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Action-Based Climate Change Governance Through Technology and Intellectual Property

INTRODUCTION

Computer scientists Lehman and Miikkulainen argue that "[e]xtinction events exert a powerful influence on evolution," inducing acceleration in "biological and artificial evolution."[1] This theory is construed as creating a possibility that global climate change will cause the extinction of humanity, stimulate the evolution of robots, and transform the Earth into a planet of superintelligent robots.[2] Basulto suggests that, instead of being overtaken by artificial intelligence after an extinction event caused by global warming, humanity should "start looking to AI to help prevent the climate-related risks."[3]

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1 Joel Lehman & Risto Miikkulainen, *Extinction Events Can Accelerate Evolution*, PLOS ONE (Aug. 12, 2015), https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0132886 [https://perma.cc/WN6A-YQ8F].

2 Dominic Basulto, *The Strange Link Between Global Climate Change and the Rise of the Robots*, WASH. POST (Sept. 8, 2015), https://www.washingtonpost.com/news/innovations/wp/2015/09/08/the-strange-link-between-global-climate-change-and-the-rise-of-the-robots/ [https://perma.cc/ETD4-F8HM].

3 *Id.*

Climate change is described as "the gravest threat of our time."[4] Technology is crucial for addressing climate change. According to Sivaram et al., "the most important contributions" that the United States can make are to improve the performance and cost efficiency of clean-energy technologies.[5]

How can these insights be applied to construct a novel approach for preventing and mitigating climate change? An action-based climate change governance through technology and intellectual property law has the potential to contribute to addressing the polycentric, global issues of climate change.

Part I of this Article first observes that climate change challenges traditional legal procedures and doctrines. Prompting every actor to make the best effort to alleviate climate change appears more important than finding a perpetrator on whom responsibility will be imposed. Thus, Part I suggests that the philosophy of climate change governance should shift from a responsibility-based framework to an action-based mindset. In an action-based philosophy of climate change governance, the use of technology such as artificial intelligence can facilitate climate change mitigation. To illustrate this argument, Part II of this Article explores how artificial intelligence contributes to energy optimization, polycentric climate impact assessments through machine learning, and the democratization of climate change governance through Big Data.

At the same time, Part III of this Article points out that the veracity of communication regarding climate change is a concern for an action-based approach because communication often influences one's decision to act. Part III explains that this aspect of climate change governance has given rise to litigation involving the Consumer Protection Procedures Act, the Lanham Act, and the First Amendment of the United States Constitution in the search for truth. Furthermore, Part IV of this Article conducts a critical and reflective analysis of debates regarding the potential contributions and hazards of patent law in an action-based governance of climate change.

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4 Varun Sivaram, Colin Cunliff & Julio Friedmann, Opinion, *To Confront the Climate Crisis, the US Should Launch a National Energy Innovation Mission*, MIT TECH. REV. (Sept. 15, 2020), https://www.technologyreview.com/2020/09/15/1008406/climate-crisis-energy-innovation-mission-us-election-tech-policy-opinion/ [https://perma.cc/C75P-QR5P].

5 *Id.*

I
CHALLENGING TRADITIONAL LEGAL PROCEDURES AND DISCIPLINES

Climate change challenges conventional ideas. The globality, polycentricity, heterogeneity, imminence, and persistence of the threat of climate change often render classic legal concepts ineffective. Transnational laws, such as the Paris Agreement,[6] the United Nations Framework Convention on Climate Change,[7] and the European Convention on Human Rights,[8] generate hope for establishing common ideals and creating arguments for safeguarding human life from global warming. Yet, many existing legal procedures and principles address a particular problem between specific parties within a certain jurisdiction rather than establishing common ideals. The following sections examine the procedure of litigation and the principle of responsibility as examples.

A. Limitation of Resorting to Litigation

Fleming v. Darpa[9] demonstrates the limitation of resorting to litigation in climate change governance. On August 12, 2015, the United States District Court for the Northern District of Alabama dismissed a citizen's complaint regarding geoengineering.[10] The plaintiff alleged that aircrafts flying over Huntsville, Alabama, were conducting geoengineering tests illegally, using biological agents and chemical agents such as sulfur dioxide, sulfuric acid, and aluminum oxide.[11] According to the plaintiff, he "sustained internal injuries including . . . severe allergic reaction."[12] Thus, the plaintiff demanded the prosecution of entities engaged in activities such as "performing, researching, or funding" geoengineering.[13] The plaintiff invoked the

6 Paris Agreement (Dec. 12, 2015), https://unfccc.int/sites/default/files/english_paris_agreement.pdf [https://perma.cc/SQ93-KRJT].

7 United Nations Framework Convention on Climate Change (May 9, 1992), https://unfccc.int/files/essential_background/background_publications_htmlpdf/application/pdf/conveng.pdf [https://perma.cc/H3ZH-FZ7W].

8 European Convention on Human Rights, Amended June 1, 2010, https://www.echr.coe.int/documents/convention_eng.pdf [https://perma.cc/CQ4B-AY9W].

9 Fleming v. Darpa, No. 5:15-cv-00285, 2015 WL 4771030 (N.D. Ala. Aug. 12, 2015).

10 *Id.*

11 *Id.* at *1.

12 *Id.*

13 *Id.*

United States Criminal Code and the Alabama Criminal Code as bases for his complaint.[14]

The federal court dismissed the complaint in *Fleming* on jurisdictional and procedural grounds.[15] First, the court stated that there must be a legal basis for the plaintiff's allegations over which the court can exercise jurisdiction.[16] Second, the court explained that any prosecution for violating the United States Criminal Code must be initiated by a federal prosecutor, not a private citizen.[17] Third, the court stated that prosecutions for violating state criminal law must be filed in a state court, not in a federal court.[18]

Having decided the case on procedural grounds in this way, the court did not reach the merits of the allegations. Neither did the court address substantive issues concerning geoengineering. *Fleming v. Darpa* illustrates how resorting to litigation is of limited value in climate change governance. Satisfying procedural and jurisdictional requirements is paramount in litigation. If a requirement is not satisfied, the court can dismiss the complaint, regardless of the urgency, magnitude, and significance of the subject matter.

B. From Responsibility to an Action-Based Philosophy of Climate Change Governance

Allocation of responsibility for climate change is an issue hidden in *Korsinsky v. U.S. Environmental Protection Agency* (EPA).[19] In *Korsinsky*, the plaintiff filed an action before the United States District Court for the Southern District of New York, seeking relief under the law of public nuisance for the phenomenon of climate change.[20] The plaintiff accused the defendants of emitting "approximately 6,500 million tons of carbon dioxide" every year.[21] In addition, the plaintiff alleged that the defendants failed to implement "options" to cut emissions of carbon dioxide.[22] According to the plaintiff, using his

14 *Id.* at *2.

15 *Id.*

16 *Id.* at *1.

17 *Id.* at *2.

18 *Id.*

19 *See* Korsinsky v. U.S. Env't Prot. Agency, No. 05 Civ. 859, 2005 WL 2414744 (S.D.N.Y. Sept. 29, 2005).

20 *Id.* at *1.

21 *Id.* (internal quotation marks omitted).

22 *Id.* (internal quotation marks omitted).

invention was that "option."[23] The plaintiff maintained that his invention would "eliminate carbon dioxide emissions without significantly increasing the cost of process activities."[24] He had attempted to obtain a patent for this invention.[25]

Korsinsky v. EPA raises the question of responsibility.[26] The plaintiff requested the imposition of joint and several liability of the EPA, the New York State Department of Environmental Conservation, and the New York City Department of Environmental Protection.[27] The role of these institutions in public administration appears to have been a critical factor in the plaintiff's decision to name them as defendants in the lawsuit. Each of these institutions has the role and capacity to determine which goals to pursue through public policy. The idea that "managers of local infrastructures" can exert "the biggest leverage on local impacts"[28] may have been an implicit assumption underlying the plaintiff's decision to seek joint and several liability of the three defendants. They are entities whose actions can contribute relatively significantly to the mitigation of climate change.

This lawsuit evokes questions concerning the responsibility for the excessive emission of greenhouse gases. Many of these questions may not have definite answers. Answers may not even exist. Yet posing these questions and reflecting on them are important processes for exploring diverse, analytical perspectives on climate change governance.

First, who is responsible for climate change? Greenhouse gases increase the Earth's temperature.[29] Carbon dioxide, methane, nitrous oxide, and fluorinated gases are greenhouse gases.[30] Greenhouse gases

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23 *Id.*

24 *Id.* (internal quotation marks omitted).

25 *Id.*

26 *See id.*

27 *Id.*

28 David G. Victor, *How Artificial Intelligence Will Affect the Future of Energy and Climate*, THE BROOKINGS INST. (Jan. 10, 2019), https://www.brookings.edu/research/how-artificial-intelligence-will-affect-the-future-of-energy-and-climate/ [https://perma.cc/Z2F9-G9S5].

29 *What Is the Greenhouse Effect?*, NASA, https://climate.nasa.gov/faq/19/what-is-the-greenhouse-effect/ [https://perma.cc/EPE5-SDJ7] (last visited May 18, 2025); Wash. Env't Council v. Bellon, 732 F.3d 1131, 1135–36, 1141 (9th Cir. 2013) (discussing the causes of global warming and the implication of greenhouse gases).

30 *Overview of Greenhouse Gases*, EPA, https://www.epa.gov/ghgemissions/overview-greenhouse-gases [https://perma.cc/F436-524R] (last updated Jan. 16, 2025).

have been construed to be "air pollutants" within the meaning of the Clean Air Act.[31] Human beings and animals exhaling carbon dioxide during respiration, cows emitting methane through digestion, bacteria generating nitrous oxide, and entities engaging in certain commercial and industrial activities produce greenhouse gases. Therefore, all these humans, animals, bacteria, and entities are potentially contributing to global warming.

However, the emission of greenhouse gases does not automatically transform an actor into a vicious perpetrator of climate change. In fact, NASA [32] portrays greenhouse gases as superheroes. [33] "Meet the Greenhouse Gases!" NASA exclaims on its website for children.[34] The website shows drawings portraying each gas.[35] Methane, for example, is depicted as a confident hero wearing a purple cape.[36] Nitrous oxide is depicted as a sturdy bulldog in a superman's uniform, posing with its red cloak flying behind its figure.[37] NASA explains that "[o]verall, greenhouse gases are a good thing. Without them, our planet would be too cold, and life as we know it would not exist."[38] At the same time, NASA notes that "there can be too much of a good thing."[39] NASA writes, "Scientists are worried that human activities are adding too much of these gases to the atmosphere."[40]

According to this perspective, the production of greenhouse gas itself is not malignant. It is the excess that is harmful. Then, who are the actors responsible for this excess of greenhouse gas emissions? Where is the boundary between a beneficial emission of greenhouse gas and harmful, excessive emission? Who draws this boundary? Is it even possible to draw this boundary?

There may be a preconception in legal thought that responsibility must be allocated and imposed upon a perpetrator to resolve a problem.

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31 Massachusetts v. Env't Prot. Agency, 549 U.S. 497, 528–29 (2007).

32 "NASA" stands for the "National Aeronautics and Space Administration."

33 *Meet the Greenhouse Gases!*, NASA CLIMATE KIDS, https://climatekids.nasa.gov/greenhouse-cards/ [https://perma.cc/FC65-GW75] (last updated Mar. 4, 2025) (website created by the "Earth Science Communications Team at NASA's Jet Propulsion Laboratory / California Institute of Technology").

34 *Id.*

35 *Id.*

36 *Id.*

37 *Id.*

38 *Id.*

39 *Id.*

40 *Id.*

The notion of responsibility, however, does not appear to be useful in the debate on climate change. The actors causing global warming are numerous. The line between a benign emitter and an excessive emitter is nebulous. Disputes over how much responsibility should be imposed on which actor seem insignificant. The focus on blame thus appears misplaced. What is important is that actions are taken to mitigate and prevent climate change. The philosophy of climate change governance should shift from a responsibility-based framework to an action-based mindset.

II
ARTIFICIAL INTELLIGENCE AS INSTRUMENT FOR CLIMATE CHANGE GOVERNANCE

Technology can facilitate actions to alleviate climate change. Artificial intelligence, in particular, is a promising instrument for climate change governance.

For instance, machine learning has been applied to facilitate energy optimization and to gain new perspectives in polycentric climate impact assessments. Big Data involving these assessments could contribute to the democratization of climate change governance. Creating a new copyright exception for the "fair training" of artificial intelligence systems could be useful in training this technology to generate unbiased, reasonable outputs to address climate change. It is crucial to assess and select which use of artificial intelligence in which areas and in what ways would alleviate the damaging impacts of climate change.

A. Energy Optimization Through Artificial Intelligence

Artificial intelligence provides market actors with novel tools to analyze the procurement and consumption of energy.[41] According to the International Energy Agency, carbon dioxide emissions in the energy sector "flattened" in 2019 owing to the "expanding role of renewable sources" in energy production.[42] In wind energy, for example, machine learning can be used to adjust the orientation of the turbine heads so that the turbine captures greater volumes of wind,

41 Victor, *supra* note 28.

42 *Global CO2 Emissions in 2019*, INT'L ENERGY AGENCY (Feb. 11, 2020), https://www.iea.org/articles/global-co2-emissions-in-2019 [https://perma.cc/N7YG-Q2SL].

thereby enhancing the efficiency of wind energy generation.[43] Artificial intelligence has also been applied to smart grids, which autonomously monitor electricity consumption to optimize the use of energy.[44]

B. Climate Impact Assessments Through Machine Learning

Climate change is a polycentric issue with heterogenous ramifications.[45] Accordingly, climate impact assessments must consider multiple local factors in numerous regions around the planet.[46] Artificial intelligence technology can facilitate this analysis by learning from enormous volumes of data (i.e., Big Data) containing information on insurance claims, migration, weather conditions, epidemics, etc., in various communities.[47] For instance, researchers who applied machine learning technology[48] to uncover how severe climate conditions influence the scale of human migration[49] observed that "machine learning . . . brings a new perspective" in the examination of large datasets.[50]

C. Democratization Through Big Data

If data and results from such polycentric climate impact assessments are disclosed to the public, democratization[51] of climate change governance could occur. While authorities will likely continue to have the power to determine the direction of climate change governance,

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43 *See id.*

44 *Patented Inventions in Climate Change Mitigation Technologies*, CANADIAN INTELL. PROP. OFF. 61 (2017), https://ised-isde.canada.ca/site/canadian-intellectual-property-office/sites/default/files/attachments/2022/patenting-climate-change-mitigation-technologies-en.pdf [https://perma.cc/5RME-LLFT].

45 Tamma A. Carleton et al., *Valuing the Global Mortality Consequences of Climate Change Accounting for Adaptation Costs and Benefits* 46 (Nat'l Bureau of Econ. Rsch., Working Paper No. 27599), http://impactlab.org/wp-content/uploads/2020/08/CIL_NBER_MortalityPaper_3Aug2020.pdf [https://perma.cc/Z4TP-Q3TX].

46 Victor, *supra* note 28.

47 *Id.*; Leigh Cowart, *How to Count Insects from Space*, MIT TECH. REV. (Oct. 21, 2020), https://www.technologyreview.com/2020/10/21/1009490/how-to-count-insects-from-space/ [https://perma.cc/EXL9-V9HF].

48 John Aoga et al., *Impact of Weather Factors on Migration Intention Using Machine Learning Algorithms* 2 (Dec. 8, 2020), https://arxiv.org/pdf/2012.02794.pdf [https://perma.cc/7AJ7-SBWR].

49 *Id.* at 16.

50 *Id.* at 17.

51 *See* Victor, *supra* note 28.

enlightenment through public disclosure could foster productive debate on how humanity should address climate change.

However, this democratization would trigger privacy issues. Big Data is likely to contain sensitive information concerning the lives of individuals. Privacy must be protected in the endeavor to mitigate climate change.

D. Copyright Exemption for the "Fair Training" of Artificial Intelligence

Utilizing artificial intelligence for climate change mitigation requires training the artificial intelligence system with abundant data. The data must be pertinent and of high quality for the system to generate unbiased, reasonable results.[52]

Yet supplying these data to the artificial intelligence system for training is likely to require the copying of numerous data.[53] In order to prevent copyright infringement in this training process, Mark A. Lemley and Bryan Casey argue that the fair use doctrine of United States copyright law should be extended to permit "fair learning" by artificial intelligence systems.[54] According to Lemley and Casey, such exceptions to liability for copyright infringement may be justified by "valuable social purposes."[55] Arguably, contribution to the prevention and mitigation of climate change qualifies as such a justification. A "fair learning" by automated systems could contribute to the "fair training" of artificial intelligence in the governance of climate change.

E. Human Choice in Artificial Intelligence Deployment

Whether artificial intelligence contributes to mitigating climate change depends on how humans choose to apply artificial intelligence in which areas. An action has multiple aspects. Some aspects of this action might mitigate global warming, while other aspects might worsen climate change.

For instance, artificial intelligence can facilitate the extraction of shale gas. Through machine learning, artificial intelligence can point

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52 Efstathios D. Gennatas et al., *Expert-Augmented Machine Learning*, 117 PROCS. NAT'L ACAD. SCIS. U.S. 4571 (2020), https://www.pnas.org/content/pnas/117/9/4571.full.pdf [https://perma.cc/CN88-56YE].

53 Mark A. Lemley & Bryan Casey, *Fair Learning*, 99 TEX. L. REV. 743, 745 (2021).

54 *Id.* at 776.

55 *Id.* at 760, 770, 783.

out where, in the complex underground reservoirs, shale gas is likely to be extracted with greater productivity.[56] Yet, does shale gas facilitate climate change mitigation? There are conflicting views.[57] Energy production through shale gas could help mitigate climate change by replacing at least a part of the energy produced through coal.[58] On the other hand, methane, a greenhouse gas, might be emitted from shale gas wells.[59] According to the EPA, while carbon dioxide has a Global Warming Potential of 1, methane has an estimated Global Warming Potential of 27–30 over one hundred years.[60] A higher Global Warming Potential means that the gas has a greater capacity to warm the Earth compared to carbon dioxide.[61] Thus, it is possible that methane, emitted through shale gas wells, will "offset the effects of lower carbon dioxide emissions."[62] In such a case, the use of artificial intelligence to facilitate shale gas extraction might aggravate climate change.

III
VERACITY OF COMMUNICATION ON GLOBAL CLIMATE CHANGE

David G. Ritchie states, "Ultimate reality may be the unknowable . . . as well as the unknown . . . ."[63] Ritchie further writes that "the ultimate reality *is* thought."[64] Ritchie seems to point out that the "ultimate reality" of a phenomenon is likely to differ depending on what each observer of the phenomenon thinks about this phenomenon. Thus, how one reacts to climate change depends on the perceptions of that individual, entity, or state. These perceptions are affected by what one sees and hears. Communication regarding climate change therefore

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56 Victor, *supra* note 28.

57 *See, e.g.*, Daniel P. Schrag, *Is Shale Gas Good for Climate Change?*, DAEDALUS (2012), https://www.amacad.org/publication/shale-gas-good-climate-change [https://perma.cc/HNE8-ZTQZ].

58 *See id.*

59 *See Shale Gas and Climate Change*, DEP'T FOR BUS., ENERGY & INDUS. STRATEGY 2, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/750895/Factsheet_2_-_Shale_Gas_and_Climate_Change.pdf [https://perma.cc/7PAW-RS6B] (last visited May 18, 2025).

60 *Understanding Global Warming Potentials*, EPA, https://www.epa.gov/ghgemissions/understanding-global-warming-potentials [https://perma.cc/9CTS-TYTD] (last updated Jan. 16, 2025).

61 *Id.*

62 *Shale Gas and Climate Change*, *supra* note 59.

63 David G. Ritchie, *What Is Reality?*, 1 PHIL. REV. 265, 270 (1892), https://www.jstor.org/stable/pdf/2175783.pdf [https://perma.cc/V5XF-56RZ].

64 *Id.* at 283 (emphasis in original).

influences one's decision on how to act against climate change. The veracity of such communication is a serious concern in an action-based governance of climate change.

A. False Advertising and the Lanham Act

On May 15, 2020, an organization called Beyond Pesticides filed an action against Exxon Mobil in the Superior Court of the District of Columbia.[65] Beyond Pesticides accused Exxon Mobil of "false and deceptive marketing."[66] The plaintiff noted that, due to concerns involving the harms of climate change, many consumers are seeking products or services that are less harmful to the environment.[67] According to the plaintiff, the defendant's "advertising and marketing mislead the public by presenting ExxonMobil's clean energy activities as a significant proportion of its overall business[,]"[68] even though the majority of its total business is based on "traditional fossil fuels and . . . petrochemicals."[69] Thus, the plaintiff alleged that the defendant is "deceiving consumers"[70] in violation of the Consumer Protection Procedures Act of the District of Columbia.[71]

Communication concerning climate change policies has also triggered accusations of "false representation" under the Lanham Act.[72] The Lanham Act is a federal statute in the United States that protects the owner of a registered trademark from use of the trademark in commerce that may cause consumer confusion.[73] In particular, the

65 Complaint at 1, 26, Beyond Pesticides v. Exxon Mobil Corp., No. 20-1815, 2021 WL 1092167 (D.D.C. Mar. 22, 2021), https://www.beyondpesticides.org/assets/media/documents/BeyondPesticidesv.Exxon.pdf [https://perma.cc/32ZY-BN74]. Although the plaintiff filed the present lawsuit in the Superior Court of the District of Columbia on May 15, 2020, the defendant removed this case to the United States District Court for the District of Columbia. *Beyond Pesticides*, 2021 WL 1092167, at *1. On March 22, 2021, the District Court granted the plaintiff's motion to remand the case to the Superior Court. *Id.* at *3.

66 Complaint, *supra* note 65, at 1.

67 *Id.* at 2, para. 5.

68 *Id.* at 3, para. 10.

69 *Id.*, para. 11.

70 *Id.*, paras. 12, 14.

71 *Id.*, para. 15.

72 Lanham Act, 15 U.S.C. § 1051.

73 *Lanham Act*, LEGAL INFO. INST., CORNELL L. SCH., https://www.law.cornell.edu/wex/lanham_act [https://perma.cc/3R4V-4BRC] (last updated June 2023).

Lanham Act bans false commercial speech, even if the commercial speech is based on science or is subject to scientific debate.[74]

In *Koch Industries, Inc. v. Does*,[75] a claim based on the Lanham Act was made against a group that allegedly released false statements concerning another entity's policy involving climate change. Koch Industries, an entity owning companies in various sectors including oil, coal, and pollution control equipment, maintained a website.[76] Some postings on Koch's website questioned scientists' conclusions regarding climate change.[77] A group of individuals called "Youth for Climate Truth" then allegedly created a "fake press release," which stated that Koch Industries planned to cease funding that had been directed to "organizations that deny climate change." [78] These statements were allegedly "in stark contrast to the policy viewpoints usually expressed by Koch."[79] Koch Industries accused the individuals of infringing the Koch trademark, engaging in unfair competition,[80] and violating the Lanham Act.[81]

The United States District Court for the District of Utah, however, dismissed this Lanham Act claim.[82] The District Court stated that there was no evidence that the defendants would have commercially benefited by making the false statements.[83]

B. Free Speech and the Search for Truth

The First Amendment of the United States Constitution protects free speech.[84] In *Dennis v. U.S.*, the Supreme Court of the United States maintained that "the liberty of man to search for truth ought not to be fettered."[85] Meanwhile, in *Gertz v. Robert Welch, Inc.*, the Supreme Court articulated that "there is no constitutional value in false

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74 Eastman Chem. Co. v. Plastipure, Inc., 775 F.3d 230, 233 (5th Cir. 2014).

75 Koch Indus., Inc. v. Does, No. 2:10CV1275, 2011 WL 1775765 (D. Utah May 9, 2011).

76 *Id.* at *1.

77 *Id.*

78 *Id.*

79 *Id.*

80 *Id.* at *2.

81 *See id.* at *5.

82 *Id.*

83 *Id.*

84 U.S. CONST. amend. I.

85 Dennis v. U.S., 341 U.S. 494, 550 (1951); *see also* William C. Tucker, *Deceitful Tongues: Is Climate Change Denial a Crime?*, 39 ECOLOGY L.Q. 831, 857 (2012).

statements of fact."[86] Henry David Thoreau wrote that "the facts of science may dust the mind by their dryness, unless they are in a sense effaced each morning, or rather rendered fertile by the dews of fresh and living truth."[87]

Greenhouse gases are construed as either beneficial, by preventing humans from freezing,[88] or as harmful, by raising the global temperature.[89] Although asbestos has been feared as a toxic substance that harms human health, fibrous asbestos is studied as having the potential to capture large amounts of greenhouse gas from the atmosphere through its large surface area.[90] These examples concerning greenhouse gases and asbestos suggest that climate change is an area in which certain conventional knowledge no longer rules. Seemingly obvious notions suddenly gain double meanings in the labyrinth of climate change.

IV
PATENT RIGHTS AS IMPEDIMENTS AND FACILITATORS FOR CLIMATE CHANGE MITIGATION

Patent rights can both hinder and facilitate measures in an action-based governance of climate change. Contemplating both sides of this debate is crucial.

A. Risk of Patent Infringement Through Climate Change Mitigation Measures

Measures to alleviate climate change can expose actors to the risk of patent infringement when the actors' measures require using an

86 Tucker, *supra* note 85, at 857; Gertz v. Robert Welch, Inc., 418 U.S. 323, 340 (1974).

87 HENRY DAVID THOREAU, LIFE WITHOUT PRINCIPLE 23–24 (Sanage Publishing, Kindle ed. 2021) (1863).

88 Phil Berardelli, *Did Carbon Save Earth from a Deep Freeze?*, SCIENCE (Dec. 5, 2007), https://www.sciencemag.org/news/2007/12/did-carbon-save-earth-deep-freeze [https://perma.cc/TZU5-3M2C].

89 Christina Nunez, *Carbon Dioxide Levels Are at a Record High. Here's What You Need to Know.*, NAT'L GEOGRAPHIC (May 13, 2019), https://www.nationalgeographic.com/environment/global-warming/greenhouse-gases/ [https://perma.cc/425N-S2Z9].

90 James Temple, *Asbestos Could Be a Powerful Weapon Against Climate Change (You Read That Right)*, MIT TECH. REV. (Oct. 6, 2020), https://www.technologyreview.com/2020/10/06/1009374/asbestos-could-be-a-powerful-weapon-against-climate-change-you-read-that-right/ [https://perma.cc/KEX4-4SGR].

invention protected by a patent. *Arkema Inc. v. Honeywell International Inc.*[91] illustrates this risk.

Arkema and Honeywell are competitors in the market of automotive refrigerants.[92] Automobile manufacturers had used the refrigerant R-134a before the mid-2000s.[93] However, in 2006, the European Union established regulations requiring automobiles to use refrigerants with low Global Warming Potential.[94]

The refrigerant HFO-1234yf has lower Global Warming Potential than the refrigerant R-134a.[95] Automobile manufacturers thus started using the refrigerant HFO-1234yf instead of the refrigerant R-134a.[96]

Honeywell owns U.S. Patent Nos. 8,033,120 and 8,065,882.[97] These patents cover methods for using the refrigerant HFO-1234yf in the air conditioning systems of automobiles.[98]

Arkema contemplated concluding contracts to supply the refrigerant HFO-1234yf.[99] Arkema feared that, if it sold the refrigerant HFO-1234yf to automobile manufacturers in the United States, it might be liable for infringing Honeywell's patents.[100] Thus, Arkema sought the court's declaratory judgment that the planned transactions would not indirectly infringe Honeywell's U.S. Patents Nos. 8,033,120 and 8,065,882.[101]

In this way, using and selling a refrigerant with low Global Warming Potential to alleviate climate change can be forestalled by the enforcement of patents covering compositions or methods that are essential for using the refrigerant. In such cases, the existence of a patent increases the cost of taking measures against climate change. It also increases the risk of implementing such measures. If a party is prevented from acting until a court issues a declaratory judgment of noninfringement, the measures will be on hold until the declaratory judgment is rendered. A lawsuit may take years to reach a court judgment. Litigation costs are also often prohibitive. Thus, patent

91 Arkema Inc. v. Honeywell Int'l Inc., 706 F.3d 1351 (Fed. Cir. 2013).
92 *Id.* at 1353.
93 *Id.* at 1354.
94 *Id.*
95 *Id.*
96 *Id.*
97 *Id.* at 1353.
98 *Id.* at 1353–55.
99 *Id.* at 1353.
100 *Id.* at 1355.
101 *Id.* at 1353.

protection appears to create a paradox in action-based climate change governance. While patents aim to encourage and incentivize innovation, they can also discourage and dissuade actors from actively and swiftly executing plans that could contribute to the deceleration of climate change.

B. Exclusion of Climate Mitigation Technology from Patent-Eligible Subject Matter

Considering this paradoxical facet of patent rights concerning climate change, should inventions that contribute to preventing climate change be excluded from subject matters that are eligible for patent protection? Even if rules are established to prevent patents from being issued for inventions that can facilitate measures against climate change, the implementation of such rules is difficult in at least two respects.

First, there are uncertainties over when an invention qualifies as being able to contribute to mitigating climate change.[102] Independent Claim 1 of Honeywell's U.S. Patent No. 8,033,120, for example, does not mention climate nor greenhouse gases.[103] The patented invention was characterized as contributing to mitigating climate change because the invention used the refrigerant HFO-1234yf, which experts believe has lower Global Warming Potential. What if experts disagree as to whether the use of this refrigerant helps mitigate climate change? If such controversies are present, then the determination of whether the invention qualifies as being able to contribute to climate change mitigation becomes even more uncertain.

Second, many inventions were patented before the issue of climate change became as urgent as it is now. If the inventions claimed in those patents are essential for alleviating climate change, is it fair to render those patents unenforceable without any inequitable conduct on the part of the patentee?

C. Compulsory Licensing of Climate Change Mitigation Technology

Should compulsory licenses be issued with respect to patents covering climate change mitigation technology so that the patented

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102 *See* Joshua D. Sarnoff, *The Patent System and Climate Change*, 16 VA. J.L. & TECH., 302, 360 (2011), https://www.law.ox.ac.uk/sites/files/oxlaw/sarnoff_paper.pdf [https://perma.cc/MTB2-9RXF].

103 *See* U.S. Patent No. 8,033,120 Claim 1.

inventions can be used freely by the public to address climate change? Compulsory licenses are often issued to cope with emergencies.[104] Climate change is a chronic phenomenon with potentially grave consequences to human life and the Earth.

Does climate change qualify as an emergency that justifies the issuance of a compulsory license to use a patented invention without any authorization from the patentee? Article 31 of the Agreement on Trade-Related Aspects of Intellectual Property Rights[105] has been interpreted to allow Member States of the World Trade Organization to issue compulsory licenses for reasons of public interest,[106] including the protection of the environment.[107] Climate change mitigation arguably serves the public interest.

D. Trade Secrets as Potential Barrier to the Use of Licensed Technology

Even if a compulsory license is granted for a technology that could be beneficial for addressing climate change, the public might not be able to use the technology if trade secrets are required to fully implement the technology.[108] Trade secrets are concealed from the public.[109] Many climate change mitigation technologies might be

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104 Roger Kampf, *Special Compulsory Licences for Export of Medicines: Key Features of WTO Members' Implementing Legislation* 1–75 (World Trade Org., Working Paper No. ERSD-2015-07, 2015), https://www.wto.org/ENGLISH/res_e/reser_e/ersd201507_e.pdf [https://perma.cc/B8CM-SQ2B].

105 *The TRIPS Agreement and the Conventions Referred to In It*, WORLD TRADE ORG., https://www.wto.org/english/tratop_e/trips_e/ta_docs_e/1_tripsandconventions_e.pdf [https://perma.cc/4SDA-YKZT] (last visited May 18, 2025).

106 Nancy L. Urizar, *Compulsory Patent Licensing in Response to COVID-19: Recent International Developments*, GOODWIN (Nov. 18, 2020), https://www.goodwinlaw.com/publications/2020/11/compulsory-patent-licensing-in-response-to-covid19 [https://perma.cc/8GRU-E3GV].

107 Antony Taubman & Jayashree Watal, *The WTO TRIPS Agreement – A Practical Overview for Climate Change Policymakers*, WORLD TRADE ORG. 8–9, https://www.wto.org/english/tratop_e/trips_e/ta_docs_e/8_3_overviewclimatechange_e.pdf [https://perma.cc/8VMG-33P4] (last visited May 18, 2025).

108 *Id.* at 9.

109 *See, e.g.*, Edward P. Richards, *Trade Secrets*, THE CLIMATE CHANGE & PUB. HEALTH L. SITE, https://biotech.law.lsu.edu/books/lbb/x888.htm [https://perma.cc/S3NL-BUNM] (last visited May 18, 2025); Mary Kuhlman, *Report: Secret Fracking Chemicals a Concern for Ohio*, OHIO NEWS CONNECTION (Sept. 16, 2019, 9:56 AM), https://www.clevescene.com/news/report-secret-fracking-chemicals-a-concern-for-ohio-31355488 [https://perma.cc/FY5V-WUYJ].

protected by trade secrets.[110] The Canadian Intellectual Property Office, for example, explains that the fact that "many innovations or inventions remain hidden as trade secrets" presents a "challenge" to the development of novel technologies for climate change mitigation.[111]

E. Climate Change Response as a Potential Defense to Patent Infringement

Should patent law adopt a doctrine similar to the fair use doctrine in copyright law in order to allow fair use of an invention for addressing climate change? Should the use of a patented invention for the mitigation of climate change be a defense, exonerating the alleged patent infringer from liability? Since measures against climate change are implemented widely by many individuals and entities in multiple industries, the invocation of such a doctrine and defense is likely to be frequent. This phenomenon could weaken patent protection for technology designed to address climate change.

F. Patent as Facilitator of Innovation in Climate Change Mitigation

There is controversy over whether patent rights are effective or harmful for alleviating climate change. Patent rights have both potentially positive and negative impacts on the prevention of climate change. CambridgeIP reports that the rate of filing of patent applications for inventions concerning climate change mitigation technologies has increased since 2006.[112]

One of the geoengineering technologies protected by patents is Mootral. Mootral is a natural feed supplement for cows.[113] Its active ingredients are garlic and citrus.[114] When cows consume Mootral with

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110 *Patented Inventions in Climate Change Mitigation Technologies*, *supra* note 44, at 8.

111 *Id.*; *see also id.* at 4.

112 *See* CambridgeIP, *The Acceleration of Climate Change and Mitigation Technologies: Intellectual Property Trends in the Renewable Energy Landscape*, WORLD INTELL. PROP. ORG. (2014), https://www.wipo.int/edocs/pubdocs/en/wipo_pub_gc_1.pdf [https://perma.cc/2DZE-EMHR].

113 *Mootral: Saving the Climate, One Cow at a Time*, WORLD INTELL. PROP. ORG. (2020), https://www.wipo.int/wipo_magazine/en/ip-at-work/2021/mootral.html [https://perma.cc/6UPX-473M].

114 *Id.*; *see also* Hilde Vrancken et al., *Reduction of Enteric Methane Emission in a Commercial Dairy Farm by a Novel Feed Supplement*, OPEN J. OF ANIMAL SCIS. (2019), https://www.researchgate.net/publication/333898079_Reduction_of_Enteric_Methane

their food, the amount of methane emissions caused by the cow's digestion will decrease.[115] Feeding Mootral to 1.5 billion cows on the Earth could achieve a reduction in emissions corresponding to 1.5 gigatons of carbon dioxide every year.[116] Thus, Mootral is a type of geoengineering technology with natural sources that aims to mitigate climate change "one cow at a time."[117] The largest challenge that the inventor of Mootral faced was how to prevent side effects of this technology so that cows' welfare will be sustained.[118]

The World Intellectual Property Organization (WIPO) explains that "IP protection is especially important" for start-up companies such as the inventor of Mootral.[119] According to WIPO, entities without large market power need protection for their inventions in order to "keep innovating and developing new solutions."[120]

G. Maintaining Core Technology of Geoengineering in the Public Domain

Meanwhile, David Keith opposes the patenting of core technologies of solar geoengineering.[121] Keith started researching solar radiation "when no one else was working on it."[122] According to Keith and John Dykema, it is imperative to conduct credible assessments concerning the efficacy and risk of solar geoengineering.[123] They argue that multipolar research and transparency are crucial in achieving credibility.[124] They state that this requisite transparency cannot be

_Emission_in_a_Commercial_Dairy_Farm_by_a_Novel_Feed_Supplement [https://perma.cc/5M66-UVZK]; U.S. Patent No. 8,771,723 (issued July 8, 2014).

115 *Mootral: Saving the Climate, One Cow at a Time*, *supra* note 113.

116 *Id.*

117 *Id.*

118 *Id.*

119 *Id.*

120 *Id.*

121 David Keith & John Dykema, *Why We Chose Not to Patent Solar Geoengineering Technologies*, HARV. UNIV.: DAVID KEITH'S RSCH. GRP. (May 3, 2018), https://web.archive.org/web/20250210103123/https://keith.seas.harvard.edu/blog/why-we-chose-not-patent-solar-geoengineering-technologies [https://perma.cc/6PU7-XR3Q].

122 Anne C. Mulkern, *Researcher: Ban Patents on Geoengineering Technology*, SCI. AM. (Apr. 18, 2012), https://www.scientificamerican.com/article/researcher-ban-patents-on-geoengineering-technology/ [https://perma.cc/7HQM-A6VJ].

123 Keith & Dykema, *supra* note 121.

124 *Id.*

reasonably attained in a "commercial setting that depends on the ability to protect and monetize intellectual property."[125]

They have, therefore, published their findings on the technology of solar geoengineering so that the publication would constitute prior art, preventing inventors from patenting the technology.[126] Keith and Dykema maintain that solar geoengineering "might allow humanity to alter the climate over decades to centuries."[127] They argue that the technology of geoengineering must be "owned and controlled by transparent democratic institutions."[128] According to Keith and Dykema, "It requires global governance."[129]

H. Strict Regulation as Complement to Patents for Stimulating Innovation

According to the Porter hypothesis, strict environmental regulations can enhance productivity and innovation.[130] Strict regulations for climate change might prompt market actors to shift resources to enterprises equipped with the technology to comply with the regulations.[131] These "selection effects"[132] could transform market actors into robust entities capable of implementing effective measures to address climate change. The Porter hypothesis[133] suggests that strict regulations of climate change may act as a complement to patent law for promoting innovation in climate change mitigation technologies.

CONCLUSION

Global climate change is much more than a scientific evaluation of temperatures and carbon dioxide emissions. It is a multilayered, large-scale problem. The focus of climate change governance should be on the stimulation of preventive and mitigating actions from as many

125 *Id.*

126 *See id.*

127 *Id.*

128 *Id.*

129 *Id.*

130 *World Trade Report 2018: The Future of World Trade: How Digital Technologies Are Transforming Global Commerce*, WORLD TRADE ORG. 101 (2018), https://www.wto.org/english/res_e/publications_e/world_trade_report18_e.pdf [https://perma.cc/4MVH-ZPMM] (citing Porter and van der Linde, 1995).

131 *Id.* (citing Qiu et al., 2017).

132 *Id.*

133 *Id.*

actors as possible. In this action-based governance of climate change, the development of novel technology and intellectual property law has the potential to help prevent and mitigate climate change. The global governance of climate change is transforming into an integrated governance.[134] It is a multidisciplinary endeavor that encompasses public health, human rights, technology, data management, ethics, privacy protection, and intellectual property governance.

134 *See* David P. Fidler, *From International Sanitary Conventions to Global Health Security: The New International Health Regulations*, 4 CHINESE J. INT'L L. 325, 343 (2005), https://academic.oup.com/chinesejil/article/4/2/325/490058 [https://perma.cc/XY2D-DY79].