per acre per year. See M. Bolinger and G. Bolinger, “Land Requirements for Utility-Scale PV: An Empirical Update on Power and Energy Density,” in IEEE Journal of Photovoltaics, vol. 12, no. 2, pp. 589-594, March 2022, doi: 10.1109/JPHOTOV.2021.3136805, https://ieeexplore.ieee.org/document/9676427. For comparison, one acre of corn is estimated to produce a quantity of ethanol equivalent to 10.3 MWh per year. This calculation assumes that one acre of corn produces approximately 462 gallons of ethanol, which contains 35,250,600 British thermal units (BTU) of energy. Applying a standard conversion factor of 3,412,000 BTU per MWh, one acre of corn generates 10.3 MWh of energy from ethanol. See F. John Hay, "Bioenergy Corn: Corn Grain as an Ethanol Feedstock," University of Nebraska-Lincoln Institute of Agriculture and Natural Resources Cropwatch, https://cropwatch.unl.edu/bioenergy/corn; Paul W. Gallagher, et al., "2015 Energy Balance for the Corn-Ethanol Industry," USDA (Feb. 2016), at 8, https://www.usda.gov/sites/default/files/documents/2015EnergyBalanceCornEthanol.pdf; "Units and Calculators Explained," U.S. Energy Information Administration (June 28, 2022), https://www.eia.gov/energyexplained/units-and-calculators/energy-conversion-calculators.php. Thus, an acre of solar panels produces roughly 38 to 43 times more energy per acre than corn ethanol. Further, in light of the relative efficiency of electric vehicles over combustion engines, a UK-based analysis from Carbon Brief found that "a hectare of solar panels delivers between 48 and 112 times more driving distance, when used to charge an electric vehicle, than that land could deliver if used to grow biofuels for cars." See Josh Gabbattis et al., "Factcheck: Is Solar Power a 'Threat' to UK Farmland?," Carbon Brief (Aug. 25, 2022), https://www.carbonbrief.org/factcheck-is-solar-power-a-threat-to-uk-farmland/

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Chapter: 32. Mitigation
Pages: 26 - 27 **Lines:** 14 - 5

The subsection on "Siting and Land Use" identifies "competition for land between renewables and agriculture (Hall, Morgan et al. 2022)" as an obstacle to siting solar and wind energy (page 26, line 25, to page 27, line 1). While it is true that developers have encountered opposition to siting solar and wind projects on agricultural land, some additional context is needed. In particular, there is no discussion in this chapter of biofuels, such as corn ethanol, which use far more land than solar and wind energy, but deliver relatively low yield in terms of energy production and few, if any, climate change benefits. There is also no discussion of legislative efforts to exclude solar energy projects from agricultural land.

Please consider noting that: (1) solar and wind energy projects use very little agricultural land compared to the production of biofuels; (2) photovoltaic (PV) solar delivers far more energy per acre than corn ethanol; (3) corn ethanol delivers few, if any, climate change benefits; (4) any competition between renewables and agricultural uses can be mitigated by deploying systems that produce energy and agricultural products on the same land; and (5) some state and local governments have taken legislative action to limit or exclude large-scale solar energy projects from some or all agricultural land within their respective jurisdictions.

With respect to point (1), approximately 40 million acres of agricultural land is currently being used to grow corn for ethanol, an area the size of Florida. According to the U.S. Department of Agriculture (USDA), 90 million acres of agricultural land in the U.S. are used to grow corn, and 45% of that corn is used for ethanol production. See Claire Hutchins, Feedgrains at a Glance, USDA Economic Research Service (last updated October 3, 2022), https://www.ers.usda.gov/topics/crops/corn-and-other-feedgrains/feedgrains-sector-at-a-glance/. By comparison, solar installations on all types of land (both agricultural and non-agricultural) occupy only 0.5 million acres, while wind turbines occupy only 0.07 million acres. See Dave Merrill, "The U.S. Will Need a Lot of Land for a Zero-Carbon Economy," Bloomberg (last updated June 3, 2021), https://www.bloomberg.com/graphics/2021-energy-land-use-economy/. To achieve complete decarbonization of the grid and electrification of end uses, the U.S. Department of Energy estimates that approximately 10 million acres of land will be needed for solar PV by 2050, still far less than the amount of land currently being used to grow corn for ethanol production. See U.S. Department of Energy, Office of Energy Efficiency & Renewable Energy, Solar Futures Study (Sep. 2021) at 180, https://www.energy.gov/sites/default/files/2021-09/Solar%20Futures%20Study.pdf. The 10 million acres of solar PV needed for full decarbonization and electrification in 2050 account for just 0.5% of all land in the contiguous U.S., whereas 43% of that land will continue to be used for agricultural production. Id.

With respect to point (2), please note that solar PV produces approximately 40 times more energy than an acre of corn grown for ethanol as measured by heating value. Redeploying the land currently used for corn ethanol production to solar PV would thus greatly increase the amount of energy produced on that land. According to the Lawrence Berkeley National Laboratory, utility-scale solar power produces between 394 and 447 megawatt hours (MWh) per acre per year. See M. Bolinger and G. Bolinger, "Land Requirements for Utility-Scale PV: An Empirical Update on Power and Energy Density," in IEEE Journal of Photovoltaics, vol. 12, no. 2, pp. 589-594, March 2022, doi: 10.1109/JPHOTOV.2021.3136805, https://ieeexplore.ieee.org/document/9676427. For comparison, one acre of corn is estimated to produce a quantity of ethanol equivalent to 10.3 MWh per year. This calculation assumes that one acre of corn produces approximately 462 gallons of ethanol, which contains 35,250,600 British thermal units (BTU) of energy. Applying a standard conversion factor of 3,412,000 BTU per MWh, one acre of corn generates 10.3 MWh of energy from ethanol. See F. John Hay, "Bioenergy Corn: Corn Grain as an Ethanol Feedstock," University of Nebraska-Lincoln Institute of Agriculture and Natural Resources Cropwatch, https://cropwatch.unl.edu/bioenergy/corn; Paul W. Gallagher, et al., "2015 Energy Balance for the Corn-Ethanol Industry," USDA (Feb. 2016), at 8, https://www.usda.gov/sites/default/files/documents/2015EnergyBalanceCornEthanol.pdf; "Units and Calculators Explained," U.S. Energy Information Administration (June 28, 2022), https://www.eia.gov/energyexplained/units-and-calculators/energy-conversion-calculators.php. Thus, an acre of solar panels produces roughly 38 to 43 times more energy per acre than corn ethanol. Further, in light of the relative efficiency of electric vehicles over combustion engines, a UK-based analysis from Carbon Brief found that "a hectare of solar panels delivers between 48 and 112 times more driving distance, when used to charge an electric vehicle, than that land could deliver if used to grow biofuels for cars." See Josh Gabbattis et al., "Factcheck: Is Solar Power a 'Threat' to UK Farmland?," Carbon Brief (Aug. 25, 2022), https://www.carbonbrief.org/factcheck-is-solar-power-a-threat-to-uk-farmland/

With respect to point (3), please consider noting that corn ethanol delivers relatively few, if any, climate change benefits. See Tyler J. Lark et al., Environmental Outcomes of the U.S. Renewable Fuel Standard, PNAS Vol. 119 No. 9 (2022), https://www.pnas.org/doi/epdf/10.1073/pnas.2101084119. In fact, one recent study published in PNAS found that the greenhouse gas (GHG) emissions intensity of corn ethanol was up to 24% higher than gasoline. Id. at 6.

With respect to point (4), please note that wind and solar projects need not compete with or displace agriculture. Wind turbines and access roads occupy relatively little land, allowing animals to graze right up to the base and crops to be planted around them. In addition, solar PV can be deployed as part of agrivoltaic systems that produce energy while simultaneously growing crops or feeding livestock. See, e.g., Andrew AC, Higgins CW, Smallman MA, Graham M and Ates S (2021) Herbage Yield, Lamb Growth and Foraging Behavior in Agrivoltaic Production System. Front. Sustain. Food Syst. 5:659175. doi: 10.3389/fsufs.2021.659175, https://www.frontiersin.org/articles/10.3389/fsufs.2021.659175/full; Sekiyama, T.; Nagashima, A. Solar Sharing for Both Food and Clean Energy Production: Performance of Agrivoltaic Systems for Corn, A Typical Shade-Intolerant Crop. Environments 2019, 6, 65. https://doi.org/10.3390/environments6060065; Graham, M., Ates, S., Melathopoulos, A.P. et al. Partial shading by solar panels delays bloom, increases floral abundance during the late-season for pollinators in a dryland, agrivoltaic ecosystem. Sci Rep 11, 7452 (2021). https://doi.org/10.1038/s41598-021-86756-4.

With respect to point (5), please note that certain state and local governments have taken legislative action to limit or prohibit large-scale solar energy projects from being sited in designated agricultural land within their respective jurisdictions. For example, Connecticut has enacted a law that requires developers of solar energy projects greater than 2 MW on "prime farmland" to obtain a written statement from the Department of Agriculture that "[the] project will not materially affect the status of such land as prime farmland." CT Gen. Stat. section 16-50k (2017). To provide another example, Monroe Township, Michigan, recently enacted an ordinance prohibiting large-scale renewable energy projects on land that is zoned for agricultural use. See Charter Township of Monroe, Ordinance No. 145 (2022), section I(D)(2), available at https://library.municode.com/mi/monroe_charter_township,_(monroe_co.)/ordinances/code_of_ordinances?nodeId=1148569.

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NCA5 Third Order Draft: Public Review

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Chapter: 11. Agriculture, Food Systems, and Rural Communities

In the chapter on Agriculture, there are several references to renewable energy production on agricultural land, including wind energy, advanced biofuels, and agrivoltaics, but there is no discussion of conventional biofuels, such as corn ethanol, which use far more land. For example, the subsection on "Rural Community Resilience" notes that rural communities are "making positive contributions in enhancing climate resilience and mitigating climate change through renewable energy production" (page 23, lines 15-16). As examples of positive contributions, the subsection notes progress in deploying "wind energy" (page 23, line 23), "advanced biofuels" (page 23, line 24), and "agrivoltaic systems, which combine solar photovoltaic energy production with agriculture" (page 23, lines 24-25). Corn ethanol is not mentioned in that subsection or any other part of the chapter.

Studies suggest that rural communities could enhance their contributions to climate resilience and mitigation by shifting away from corn ethanol production and using that same land instead for solar power-whether as part of an agrivoltaic system or not. Indeed, as described below, the production of corn ethanol uses a vast amount of land (approximately 40 million acres) but delivers relatively low yield in terms of energy production and few, if any, climate change benefits. This should be noted in the chapter.

In particular, please consider noting that: (1) solar and wind energy projects use very little agricultural land compared to the production of biofuels; (2) photovoltaic (PV) solar delivers far more energy per acre than corn ethanol; and (3) corn ethanol delivers few, if any, climate change benefits.

With respect to point (1), approximately 40 million acres of agricultural land is currently being used to grow corn for ethanol, an area the size of Florida. According to the U.S. Department of Agriculture (USDA), 90 million acres of agricultural land in the U.S. are used to grow corn, and 45% of that corn is used for ethanol production. See Claire Hutchins, Feedgrains at a Glance, USDA Economic Research Service (last updated October 3, 2022), https://www.ers.usda.gov/topics/crops/corn-and-other-feedgrains/feedgrains-sector-at-a-glance/. By comparison, solar installations on all types of land (both agricultural and non-agricultural) occupy only 0.5 million acres, while wind turbines occupy only 0.07 million acres. See Dave Merrill, "The U.S. Will Need a Lot of Land for a Zero-Carbon Economy," Bloomberg (last updated June 3, 2021), https://www.bloomberg.com/graphics/2021-energy-land-use-economy/. To achieve complete decarbonization of the grid and electrification of end uses, the U.S. Department of Energy estimates that approximately 10 million acres of land will be needed for solar PV by 2050, still far less than the amount of land currently being used to grow corn for ethanol production. See U.S. Department of Energy, Office of Energy Efficiency & Renewable Energy, Solar Futures Study (Sep. 2021) at 180, https://www.energy.gov/sites/default/files/2021-09/Solar%20Futures%20Study.pdf. The 10 million acres of solar PV needed for full decarbonization and electrification in 2050 account for just 0.5% of all land in the contiguous U.S., whereas 43% of that land will continue to be used for agricultural production. Id.

With respect to point (2), please note that solar PV produces approximately 40 times more energy than an acre of corn grown for ethanol as measured by heating value. Redeploying the land currently used for corn ethanol production to solar PV would thus greatly increase the amount of energy produced on that land. According to the Lawrence Berkeley National Laboratory, utility-scale solar power produces between 394 and 447 megawatt hours (MWh) per acre per year. See M. Bolinger and G. Bolinger, "Land Requirements for Utility-Scale PV: An Empirical Update on Power and Energy Density," in IEEE Journal of Photovoltaics, vol. 12, no. 2, pp. 589-594, March 2022, doi: 10.1109/JPHOTOV.2021.3136805, https://ieeexplore.ieee.org/document/9676427. For comparison, one acre of corn is estimated to produce a quantity of ethanol equivalent to 10.3 MWh per year. This calculation assumes that one acre of corn produces approximately 462 gallons of ethanol, which contains 35,250,600 British thermal units (BTU) of energy. Applying a standard conversion factor of 3,412,000 BTU per MWh, one acre of corn generates 10.3 MWh of energy from ethanol. See F. John Hay, "Bioenergy Corn: Corn Grain as an Ethanol Feedstock," University of Nebraska-Lincoln Institute of Agriculture and Natural Resources Cropwatch, https://cropwatch.unl.edu/bioenergy/corn; Paul W. Gallagher, et al., "2015 Energy Balance for the Corn-Ethanol Industry," USDA (Feb. 2016), at 8, https://www.usda.gov/sites/default/files/documents/2015EnergyBalanceCornEthanol.pdf; "Units and Calculators Explained," U.S. Energy Information Administration (June 28, 2022), https://www.eia.gov/energyexplained/units-and-calculators/energy-conversion-calculators.php. Thus, an acre of solar panels produces roughly 38 to 43 times more energy per acre than corn ethanol. Further, in light of the relative efficiency of electric vehicles over combustion engines, a UK-based analysis from Carbon Brief found that "a hectare of solar panels delivers between 48 and 112 times more driving distance, when used to charge an electric vehicle, than that land could deliver if used to grow biofuels for cars." See Josh Gabbattis et al., "Factcheck: Is Solar Power a 'Threat' to UK Farmland?," Carbon Brief (Aug. 25, 2022), https://www.carbonbrief.org/factcheck-is-solar-power-a-threat-to-uk-farmland/

With respect to point (3), please consider noting that corn ethanol delivers relatively few, if any, climate change benefits. See Tyler J. Lark et al., Environmental Outcomes of the U.S. Renewable Fuel Standard, PNAS Vol. 119 No. 9 (2022), https://www.pnas.org/doi/epdf/10.1073/pnas.2101084119. In fact, one recent study published in PNAS found that the greenhouse gas (GHG) emissions intensity of corn ethanol was up to 24% higher than gasoline. Id. at 6.

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