ARTICLES

Climate Change Beyond Environmentalism Part II: Near-Term Climate Mitigation in a Post-Regulatory Era

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ABSTRACT

This Article is the second in a two-part series exploring key obstacles to effective climate change emissions reduction efforts in the United States and potential solutions. Part I explored the intersectional threats of climate change, its discriminatory impacts upon the economically disadvantaged, people of color, women, children, and animals; and the unique role animals play as both a cause and victims of climate change emissions. Part I also argued for reactivation of the historic alliance between animal protection and environmental advocates as a first step in creating a more inclusive climate coalition effort. This Article draws on the conclusions in Part I to explore both a new climate policy strategy and potential operational tactics for the proposed new climate coalition. After discussing the potential benefits of refocusing climate change mitigation strategies on short-term methane control opportunities, this Article discusses whether the campaign tactics deployed by the animal protection movement over the last decade to address farm animal abuses could be a model for a new collaborative effort to control climate change emissions in an era where the efficacy and existence of regulatory control measures is in doubt.

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INTRODUCTION

This Article is the second in a two-part series exploring key obstacles to effective climate change emissions reduction efforts in the United States and potential solutions. Part I explored the intersectional threats of climate change, its discriminatory impacts upon the economically disadvantaged, people of color, women, children, and animals; and the unique role animals play as both a cause of climate change emissions and some of its front-line victims. Part I also discussed the failure of legislative and regulatory institutions to provide meaningful solutions to the climate change problem; argued for the immediate engagement of the animal protection community due to the impending death of billions of animals from climate change; and made the case for reactivation of the historic alliance between animal protection and environmental advocates as a first step towards a more holistic and inclusive climate coalition effort.

This Article draws on the conclusions reached in Part I to explore both a new climate policy strategy and potential operational tactics for a broad coalition of public interest groups who (whether they know it or not) are facing a major crisis as the impacts of climate change continue to materialize. As discussed in Part I, these impacts are not far-flung estimates of what might occur in 2075 or beyond.[1] The net negative impacts of climate change on at-risk populations of people and animals are already emerging all over the world. Indeed, in the time between publication of Parts I and II of these Articles, there has been a flood of new reports, studies, and events all confirming the urgent need to scale-up global and domestic efforts to fight climate change.[2]

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1. *See* Jonathan Lovvorn, *Climate Change Beyond Environmentalism Part I: Intersectional Threats and the Case for Collective Action*, 29 GEO. ENVTL. L. REV. 1 (2016).

2. *See* Andrew Griffin, *Hurricane Irma Likely to be Followed by More Extreme Weather Events so We Should Prepare for Horror of Global Warming Now, Say Experts*, THE INDEPENDENT

To date, most of the work being done to reduce the increasingly existential threat of greenhouse gas ("GHG") emissions—both domestically and in the international arena—has focused primarily on the reduction of CO_2 emissions. However, the long lifespan of carbon in the atmosphere, combined with recent moves towards dismantling federal CO_2 control efforts in the United States, present serious questions about the ability of CO_2 regulation to mitigate emerging climate change impacts, and the drastic impacts slated to hit over the next 10–15 years. While CO_2 emission control is critically necessary for the sake of future generations and the long-term survival of human and non-human animal life, it is increasingly apparent that CO_2 mitigation alone (or even an immediate and impractical halt of all CO_2 emissions) will not avert the impending climate disasters described in Part I of this series—including annual deaths from extreme heat in the United States exceeding gun violence, the mass relocation of millions of Americans of limited economic means to higher ground, and the irretrievable loss of billions of animals and many entire species.[3]

Accordingly, this Article explores why climate advocacy efforts should be refocused to pursue immediate and drastic reduction of GHG emissions that might dissipate in time to mitigate some of these looming climate change impacts. This Article is in no way an argument for ignoring the problem of CO_2 emissions, including the pressing need to increase efforts to transition to clean

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(Sept. 7, 2017), https://www.independent.co.uk/environment/irma-hurricane-extreme-weather-events-climate-change-global-warming-experts-a7934211.html ("Increasingly, the evidence is clear that the poorest, being the most exposed to many climate risks and often being the least protected, will be most affected"); Zoë Schlanger, *If Oceans Stopped Absorbing Heat from Climate Change, Life on Land Would Average 122 ℉*, QUARTZ (Nov. 29, 2017), https://qz.com/1141633/if-oceans-stopped-absorbing-heat-from-climate-change-life-on-land-would-average-122f/ ("more than 93% of excess heat captured by greenhouse gases has been absorbed by the oceans . . . If the oceans *weren't* absorbing it, average global temperatures on land would be far higher—around 122°F, according to researchers on the documentary *Chasing Coral*"); Sarah Kaplan, *Thousands of Scientists Issue Bleak 'Second Notice' to Humanity*, WASH. POST (Nov. 13, 2017), https://www.washingtonpost.com/news/speaking-of-science/wp/2017/11/13/thousands-of-scientists-issue-bleak-second-notice-to-humanity/?utm_term=.6a937f0a09b9 ("more than 15,000 scientists from 184 countries assess the world's latest responses to various environmental threats. Once again, they find us sorely wanting"); David Wallace-Wells, *The Uninhabitable Earth*, N.Y. MAG. (July 9, 2017), http://nymag.com/daily/intelligencer/2017/07/climate-change-earth-too-hot-for-humans-annotated.html (providing a bleak and vivid description of the climate change threat in a piece subtitled "*Famine, economic collapse, a sun that cooks us; What climate change could wreak – sooner than you think*," but also setting off a fierce debate among climate scientists and advocates over the role of fear in climate advocacy and the dangers of doomsday rhetoric); *see also* Emily Atkin, *The Power and Peril of "Climate Disaster Porn*," THE NEW REPUBLIC (July 10, 2017), https://newrepublic.com/article/143788/power-peril-climate-disaster-porn.

3. *See* Lovvorn, *supra* note 1, at 2; *see also* Gerardo Ceballos et al., *Biological Annihilation via the Ongoing Sixth Mass Extinction Signaled by Vertebrate Population Losses and Declines*, 30 PROCEEDINGS OF THE NAT'L ACAD. OF SCIS. 1 (July 10, 2017), http://www.pnas.org/content/pnas/114/30/E6089.full.pdf (finding that "Earth's sixth mass extinction is more severe than perceived when looking exclusively at species extinction," that "more than 40% of the species [studied] have experienced severe population declines" short of extinction, that this "episode of population declines and extirpations . . . will have negative cascading consequences on ecosystem functioning and services vital to sustaining civilization," and describing this loss as "biological annihilation").

energy sources. Especially in light of recent executive branch moves to dismantle the last decade of progress toward developing a comprehensive federal regulatory scheme for energy sector emissions, the need for climate advocates to develop new tools to address CO_2 emissions is greater than ever. But the available science makes clear that merely stabilizing CO_2 emissions—or even slightly reducing them—will not be enough. The 900,000,000 people in the world living in extreme poverty, the native communities literally disappearing into the sea throughout Alaska and elsewhere around the globe, the 600,000,000 people living less than ten meters above sea level, and the more than 140,000,000,000 wild animals already caught in climate change's cruel grasp cannot afford to wait for incremental emissions reduction plans, GHG trading schemes, or other efforts to "stabilize" global warming pollutant emissions.[4] Given the current regulatory environment, any hope of mitigating near-term climate disasters is dependent on adopting a more comprehensive view of the GHG emission problem, combined with new consumer, corporate, and legal strategies to move control efforts forward.

The first question addressed in this Article is, therefore, whether methane reduction efforts might present a fruitful strategic opportunity for near–term mitigation, in addition to ongoing CO_2 control efforts. Although much smaller than carbon in the overall portfolio of GHG emissions, methane is approximately eighty times more potent a global warming agent than carbon over a twenty-year timeframe, but unlike carbon it dissipates in just a few years.[5] There are strong indications that methane might provide a pathway to near-term climate change mitigation. A 2016 study entitled "*The Growing Role of Methane in Anthropogenic Climate Change*," found that "[u]nlike CO_2, atmospheric methane concentrations are rising faster than at any time in the past two decades," that "the rapid rise in global methane concentrations is predominantly biogenic—most likely from agriculture," and that "[m]ethane mitigation offers rapid climate benefits."[6]

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4. *See* Lovvorn, *supra* note 1, at 7.

5. *See* Scot M. Miller et al., *Anthropogenic Emissions of Methane in the United States*, 50 PROC. NAT'L ACAD. SCIS. 20018, 20018 (Dec. 10, 2013), http://www.pnas.org/content/pnas/110/50/20018.full.pdf; JOSEPH ROMM, CLIMATE CHANGE: WHAT EVERYBODY NEEDS TO KNOW 81 (2016).

6. Marielle Saunois, et al., *The Growing Role of Methane in Anthropogenic Climate Change*, 11 ENVTL. RES. LETTERS 120207, 1 (2016), http://iopscience.iop.org/article/10.1088/1748-9326/11/12/120207/pdf ("Methane emissions from increasing agricultural activities seem to be a major, possibly dominant, cause of the atmospheric growth trends of the past decade."); *see also* George D. Banks, AM. COUNCIL FOR CAPITAL FORMATION, SUCCESS OF U.S. CLIMATE PLEDGE DEPENDS ON FUTURE GHG REGULATION OF U.S. INDUSTRY, OTHER SECTORS 6, 7 (2015), http://accf.org/2015/11/24/success-of-u-s-climate-pledge-depends-on-future-ghg-regulation-of-u-s-industry-other-sectors/ (detailing how in order to meet the Obama Administration's climate pledge to the United Nations; it will be necessary to regulate not just the energy, transportation, and industrial sectors but also other sectors like land use and agriculture.); Seth Borenstein, *Scientists: World Likely Won't Avoid Dangerous Warming Mark*, ASSOCIATED PRESS (Sept. 29, 2016), http://www.bigstory.ap.org/article/58126674d35b4504b44c4010389a2258/scientists–world–likely–wont–avoid–dangerous–warming–mark ("A team of top scientists is telling world leaders to

There are two major problems with this strategy. The first is that one of the top three major sources of methane emissions—animal and plant agriculture—is essentially unregulated, and often ignored in climate policy discussions. This blindness to one of the largest sources of controllable methane emissions (as well as CO_2 and nitrous oxide) not only frustrates efforts at meaningful climate change mitigation under existing long-term agreements,[7] it also makes these emissions almost impossible to bring under strict control in the short-term. There is simply no legal infrastructure in place to upgrade or otherwise build upon. In the United States, GHG emissions regulators do not even catalog where the agricultural sources are, nor are they monitoring or regulating emissions from these sources.

The second problem with a methane strategy is that the Trump administration has ushered in a new era of extreme hostility to regulation of any kind, but especially to the regulation of GHG emissions. Thus, not only is the concept of expanding methane control efforts via existing regulatory institutions politically impossible, the limited methane regulations already in place are currently being rolled back or eliminated entirely. Efforts to control CO_2 emissions are equally at risk. Thus, some other approach will be required if we are to make any effort to deploy methane control as a near-term climate change mitigation tool, and continue CO_2 control efforts in a post-regulatory environment.

Accordingly, the second major question addressed in this Article is whether there are alternative tactics for cutting methane (and potentially CO_2 emissions) that are not dependent on the issuance of new regulations or legislative mandates that will not be forthcoming anytime soon. The jumping off point for this discussion will be a comparative analysis of whether the legal and policy tactics deployed by the animal protection movement over the last decade—wherein major animal abuses have been controlled through individual and institutional consumer campaigns, consumer protection litigation, investor advocacy, and corporate pressure—could be a model for a new collaborative and cross-disciplinary effort to control climate change emissions in an era where the efficacy (and indeed the very existence) of regulatory control measures is in doubt.

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stop congratulating themselves on the Paris agreement to fight climate change because if more isn't done, global temperatures will likely hit dangerous warming levels.").

7. *See* Eva Wollenberg et al., *Reducing Emissions from Agriculture to Meet the 2°C Target*, 22 GLOBAL CHANGE BIOLOGY 3859, 3859 (2016) (noting that excluding agriculture from mitigation targets will increase mitigation costs in other sectors or reduce the feasibility of meeting the 2°C goal but concluding that current mitigation strategies in the agriculture sector only have the capacity to deliver 21 to 40% of needed mitigation); ROB BAILEY, ANTONY FROGGATT & LAURA WELLESLEY, LIVESTOCK—CLIMATE CHANGE'S FORGOTTEN SECTOR: GLOBAL OPINION ON MEAT AND DAIRY CONSUMPTION, CHATHAM HOUSE 4 (2014), https://www.chathamhouse.org/sites/files/chathamhouse/field/field_document/20141203LivestockClimateChangeForgottenSectorBaileyFroggattWellesleyFinal.pdf (noting that while new technologies and changes in livestock production practices can reduce livestock emissions, these efforts alone are insufficient to mitigate emissions to meet the 2°C goal).

This Article is not a critique of emissions trading programs, expanded regional planning, state and local efforts, or existing consumer and corporate efforts to control CO_2 emissions. Nor will it assert that legislatures and agencies have no role to play in controlling climate emissions. Rather, it seeks to explore whether there are short-cuts to near-term climate mitigation that are being overlooked, and whether aggressive consumer campaigns, corporate pressure, and corporate-based litigation campaigns focused on methane might be additional tools to address near-term climate mitigation in light of the dysfunctional and rapidly disappearing regulatory norms applied to date.

Section I explains the difficulty of CO_2 emission control efforts as a strategy for near-term mitigation of the climate change impacts already manifesting for people, animals, and the environment across the globe. Section II explores the promises and potential limitations of methane control as a near-term mitigation strategy for climate change, with a focus on the top three major sources: landfills, oil and gas development, and agriculture. This section will include an exploration of the serious problem of unregulated and unmonitored methane emissions from agriculture, with the goal of understanding the reasons why such emissions are routinely ignored by policymakers and climate advocates. Section III explores tactical options for operationalizing a near-term methane reduction strategy, including a description of the animal protection movement's success over the last decade utilizing consumers, corporations, investors, and the courts, rather than government regulations, to control anti-social animal-use behavior, and how this model could be applied to a social problem that has evaded traditional legal control efforts for many years.

As described in Part I of this series, the goal of these Articles is to diversify and increase the social, political, legal, and economic leverage currently being applied to the problem of climate change, prepare for the dismantling of existing regulatory frameworks for climate change emissions, develop ideas for bypassing regulatory and political roadblocks that have stalled climate policy for decades, and explore creative ways to mitigate some of the near-term impacts of a climate change crisis that is already upon us.

I. THE LIMITS OF NEAR-TERM CO_2 REDUCTION

Almost every day there is new evidence that it is simply too late for even extremely aggressive CO_2 emissions cuts to avert a climate crisis over the next 10 to 20 years. Prior to the industrial revolution, scientists believe that total atmospheric CO_2 levels were approximately 280 parts per million (ppm).[8] Human activities between the mid–eighteenth century and 1970 raised this

8. *The Relentless Rise of Carbon Dioxide*, NASA, https://climate.nasa.gov/climate_resources/24/ (last visited Mar. 14, 2018).

number to approximately 325 ppm.[9] Between 1970 and 2015, that number jumped to over 400 ppm.[10] 2016 had the dubious distinction of being "the first year in human history where carbon dioxide levels have reached the symbolic milestone [of 400 ppm] for an entire year."[11] 2016 and 2017 were both record-setting years for climate change warming, continuing a trend in which "17 of the 18 warmest years since modern record-keeping began have occurred since 2001."[12]

It may be too late to affect near-term climate impacts with CO_2 emission controls for three key reasons: the inadequacy of existing CO_2 control targets; the fact that total CO_2 is already so high that it will be impossible to hit those targets without extracting CO_2 from the atmosphere; and the concern that even getting on course to meet those increasingly unrealistic targets would do little to mitigate the devastating impacts of climate change already well underway throughout the world.

First, current domestic CO_2 emission targets do not even put a serious dent in either existing emissions levels or the resulting warming. Indeed, "[e]ven if the US implements a range of emissions-slashing proposals that have yet to be introduced, the nation could still overshoot its 2025 target by nearly 1bn tonnes of greenhouse gases."[13] As they stood before the 2016 U.S. election, the Obama Administration's emission reduction policies were projected to fall short of both the upper and lower limits of the U.S.'s internationally determined contributions.[14] However, even these modest emissions goals are being rolled back by the Trump administration, in keeping with the President's campaign promise to "pull America out of the landmark Paris

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9. Richard Harris, *'Dangerous Territory': Carbon Dioxide Levels Reach Milestone*, NPR (May 10, 2013), https://www.npr.org/2013/05/10/182029983/dangerous-territory-carbon-dioxide-levels-reach-iconic-high.

10. *Id.*; Doyle Rice, *The Last Time the Earth Was this Warm Was 125,000 Years Ago*, USA TODAY (Jan. 18, 2017), https://www.usatoday.com/story/weather/2017/01/18/hottest-year-on-record/96713338/ ("Since the start of the 21st century, the annual global temperature record has been broken five times — 2005, 2010, 2014, 2015, and 2016. . .").

11. Brian Kahn, *Carbon Dioxide Passed Critical Threshold in 2015*, CLIMATE CENTRAL (Oct. 24, 2016), https://www.climatecentral.org/news/carbon-dioxide-400-ppm-threshold-2015-20809.

12. Henry Fountain, Jugal K. Patel & Nadia Popovich, *2017 Was One of the Hottest Years on Record. And That Was Without El Niño*, N.Y. TIMES (Jan. 18, 2018), https://www.nytimes.com/interactive/2018/01/18/climate/hottest-year-2017.html ("The world in 2017 saw some of the highest average surface temperatures ever recorded, surprising scientists who had expected sharper retreat from recent record years."); Jugal K. Patel, *How 2016 Became Earth's Hottest Year on Record*, N.Y. TIMES (Jan. 18, 2017), https://www.nytimes.com/interactive/2017/01/18/science/earth/2016-hottest-year-on-record.html.

13. Oliver Milman, *US Emissions Set to Miss 2025 Target in Paris Climate Change Deal, Research Finds*, THE GUARDIAN (Sept. 26, 2016), https://www.theguardian.com/science/2016/sep/26/us-climate-change-emissions-miss-2025-target-research.

14. Jeffrey B. Greenblatt & Max Wei, *Assessment of the Climate Commitments and Additional Mitigation Policies of the United States*, NATURE CLIMATE CHANGE 1 (Sept. 26, 2016).

agreement" and take other action to eliminate Obama-era climate emissions restrictions.[15]

Second, we have reached the point where hitting standard CO_2 emission targets such as limiting warming to two or three degrees or keeping total emissions under 400ppm will now require "negative emissions"—*i.e.*, extracting CO_2 from the atmosphere.[16] But according to a 2016 study about the feasibility of such strategies, "[n]egative-emission technologies are not an insurance policy, but rather an unjust and high-stakes gamble."[17] These "high-tech" solutions are increasingly brought up as a quick fix for a society unwilling to address front-end causation, but they have significant risks associated with them, including the need for significant land resources, the attendant costs to wildlife species, impacts on the livelihood of indigenous peoples, a reduction in land suitable for food production, and interference with ongoing battles over land rights.[18] There is also a high likelihood that they will not prove feasible, either technologically and/or because of intervening factors.[19] These strategies also sound increasingly far-fetched, with some proposals "relying on large-scale bioenergy with carbon capture technology that would require a land area twice the size of India to be dedicated solely to growing trees for bioenergy, potentially risking the land's ability to grow food and jeopardizing the communities that rely on it."[20]

Third, and most importantly, because of the long-term damage already done by more than a century of unregulated carbon emissions,[21] and the long lifespan of carbon in the atmosphere, even immediate (and unlikely) reductions in carbon emissions would take many decades to have any significant effect on the human-caused warming already underway, and would thus arrive too late to mitigate the

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15. Tom Batchelor, *Trump 'Will Definitely Pull Out of Paris Climate Change Deal,'* THE INDEPENDENT (Jan. 30, 2017), https://www.independent.co.uk/news/world/americas/donald-trump-paris-climate-change-deal-myron-ebell-us-president-america-pull-out-agreement-a7553676.html; Coral Davenport, *Top Trump Advisers Are Split on Paris Agreement on Climate Change*, N.Y. TIMES (Mar. 2, 2017), https://www.nytimes.com/2017/03/02/us/politics/climate-change-trump.html.

16. H. Damon Matthews, Susan Solomon & Raymond Pierrehumbert, *Cumulative Carbon as a Policy Framework for Achieving Climate Stabilization*, 370 PHIL. TRANSACTIONS: MATHEMATICAL, PHYSICAL AND ENG'R SCI. 4365, 4368 (2012); Brian Walsh et al., *Pathways for Balancing CO2 Emissions and Sinks*, 8 NATURE COMM. 1, 8 (2017).

17. Bobby Magill, *Scientists Warn Negative Emissions Are a 'Moral Hazard,'* CLIMATE CENTRAL (Oct. 13, 2016), http://www.climatecentral.org/news/scientists-warn-negative-emissions-moral-hazard-20785.

18. *Id.*

19. Sivan Kartha & Kate Dooley, *The Risks of Relying on Tomorrow's "Negative Emissions" to Guide Today's Mitigation Action*, STOCKHOLM ENVIR. INST. 3–4 (2016), https://www.sei-international.org/medimediaman/documents/Publications/Climate/SEI-WP-2016-08-Negative-emissions.pdf.

20. Magill, *supra* note 17 ("Scientists have also questioned whether the process is carbon neutral").

21. *See* Brian Kahn, *The World Passes 400ppm Carbon Dioxide Threshold. Permanently*, CLIMATE CENTRAL (Sept. 27, 2016), http://www.climatecentral.org/news/world-passes-400-ppm-threshold-permanently-20738; Cheyenne Macdonald, *Global Warming Milestone as Scientists Warn Earth Has Passed Carbon Tipping Point 'For Good'*, DAILY MAIL (Sept. 28, 2016), http://www.dailymail.co.uk/sciencetech/article–3812087/Global–warming–milestone–scientists–warn–Earth–passed–carbon–tipping–point–good.html.

devastating impacts of climate change. According to one recent study, even if all CO_2 emissions stopped immediately, it would take up to 1,000 years for existing carbon to dissipate, and "limiting the warming to 2 degrees would require keeping future cumulative carbon emissions below 250 billion tons, only half of the already emitted amount of 500 billion tons."[22] In contrast to other more familiar types of air and water pollution, CO_2 does not quickly dissipate from the atmosphere once carbon emissions are halted or reduced.[23] Unlike the chlorofluorocarbons that famously threatened the ozone layer in the 1980s, and then began to dissipate once they were banned,[24] CO_2 emissions take many decades or even centuries to naturally disperse.[25]

Thus, contrary to many people's understanding of the problem of climate change,[26] simply cutting off the source of CO_2 emissions does nothing to stop the warming effect of existing atmospheric CO_2 or the cycle of warming feedbacks created by current CO_2 levels. Although there is no question that, for the benefit of future generations, current CO_2 emissions levels must be significantly reduced, the available science suggests that an immediate halt of all CO_2 emissions (something that is politically and practically impossible) would not stave off the already manifesting negative effects of climate change.[27] As a scientist from the National Oceanic and Atmospheric Administration concluded back in 2009, "the climate change that takes place due to increases in carbon dioxide concentration is largely irreversible for 1,000 years after emissions stop."[28] Accordingly, whatever the solution may be, one thing is clear—near-term climate change is extremely unlikely to be controlled or mitigated by either command and control or voluntary reductions in CO_2 emissions.

II. METHANE REDUCTION AS A NEAR-TERM STRATEGY

Given the inadequacy of CO_2 control efforts as a near-term mitigation strategy, the question presented is whether refocusing efforts on methane control might be

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22. *See* Thomas L. Frolicher et al., *Continued Global Warming After CO_2 Emissions Stoppage*, 4 NATURE CLIMATE CHANGE 40 (2014); Morgan Kelly, *Even if Emissions Stop, Carbon Dioxide Could Warm Earth for Centuries*, PRINCETON (Nov. 24, 2013), https://www.princeton.edu/news/2013/11/24/even-if-emissions-stop-carbon-dioxide-could-warm-earth-centuries.

23. *See* Kelly, *supra* note 22.

24. *See* Eric Hand, *CFC Bans Pay Off as Antarctic Ozone Layer Starts to Mend*, 353 SCI. 16, 16–17 (2016) (finding ozone hole was shrinking due to declining pollutants in the atmosphere after CFCs were phased out by the Montreal Protocol).

25. *See* Frolicher et al., *supra* note 22.

26. ANTHONY LEISEROWITZ ET AL., YALE PROJECT ON CLIMATE CHANGE COMMC'N, AMERICANS' KNOWLEDGE OF CLIMATE CHANGE 10 (2010) (stating that more than half of Americans believe or aren't sure about the proposition that if humans stopped burning fossil fuels today, the amount of carbon dioxide in the atmosphere would decrease almost immediately and that less than 20% of Americans understand that carbon dioxide stays in the atmosphere for at least hundreds of years).

27. *See* Frolicher et al., *supra* note 22, at 43.

28. Susan Solomon et al., *Irreversible Climate Change Due to Carbon Dioxide Emissions*, 106 PROC. NAT'L ACAD. SCIS. 1704, 1704 (2009).

more effective for near-term climate mitigation. In order to answer this question, it is important to first understand how methane differs from other common GHG pollutants, the major sources of anthropogenic methane emissions, the regulatory efforts taken to date to control such emissions, and the problems presented by major emissions sources that continue to pump large and growing amounts of methane into the atmosphere without any regulation whatsoever.

A. METHANE AS A GREENHOUSE GAS

Methane is a much less commonly discussed gas as compared with CO_2. It is "the world's simplest hydrocarbon, with a chemical formula CH_4 (one atom of carbon and four atoms of hydrogen)," and "is commonly produced through the decomposition of organic materials in the absence of oxygen."[29] Although much smaller than carbon in the overall portfolio of GHG emissions, methane is seventy-four times more potent a global warming agent than carbon over a twenty-year timeframe, but unlike carbon it dissipates in just a few years.[30] Because of the long-lived nature of CO_2 emissions, some climate scientists now see methane emissions—the second largest source of GHGs after CO_2—as a more practical target for significant reduction over the near–term.[31] For this reason, methane reduction might be the only feasible climate strategy left to us after years of carbon emission neglect, and the only hope of mitigation over the next ten to twenty years.

Analyzing climate warming potential for methane as compared with other gases like CO_2 is relatively straightforward. The standard method for comparing GHG impacts is called Global Warming Potential, or "GWP," and provides a "measure of the total energy that a gas absorbs over a particular period of time compared to CO_2."[32] Thus, the "[k]ey factors affecting the GWP of any given gas include its average atmospheric lifetime and the ability of that molecule to trap heat. While methane is a highly potent GHG for a short period of time after its initial release, its capacity to trap heat dissipates after approximately 12 years."[33]

The lifecycle for CO_2 is very different and much longer as "atmospheric carbon from CO_2 emissions mixes into the oceans and biosphere (e.g., plants) over a period of a few hundred years, and then it is slowly removed over hundreds of thousands of years as it is gradually incorporated into carbonate rocks."[34] Thus, "[b]ecause of methane's high global warming potential and short lifetime in the

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29. RICHARD K. LATTANZIO ET AL., CONG. RESEARCH SERV., R43860, METHANE: AN INTRODUCTION TO EMISSION SOURCES AND REDUCTION STRATEGIES 1 (2016).

30. *See* Miller et al., *supra* note 5; ROMM, *supra* note 5.

31. Drew Shindell et al., *Simultaneously Mitigating Near–Term Climate Change and Improving Human Health and Food Security*, 335 SCI. 183, 183 (2012); MIKLOS BANKUTI ET AL., COMPLEMENTS TO CARBON: OPPORTUNITIES FOR NEAR–TERM ACTION ON NON–CO_2 CLIMATE FORCERS 13–15 (2011).

32. LATTANZIO ET AL., *supra* note 29, at 10.

33. *Id.*

34. *Id.*

atmosphere compared to CO_2, its mitigation offers the possibility to slow climate change efficiently in a shorter time horizon."[35]

The GWP of a particular GHG gas is typically measured over either a twenty-year or one hundred-year timeframe.[36] The United Nations Framework Convention on Climate Change ("UNFCCC") and the U.S. Environmental Protection Agency ("EPA") have differed slightly over the years in their assessments of the GWP of methane, but the most recent EPA assessment accepted by the UNFCCC assigns methane a GWP of twenty-five over one hundred years, which means methane has twenty-five times the warming effect of CO_2 over a one hundred-year span.[37] However, on the twenty-year scale, EPA's estimate of methane's GWP jumps to seventy-four—three times the one hundred-year potential.[38] In other words, stopping the emission of a single ton of methane has the same climate mitigation effect as removing seventy-four tons of CO_2 between now and 2040. Given the near-term climate change threats detailed in Part I of these articles,[39] the twenty-year GWP timeframe is by far the more important number.[40]

Unlike CO_2, the basics of how methane is released and absorbed, how it affects the environment, its method and timeline for dissipation, and its role in climate warming, are rarely discussed in popular literature concerning climate change. Methane is "both a precursor to ground-level ozone formation and a potent GHG."[41] Widely regarded as "the second most important anthropogenic greenhouse gas," methane "affects the ability of the atmosphere to oxidize other pollutants and plays a role in water formation within the stratosphere."[42]

Like CO_2, "methane emitted into the atmosphere absorbs terrestrial infrared radiation, which contributes to increased global warming and continuing climate

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35. Saunois et al., *supra* note 6, at 4.

36. *Understanding Global Warming Potentials*, U.S. ENVTL. PROT. AGENCY, https://www.epa.gov/ghgemissions/understanding-global-warming-potentials#Learn%20why (last visited Nov. 27, 2017); *Global Warming Potentials*, UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE, http://unfccc.int/ghg_data/items/3825.php (last visited Nov. 27, 2017).

37. EPA 2013 Revisions to the Greenhouse Gas Reporting Rule and Final Confidentiality Determinations for New or Substantially Revised Elements, 40 C.F.R. § 98 (2013).

38. *Id.*

39. *See* Lovvorn, *supra* note 1, at 20–53.

40. The EPA has suggested that methane might be as high as thirty-four and eighty-six times more potent than CO_2 over one hundred and twenty year timeframes. *See* Lattanzio, *supra* note 29, at 10 ("AR5, released in September 2013, lists methane's GWP at 28 and 84 over a 100-year and a 20-year time horizon, respectively, but these values have not yet been accepted officially by parties to the UNFCCC. Further, the AR5 reports methane's GWP inclusive of methane's indirect effects on aerosols as 34 and 86 over a 100-year and a 20-year time horizon, respectively.").

41. *See id.*, at 9 ("As a precursor to ground-level ozone formation, methane reacts with nitrogen oxides in the presence of sunlight to form what is commonly referred to as smog. Methane, however, is generally less reactive than other hydrocarbons. For this reason—and at this time—EPA has excluded it from the definition of regulated hydrocarbons called volatile organic compounds (VOCs).").

42. Miller et al., *supra* note 5 (citations omitted).

change."[43] With respect to historical trends, "[a]nthropogenic CH_4-emissions have almost tripled . . . since preindustrial times," which "contributes strongly to anthropogenic climate change through radiative forcing and impacts on atmospheric chemistry, particularly hydroxyl consumption, tropospheric ozone generation and water vapor formation in the stratosphere."[44]

Methane is "released into the atmosphere by natural sources such as wetlands, oceans, sediments, termites, volcanoes, and wildfires, as well as human activities such as oil and natural gas systems, coal mines, landfills, wastewater treatment facilities, and the raising of livestock."[45] According to the EPA:

> methane is primarily produced through anaerobic decomposition of organic matter in biological systems. Agricultural processes such as wetland rice cultivation, enteric fermentation in animals, and the decomposition of animal wastes emit CH_4, as does the decomposition of municipal solid wastes. Methane is also emitted during the production and distribution of natural gas and petroleum, and is released as a by-product of coal mining and incomplete fossil fuel combustion.[46]

Altogether, "[n]atural sources of CH_4 are estimated to produce 37 percent of the total CH_4 flux into the atmosphere every year,"[47] with the remaining 63% originating from human activities.[48]

Like CO_2, methane is removed from the atmosphere via interactions with other gases. Methane is "primarily removed from the atmosphere through a reaction with the hydroxyl radical (OH)," which "leads to production of tropospheric ozone and stratospheric water vapor, both of which also contribute to climate change."[49] But unlike CO_2, very little emitted methane is captured or sequestered in terrestrial "sinks"—*i.e.*, certain types of surface environments that collect and store GHG emissions.[50] In other words, once methane is released, the only possible outcome is climate warming, followed by its breakdown into *other climate-*

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43. *See* LATTANZIO ET AL., *supra* note 29, at 9.

44. Heinrich Schaefer et al., *A 21st Century Shift from Fossil Fuel to Biogenic Methane Emissions Initiated by $^{13}CH_4$*, 352 SCI. 6281, 6280 (2016) (citations omitted).

45. *See* LATTANZIO ET AL., *supra* note 29, at 1.

46. EPA, INVENTORY OF U.S. GREENHOUSE GAS EMISSIONS AND SINKS: 1990-2014 1-6 (2016).

47. EPA, METHANE AND NITROUS OXIDE FROM NATURAL SOURCES ES-2 (2010), http://scholars.unh.edu/cgi/viewcontent.cgi?article=1483&context=earthsci_facpub ("The largest source of natural CH_4 emissions is natural wetlands, which contribute 170Tg CH_4/yr (per year)"). Several other sources contribute substantially as well, including geologic emissions (now estimated at 42 to 64 Tg CH_4/yr), lakes (estimated at 30 Tg CH_4/yr), and vegetation (which potentially contributes 20 to 60 Tg CH_4/yr)).

48. Saunois et al., *supra* note 6, at 1 ("Tropical sources, including both natural and anthropogenic sources represent two-thirds of total global emissions and are dominated by emissions from wetlands . . . Approximately two-thirds of global emissions are also attributable to anthropogenic activities, including those from both mid-latitudes and the tropics (e.g., agriculture and waste).").

49. EPA, *supra* note 46.

50. *Id.* ("Minor removal processes also include reaction with chlorine in the marine boundary layer, a soil sink, and stratospheric reactions."); *see also* Saunois, *supra* note 6, at 4.

warming gases.[51]

In terms of total emissions, the EPA identifies methane as the second largest source of GHG emissions.[52] According to the agency, methane accounted for 10.6% of GHG emissions in 2014.[53] Carbon dioxide accounted for 80.9%; nitrous oxide accounted for 5.9%; and hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride, and nitrogen trifluoride combined accounted for 2.6%.[54] As is the case with CO_2, methane emissions levels have increased rapidly across the globe.

According to the EPA's 2016 Inventory of U.S. Greenhouse Gas Emissions and Sinks:

> [a]tmospheric concentrations of CH_4 have increased by about 160 percent since 1750, from a pre-industrial value of about 700 ppb to 1,823 ppb in 2014, although the rate of increase decreased to near zero in the early 2000s, and has recently increased again to about 5 ppb/year. The IPCC has estimated that slightly more than half of the current CH_4 flux to the atmosphere is anthropogenic, from human activities such as agriculture, fossil fuel use, and waste disposal.[55]

A 2016 study of this increase in methane noted that "the sustained nature of the increase and isotopic shift, and the regional and global distribution of the methane growth, implies that major ongoing changes in methane budgets are occurring."[56] According to that same study:

> Methane in past global climate events has been both a 'first indicator' and a 'first responder' to climatic change. Comparison with these historic events suggests that if methane growth continues, and is indeed driven by biogenic emissions, the present increase is already becoming exceptional, beyond the largest events in the last millennium.[57]

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51. NAZIM MURADOV, LIBERATING ENERGY FROM CARBON: INTRODUCTION TO DECARBONIZATION 55 (2014); *see* Susan Solomon et al., *Contributions of Stratospheric Water Vapor to Decadal Changes in the Rate of Global Warming*, 327 SCI. 1219, 1221 (2010).

52. EPA, *supra* note 46, at ES-8.

53. *Id.*; *see* LATTANZIO ET AL., *supra* note 29, at 9 (citing IPCC, *Climate Change 2013: The Physical Science Basis*, Working Group I Contribution to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change) ("[Methane] contributed about 16% to global warming due to anthropogenic GHG sources, making methane the second-leading climate forcer after CO_2 globally.").

54. EPA, *supra* note 46, at ES-4.

55. *Id.* at 1–6 (citation omitted). "According to the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report 2013 (AR5), in 2011, methane concentrations in the atmosphere exceeded preindustrial levels by 150%." Lattanzio, *supra* note 29, at 9 (citing IPCC, *Climate Change 2013: The Physical Science Basis*, Working Group I Contribution to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change).

56. E. G. Nisbet et al., *Rising Atmospheric Methane: 2007-2014 Growth and Isotopic Shift*, 30 GLOBAL BIOGEOCHEMICAL CYCLES 1356, 1356 (2016) (citations omitted).

57. *Id.* at 1359 ("In the past millennium between 1000 and 1700 C.E., methane mole fraction varied by no more than about 55 ppb.").

However, methane trends are more difficult to predict than other warming gases. As explained in another study from 2016, "[a]tmospheric methane (CH_4) has experienced puzzling dynamics over the past 15 years. After a period of relative stagnation in the early 2000s ($+0.5 \pm 3.1$ ppb yr^{-1} increase on average for 2000–2006), atmospheric methane concentrations have increased rapidly since 2007 at more than ten times this rate."[58] This same study concluded that "[m]ethane emissions from increasing agricultural activities seem to be a major, possibly dominant, cause of the atmospheric growth trends of the past decade."[59]

This finding is consistent with a third 2016 methane-related study in which the authors concluded the increase in methane is consistent with biogenic emissions, and that the increase was more consistent with agricultural emissions than wetland emissions.[60] According to that study, the "isotopic evidence . . . is harder to reconcile with tropical wetlands compared to other biogenic emissions, e.g., agricultural ones."[61] Moreover, "it seems likely that fossil-fuel emissions stagnated or diminished in the 1990s," and "[a]lthough we cannot identify the specific biogenic source driving the [CH_4]-increase with certainty, it is compatible with agricultural emissions."[62] The reason for this uncertainty is that:

> Unlike CO_2, whose emissions are reported using well-tracked energy statistics, methane is emitted to the atmosphere primarily through fugitive releases of the gas (e.g., leaks in infrastructure, vapors from landfills, eructation [i.e., belching or flatulence] from livestock.). By definition, fugitive emissions are diffuse, transitory, and elusive. Thus, one of the greater difficulties in understanding the impacts of methane emissions is acquiring comprehensive and consistent observational data.[63]

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58. Saunois et al., *supra* note 6, at 1.

59. *Id.; see also* Camille von Kaenel, *Scientists Struggling to Understand Rise of Potent GHG*, E&E NEWS (Dec. 12, 2016) ("'Cattle is an important piece of the puzzle,' said Jackson. 'The oil and gas industry has received most of the scrutiny, but agriculture is just as big, even bigger of an opportunity for mitigation. . . . .'").

60. Schaefer et al., *supra* note 44, at 82.

61. *Id.* at 83.

62. *Id.* ("Inventories report increased annual agricultural emissions over the 2000-2006 average of ~12 Tg by 2011; dominated by ruminants. This can largely account for the post-2006 [CH4]-growth, estimated at 15-22 Tg/a (30).").

63. *See* LATTANZIO ET AL., *supra* note 29, at 23 (citation omitted). Accordingly, there are ongoing scientific disagreements on the exact sources responsible for the increase in methane emissions. *Compare* Andrew L. Rice et al., *Atmospheric Methane Isotope Record Favors Fossil Sources Flat in 1980s and 1990s with Recent Increase*, 113 PROC. NAT'L ACAD. SCI. 10791, 10791 (2016) ("We present strong evidence that methane emissions from fossil fuel sectors were approximately constant in the 1980s and 1990s but increased significantly between 2000 and 2009. This finding challenges recent conclusions based on atmospheric methane that fugitive fossil fuel emissions fell during much of this period. Emissions from other anthropogenic sources also increased, but were partially offset by reductions in wetland and fire emissions."), *with* Stefan Schwietzke et al., *Upward Revision of Global Fossil Fuel Methane Emissions Based on Isotope Database*, 538 NATURE 88, 90 (2016); *see* Keith Goldberg, *Drilling-Related Methane Emissions Underestimated: NOAA*, LAW360 (Oct. 6, 2016) ("We believe methane produced by microbial sources — cows, agriculture, landfills, wetlands and fresh waters — are responsible for the increase, but we cannot yet pinpoint which are the primary drivers").

Accordingly, any strategy to reduce methane emissions that attempts to isolate and blame any particular source or industry is unlikely to succeed. A more comprehensive approach is necessary, especially given the uncertain nature of the available science.

B. THE BIG THREE – LANDFILLS, OIL & GAS, AND AGRICULTURE

Given the importance of methane both as a climate change agent, and as a potential pathway for near-term mitigation, one might expect a robust and aggressive regulatory framework for mitigating and reducing such emissions. After all, if every ton of methane blocked from entering the environment is worth the same as stopping seventy-four tons of CO_2—and shutting off the methane tap will affect actual warming in seven to twelve years rather than two hundred years—surely this must have been the primary focus of GHG regulatory attention over the last fifteen years. It has not. Rather, as discussed below, efforts to control methane emissions domestically have been limited, piecemeal, and most recently, the victim of wholesale repeal.

The key sources of methane emissions in the United States are well-known, and include landfills, oil and gas production and distribution, and plant and animal agriculture.[64] Although the EPA has vacillated about which of these sources is the largest,[65] there is no dispute that gas and agriculture are the two largest sources, and each contribute roughly 30% of the total,[66] with landfills emitting approximately 10%.[67] It is important to note that many scientists believe these numbers, which are derived from the EPA, are significantly underestimated (and in one case perhaps overrepresented). As explained by the Congressional Research Service:

> EPA's inventory has been challenged by a number of academic studies as both over- and under-reporting methane releases from man-made sources. As examples, a 2015 study by Yale researchers concludes that methane emissions from U.S. landfills may be double EPA's estimates; a 2014 study by federal and academic researchers suggests that methane emissions from gas-producing areas in Colorado are as much as three times higher than EPA inventories; a 2013 paper published by Harvard University researchers and federal scientists reports that EPA's oil and gas figures may be underestimated in some cases by as much as 50%; a February 2014 study by Stanford University researchers estimates that methane leakage from natural gas lines and other sources could be 50% higher than current EPA estimates; and, conversely, an April 2016 paper by New Zealand researchers reports that increases in global methane

64. *See, e.g.*, Patrick Parenteau, *Status of Methane Regulation in the United States*, SABIN CTR. CLIMATE CHANGE L. (Feb. 22 2016); *see also* Miller, *supra* note 5.

65. *See* Lovvorn, *supra* note 1, at 15–16.

66. *See* LATTANZIO ET AL., *supra* note 29, at 14, 17 (citing U.S. ENVTL. PROT. AGENCY, INVENTORY OF U.S. GREENHOUSE GAS EMISSIONS AND SINKS: 1990-2014 (2016)).

67. *Id.* at 21.

> emissions since 2006 are predominantly biogenic, as fossil fuel emissions were seen to have stagnated or diminished.[68]

Emissions from agriculture are going up while those from the other main sources are going down. Thus, "[f]rom 1990 to 2014, methane emissions from agricultural sources increased by nearly 11%."[69] At the same time, "methane emissions from fossil energy sources have decreased by approximately 10%."[70] Likewise, "estimated methane emissions from landfills have declined 18.5% in recent years from a high of 181.7 million metric tons (MMT) in 1991."[71]

Although the Obama Administration's EPA recognized the importance of increasing regulation of methane emissions due to their high warming potency, short–lived nature, and resulting high potential for climate warming mitigation as early as 2009,[72] the agency didn't start the process of trying to upgrade controls on methane emission sources under the Clean Air Act until its second term. The Administration's 2013 Climate Action Plan recognized the need to cut methane emissions, noting that:

> Taking action to curb methane waste and pollution is important because emissions of methane make up nearly 9 percent of all the greenhouse gas emitted as a result of human activity in the United States. Since 1990, methane pollution in the United States has decreased by 11 percent, even as activities that can produce methane have increased. However, methane pollution is projected to increase to a level equivalent to over 620 million tons of carbon dioxide pollution in 2030 absent additional action to reduce emissions. Reducing methane emissions is a powerful way to take action on climate change; and putting methane to use can support local economies with a source of clean energy that generates revenue, spurs investment and jobs, improves safety, and leads to cleaner air. When fully implemented, the policies in the methane strategy will improve public health and safety while recovering otherwise wasted energy to power our communities, farms, factories, and power plants.[73]

The plan and the follow-up "Strategy to Reduce Methane Emissions" released in March 2014 "summarizes the sources of methane emissions, commits to new steps to cut emissions of this potent greenhouse gas, and outlines the Administration's efforts to improve the measurement of these emissions."[74] The "key steps" for the Methane Strategy included promises to (1) "propose updated

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68. *Id*. at 25.
69. *Id*. at 14.
70. *Id*. at 16.
71. *Id*. at 22.
72. *See* Saunois, *supra* note 6 ("Because of methane's high global warming potential and short lifetime in the atmosphere compared to CO_2, its mitigation offers the possibility to slow climate change efficiently in a shorter time horizon.").
73. *A Strategy to Cut Methane Emissions*, THE WHITE HOUSE (2013), https://obamawhitehouse.archives.gov/blog/2014/03/28/strategy-cut-methane-emissions.
74. *Id*.

standards to reduce methane from new landfills and take public comment on whether to update standards for existing landfills;" and (2) "assess several potentially significant sources of methane and other emissions from the oil and gas sector" and "[i]f EPA decides to develop additional regulations, [] complete those regulations by the end of 2016."[75] With regard to agricultural emissions, the Methane Strategy merely promised to work "in partnership with the dairy industry" and others to jointly release a "Biogas Roadmap" outlining "voluntary strategies" to reduce methane emissions.[76]

1. Landfill and Oil & Gas Methane Emissions Controls

Although not without significant limitations, the EPA has at least made some effort to regulate two of the three major sources of methane emissions domestically. For example, EPA began regulating emissions from municipal landfills in 1996, when they were categorized as a Section 111 source (stationary industrial source of air pollution) under the Clean Air Act.[77] That regulation established performance standards for both newly constructed landfills and for existing facilities.[78] The Environmental Defense Fund filed suit against the EPA in 2011 based on the EPA's failure to conduct a mandatory eight year review of source standards under Section 111 of the Clean Air Act.[79] That case was resolved by a consent decree in which the EPA agreed to review the standards and issue new proposed regulations for landfills, which the agency did in 2014.[80]

The agency proposed rules that would require new landfills "for which construction, modification, or reconstruction is commenced on or after July 17, 2014" to capture additional landfill gas, including methane.[81] The new rule also required new landfills to capture "two-thirds of their methane and air toxics emissions by 2023—13 percent more than required under current rules."[82] The EPA subsequently proposed new rules for existing landfills, which also significantly

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75. *Id.*

76. *Id.*

77. EPA, *Standards of Performance for New Stationary Sources and Guidelines for Control of Existing Sources: Municipal Solid Waste Landfills*, 61 Fed. Reg. 9905 (Mar. 6, 1996), https://www.gpo.gov/fdsys/pkg/FR-1996-03-12/pdf/96-5529.pdf.

78. *Id.*

79. *Environmental Defense Fund Takes Legal Action to Address Landfill Methane Emissions*, ENVTL. DEF. FUND (October 23, 2008), https://www.edf.org/news/environmental-defense-fund-takes-legal-action-address-landfill-methane-emissions.

80. Standards of Performance for Municipal Solid Waste Landfills, 79 Fed. Reg. 41,796, 41,798 (proposed July 17, 2014), https://www.gpo.gov/fdsys/pkg/FR-2014-07-17/pdf/2014-16405.pdf.

81. *Id.*

82. *EPA Proposes Updates to Reduce Methane, Other Harmful Pollution from New Landfills/ Agency Also Seeks Public Input on Potential Updates to Guidelines for Existing Landfills*, EPA (July 1, 2014), https://yosemite.epa.gov/opa/admpress.nsf/bd4379a92ceceeac8525735900400c27/a62338c1569bc46985257d08005d1adf!opendocument.

reduced methane emissions, with a thirty-month phase-in period.[83] In July 2016, the EPA issued final rules for new, modified, and existing landfills which required them to "begin capturing and controlling landfill gas emissions at levels that are one-third lower than current requirements," a change that was projected to "reduce methane emissions by an estimated 334,000 tons a year beginning in 2025—equivalent to reducing 8.2 million metric tons of carbon dioxide."[84]

Although methane emissions from oil and gas production and transportation have been considered in agency decision-making for decades, the EPA did not promulgate any specific regulations with significant methane reduction effect until 2012.[85] The 2012 rules setting "New Source Performance Standards and National Emission Standards for Hazardous Air Pollutants" from oil and gas wells did not regulate methane emissions directly.[86] However, the EPA estimated that the regulations would have the "co-benefit" of reducing methane emissions from the oil and gas sector by about "1.0 million short tons" or the equivalent of "about 19 million metric tons CO_2e."[87]

In 2015, the Obama administration stepped up its efforts to control methane emissions from the oil and gas sector by proposing "to cut methane emissions from the oil and gas sector by 40–45 percent from 2012 levels by 2025."[88] The move was celebrated by environmentalists for cracking down on "the second leading source of methane emissions in the U.S."[89] The New York Times reported the new regulations as "the first federal regulations requiring the nation's oil and gas industry to cut emissions of methane as part of an expanding and increasingly aggressive effort to combat climate change."[90] The EPA Assistant Administrator for the Office of Air and Radiation, Janet McCabe, explained that

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83. Emission Guidelines and Compliance Times for Municipal Solid Waste Landfills, 80 Fed. Reg. 52,100, 52,102 (proposed Aug. 27, 2015), https://www.gpo.gov/fdsys/pkg/FR-2015-08-27/pdf/2015-20899.pdf.

84. *EPA Issues Final Actions to Cut Methane Emissions from Municipal Solid Waste Landfills*, EPA (July 15, 2016), https://archive.epa.gov/epa/newsreleases/epa-issues-final-actions-cut-methane-emissions-municipal-solid-waste-landfills-0.html.

85. Oil and Natural Gas Sector: New Source Performance Standards and National Emission Standards for Hazardous Air Pollutants Reviews, 77 Fed. Reg. 49,490 (Aug. 16. 2012), https://www.gpo.gov/fdsys/pkg/FR-2012-08-16/pdf/2012-16806.pdf.

86. *Id*. at 49, 513.

87. *Id*.

88. *Fact Sheet: Administration Takes Steps Forward on Climate Action Plan by Announcing Actions to Cut Methane Emissions*, THE WHITE HOUSE (Jan. 14, 2015), https://obamawhitehouse.archives.gov/the-press-office/2015/01/14/fact-sheet-administration-takes-steps-forward-climate-action-plan-anno-1; *EPA Proposes New Commonsense Measures to Cut Methane Emissions from the Oil and Gas Sector/Proposal Cuts GHG Emissions, Reduces Smog–Forming Air Pollution and Provides Certainty for Industry*, EPA (Aug. 18, 2015), https://archive.epa.gov/epa/newsreleases/epa-proposes-new-commonsense-measures-cut-methane-emissions-oil-and-gas-sectorproposal.html [hereinafter EPA Aug. 2015 Release].

89. *See, e.g*., Parenteau, *supra* note 64.

90. Gardiner Harris & Coral Davenport, *E.P.A. Announces New Rules to Cut Methane Emissions*, N.Y. TIMES (Aug. 18, 2015), https://www.nytimes.com/2015/08/19/us/epa-announces-new-rules-to-cut-methane-emissions.html?_r=0.

"[t]he latest proposed regulations are expected to reduce methane emissions by 20 to 30 percent . . . getting the administration about halfway to its overall methane reduction target," but McCabe did not say how the administration intended to get all the way to its goal.[91]

This omission was not lost on the oil and gas industry, which loudly condemned the move, and claimed that—unlike some other sources of methane emissions—the oil and gas industry has "reduced methane emissions by 79 percent since 2005," and that "[t]he last thing we need is more duplicative and costly regulation that could increase the cost of energy for Americans."[92] Other commenters also questioned why the EPA's rule said nothing about the *number one source* of such emissions in the United States—animal and plant agriculture.[93]

In 2016, the EPA revised its official website methane "pie chart" of emission sources to nudge oil and gas methane emissions up a few percentage points to first place and drop agricultural methane emissions down to a close second.[94] The agency then issued the final rules in May of 2016, which were now purportedly aimed squarely at the number *one* source of methane pollution on the EPA's pie-chart.[95] The EPA promised that these rules would "reduce methane pollution by 400,000 tons per year by 2025—the equivalent of removing 1.8 million cars from the road."[96] The EPA proposed to implement these new rules by first collecting emissions information "through a general survey for all owners/operators of existing sources and a more detailed survey for specific facilities," and "anticipate[d] receiving data from the operator survey later this year and expect[ed] to conclude all aspects of the ICR in the first part of 2017."[97]

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91. *Id.*

92. Krishnadev Calamur, *The EPA's New Methane Rules for the Oil and Gas Industry*, THE ATLANTIC (Aug. 18, 2015), https://www.theatlantic.com/business/archive/2015/08/epa-methane-emissions-oil-gas-industry/401651/.

93. *See* Oil and Natural Gas Sector: Emission Standards for New and Modified Sources, 80 Fed. Reg. 56,593 (Sept. 18, 2015).

94. *See Overview of Greenhouse Gases: Methane Emissions*, EPA, https://www.epa.gov/ghgemissions/overview-greenhouse-gases (follow "Methane" "hyperlink") (last updated Apr. 14, 2017).

95. *Compare* Oil and Natural Gas Sector: Emission Standards for New and Modified Sources, 80 Fed. Reg. 56,593, 56,606-07 (Sept. 18, 2015) (Table 2 showing enteric fermentation and manure management as the largest methane source in 1990, 2005, and currently), *with* Oil and Natural Gas Sector: Emission Standards for New, Reconstructed, and Modified Sources, 81 Fed. Reg. 35,824, 35,838 (June 3, 2016) (Table 3 revising figures for 1990, 2005, and currently to make oil and gas the largest source of methane emissions in the United States).

96. Reid Frazier, *EPA Hears Comments on Proposed Methane Rule for Oil and Gas*, STATEIMPACT (Sept. 29, 2015), https://stateimpact.npr.org/pennsylvania/2015/09/29/epa-hears-comments-on-proposed-methane-rule-for-oil-and-gas/.

97. *EPA Releases First-Ever Standards to Cut Methane Emissions from the Oil and Gas Sector*, EPA (May 12, 2016), https://archive.epa.gov/epa/newsreleases/epa-releases-first-ever-standards-cut-methane-emissions-oil-and-gas-sector.html.

However, more than a dozen states, as well as several oil and gas industry groups, immediately filed suit challenging the new rules.[98] Then on March 2, 2017, the Trump administration issued a notice explaining that "EPA has withdrawn the 2016 information request for the oil and gas industry, effective immediately," and notifying methane emission sources that "[i]f you received a letter requiring you to fill out a survey, you are no longer required to respond."[99] Conservation groups filed suit over the EPA's decision and the agency's subsequent efforts to stay or withdraw the rule.[100] The D.C. Circuit vacated the agency's stay on July 3, 2017, the EPA again attempted to block implementation of the rule, and litigation over the rule continues.[101]

There have also been a number of state, local, regional, and industry-organized programs to reduce landfill and oil and gas methane emissions over the last two decades. As of 2014, fourteen states had adopted regulations to limit methane emissions from landfill operations.[102] As for oil and gas, California, Colorado, Ohio, Wyoming, and Pennsylvania have all either promulgated or proposed regulations to address methane emissions.[103] While industry-led efforts have in fact reduced oil and gas emissions in recent years, the "voluntary adoption of control techniques [have] been uneven across companies and regions," and the Obama Administration specifically cited the inherent inadequacy of voluntary and cooperative reduction efforts as a reason for its 2016 decision to implement new, nationwide regulatory controls on oil and gas methane emissions.[104]

2. The Problem of Uncontrolled Agricultural Emissions

Unlike landfills or oil and gas operations, there simply is no federal regulation of GHG emissions from agricultural operations—regardless of size or total annual emissions. This is not entirely the EPA's fault, given the Congressional constraints imposed on the agency.[105] But the omission is impossible to justify, given

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98. Devin Henry, *Thirteen States Sue over EPA Methane Rule*, THE HILL (Aug. 2, 2016), http://thehill.com/policy/energy-environment/290159-thirteen-states-sue-over-epa-methane-rule.

99. *Information Request for the Oil and Natural Gas Industry*, EPA (Mar. 2, 2017), https://www.epa.gov/controlling-air-pollution-oil-and-natural-gas-industry/oil-and-gas-industry-information-requests.

100. Tom DiChristopher, *Trump's EPA Hit with Lawsuit Over Suspension of Oil- and Gas-Drilling Rules*, CNBC (June 5, 2017), https://www.cnbc.com/2017/06/05/conservation-groups-sue-epa-over-stay-of-oil-and-gas-drilling-rules.html.

101. *See* Clean Air Council v. Pruitt, 862 F.3d 1, 14 (D.C. Cir. 2017); *see also Oil and Gas Standards Resources*, ENVTL. DEF. FUND, https://www.edf.org/energy/oil-and-gas-standards-resources (last visited Feb. 21, 2018) (listing updates and pleadings).

102. *State Methane Policies*, NAT'L CONF. OF ST. LEGISLATURES (Feb. 11, 2009), http://www.ncsl.org/research/environment-and-natural-resources/state-methane-policies.aspx.

103. LATTANZIO ET AL., *supra* note 29, at 18.

104. *See id.* at 17; *see also* GLOBAL CLIMATE CHANGE AND U.S. LAW (Michael B. Gerrard & Jody Freeman eds., 2d ed. 2014).

105. *See 2017 Anti-Environmental Budget Riders*, NAT. RES. DEF. COUNCIL (Nov. 28, 2017), https://www.nrdc.org/resources/anti-environmental-budget-riders ("A rider in the House Interior and Environment appropriation (Sec. 418) prevents the EPA from requiring the reporting of greenhouse gas emissions from

the available science concerning agricultural emissions of a number of GHGs, including CO_2, nitrous oxide, and methane. As discussed above, one recent study concluded that "[m]ethane emissions from increasing agricultural activities seem to be a major, possibly dominant, cause of the atmospheric growth trends of the past decade," and this "rapid increase in methane concentrations offers a growing mitigation opportunity."[106]

The United Nations Food and Agriculture Organization has also commented on the problem, noting that "meeting the goals of eradicating hunger and poverty by 2030, while addressing the threat of climate change, will require a profound transformation of food and agriculture systems worldwide."[107] The UN's conclusion was based both on agriculture's contributions to GHG emissions and the fact that agricultural production will be dramatically impacted by climate change.[108] The primary source of agricultural methane emissions is animal agriculture driven by global demand for meat consumption. In terms of demand, "[t]he USA leads by far with over 322 grams of meat [roughly the equivalent of three hamburgers] per person per day (120 kg per year), with Australia and New Zealand close behind."[109] Consumption levels are much lower in other countries, as "Europeans consume slightly more than 200 grams of meat (76 kg per year)," with similar consumption levels for South Americans, and "Asia's meat consumption [is at] only 25 per cent of the U.S. average (84 grams per day, 31 kg per year)."[110]

The animal agriculture sector is massive in scale, and difficult to conceptualize in comparison to other major GHG emission sources. The tens of billions of animals currently used for animal agriculture "make use of 30% of the terrestrial land area for grazing, one-third of global cropland area is devoted to producing animal feed, and 32% of freshwater is used to provide direct livelihood and

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manure management systems. A similar provision was included in the Senate Interior and Environment appropriation (Sec. 417)."); *https://www.nrdc.org/resources/anti-environmental-budget-riders; 2016 Anti-Environmental Budget Riders*, NAT. RES. DEF. COUNCIL (Sep. 19, 2017), https://www.nrdc.org/resources/2016-anti-environmental-budget-riders (stating specific examples of riders constraining EPA action); *2015 Anti-Environmental Budget Riders*, NAT. RES. DEF. COUNCIL (Mar. 7, 2016), https://www.nrdc.org/resources/2015-anti-environmental-budget-riders.

106. Saunois et al., *supra* note 6 at 4*; see also* Schaefer, *supra* note 44 ("Post-2006 source increases [of methane emissions] are predominantly biogenic, outside the Arctic, and arguably more consistent with agriculture than wetlands. If so, mitigating CH4-emissions must be balanced with the need for food production.").

107. FOOD AND AGRIC. ORG. OF THE UNITED NATIONS, 2016 THE STATE OF FOOD AND AGRICULTURE: CLIMATE CHANGE, AGRICULTURE, AND FOOD SECURITY xi (2016).

108. *Id*. at xi, xiii.

109. Stefan Schwarzer, *Growing Greenhouse Gas Emissions from Meat Production*, UNEP (Oct. 2012), https://na.unep.net/geas/archive/pdfs/GEAS_Oct2012_meatproduction.pdf.

110. *Id*. ("there are large differences, for example, between the two most populous countries: China consumes 160 grams per day, India only 12 grams per day.").

economic benefits to at least 1.3 billion producers and retailers."[111] Overall, "livestock contributes up to 50% of agricultural GDP globally."[112]

Despite a modest reduction in consumption of some meat and dairy products in the United States over the last decade,[113] global demand is increasing rapidly. For example, "[g]lobal per capita consumption of livestock products has more than doubled in the past 40 years," and "[i]ncreasing human population, incomes and urbanization are projected to drive increases in the consumption of milk and meat over the next 20 years."[114] Notably, "[b]eef and milk production have more than doubled over the past 40 years and monogastric production (pigs and poultry) has grown in places by a factor of five or more."[115]

This increase in consumption "is strongly linked to increasing levels of income in many countries of the world," which increases demand for animal protein, with the effect being "greatest among lower- and middle-income populations."[116] Despite their traditional status as a low per-capita region for meat consumption, China and other Asian countries are increasing their meat consumption faster than anywhere else in the world—thus "total meat consumption has increased 30-fold since 1961 in Asia, and by 165 per cent since 1990 in China."[117] This increase in consumption is also driven by the fact that "the global human population grew from around 5 billion in 1987 to 7 billion in 2011, and is expected to reach 9 billion people in 2050."[118] Thus, on a macro scale, "the total amount of meat produced climbed from 70 million tonnes in 1961 to 160 million tonnes in 1987 to 278 million tonnes in 2009," and is expected to "rise to 460 million tonnes in 2050, a further increase of 65 percent within the next 40 years."[119] No other GHG source in the world is growing at even half the rate of animal agriculture.[120]

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111. Mario Herrero et al., *Greenhouse Gas Mitigation Potentials in the Livestock Sector*, 6 NATURE CLIMATE CHANGE 452, 452 (2016).

112. *Id.*

113. Sujatha Bergen, *Less Beef, Less Carbon: Americans Shrink Their Diet-Related Carbon Footprint by 10 Percent Between 2005 and 2014*, NAT'L. RES. DEF. COUNCIL 1, 1 (2017), https://www.nrdc.org/sites/default/files/less-beef-less-carbon-ip.pdf ("Between 2005 and 2014, Americans cut their per-capita diet-related climate-warming pollution by approximately 10 percent. Based on NRDC's calculations, these changes cumulatively avoided approximately 271 million metric tons (MMT) of climate-warming pollution. This was roughly equivalent to the annual pollution of 57 million car tailpipes, with most of these cuts in emissions due to reduced beef consumption. . . Pollution could have been cut even deeper had Americans not simultaneously increased consumption of other carbon-intensive foods like cheese, yogurt, butter and other foods.").

114. Herrero, *supra* note 111, at 452.

115. *Id.*

116. Schwarzer, *supra* note 109, at 3.

117. *Id.*

118. *Id.*

119. *Id.*

120. *Id.*; *see also* BAILEY ET AL., *supra* note 7, at 5 ("Demand for animal products is rising fast. By 2050, consumption of meat and dairy is expected to have risen 76 percent and 65 percent respectively against a 2005–07 baseline, compared with 40 percent for cereals. Currently, the biggest meat-consuming countries are China, the European Union, the United States and Brazil; major dairy

The resultant GHG emissions from the livestock and dairy sector have received comparatively little attention and quantification compared to other sources, but can be divided into three rough classes—methane from animal digestive processes; methane, CO_2, and nitrous oxide from manure management; and more traditionally understood emissions from the transportation and energy used to grow animal feed, transport feed to animal agricultural operations, transport animals long distances to slaughter, and related energy expenditures.[121] Given the industrial scale of meat production in the United States and globally, the significant GHG emissions from this sector should not be at all surprising. Nor are such emissions limited to animal-based agriculture.

Although "[e]stimates of the total emissions from agriculture differ according to the system boundaries used for calculations. Most studies attribute 10–35 percent of all global GHG emissions to agriculture."[122] As one recent study noted, "[t]he consumption of food contributes to a significant proportion of a person's overall greenhouse gas impact, with agricultural production accounting for 19–29% of global anthropogenic greenhouse gas emissions."[123] Unlike the majority of GHG emission sources, which are dramatically higher in wealthy countries, the level of agricultural emissions is significantly higher in non-wealthy and developing nations.[124] Thus, "[d]eveloping countries collectively produce the majority of agriculture-related emissions globally and are where emissions are expected to rise the fastest," with "an average of 35% of emissions in developing countries and 12% in developed countries according to countries' GHG emissions inventory reports to the UNFCCC."[125]

Due to the shallow treatment afforded to the agricultural sector in domestic and international GHG control programs and literature, disambiguating the various types of agricultural emissions is no small task. However, it is well-established that animal agriculture and meat production contribute the vast majority of agricultural sector emissions. According to a 2016 analysis in the Proceedings of the National Academy of Sciences, "[t]he food system is responsible

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consumers are China, India, the EU and the United States. Growth in meat consumption in China is projected to be over four times that of the next fastest-growing consumer, Brazil, in absolute terms.").

121. For an excellent overview of the total GHG output of the animal agriculture sector, *see* Bruce Myers, *Livestock's Hoof Print*, 31 ENVTL. FORUM 34, 34–35 (2014) ("Energy is used throughout the livestock production process, for example, in the manufacture of chemical inputs (such as fertilizer), in the operation of farm machinery and equipment, and in processing and transporting final products. But where livestock production really separates itself from most other sectors is through the emission of large amounts of the far more potent heat-trapping gases methane (CH_4) and nitrous oxide (N_2O). These two gases are responsible for nearly three-quarters of the global livestock sector's CO_2-equivalent emissions.").

122. Schwarzer, *supra* note 109, at 4.

123. Stephen Clune et al., *Systematic Review of Greenhouse Gas Emissions for Different Fresh Food Categories*, 140 J. CLEANER PRODUCTION 766, 766 (2017).

124. Pete Smith et al., *Agriculture*, in CLIMATE CHANGE 2007: MITIGATION (Bert Metz, et al., eds. 2007).

125. Wollenberg et al., *supra* note 7, at 3860 (citations omitted); Schwarzer, *supra* note 109, at 4.

for more than a quarter of all greenhouse gas emissions, of which up to 80% are associated with livestock production."[126] The United Nations' Food and Agriculture Organization has stated that "[t]otal GHG emissions from livestock supply chains are estimated at 7.1 gigatonnes CO_2-eq per annum for the 2005 reference period," which "represent 14.5 percent of all human-induced emissions."[127] Some analysts have suggested that the United Nations' 14.5% figure is grossly underestimated, as it excludes various associated emission sources, including land use changes, deforestation, and other emissions integral to the livestock production process.[128]

However, as discussed above, the 14.5% figure can be misleading, as it represents the total emissions from the sector, and is not broken down based on particular GHGs, which have significantly different GWP and different length lifecycles, and thus significantly different mitigation and dissipation opportunities. While the agricultural sector only represents approximately 10% of total global CO_2 emissions, the sector contributes a much larger percentage of total methane emissions.[129] Thus, worldwide approximately 20% of increasingly important methane emissions come from the raising of animals for food.[130] The numbers are similar in the United States, with methane from agriculture making up approximately 30% of all domestic methane emissions.[131]

Within the livestock sector, there are differing levels of emissions at various stages of livestock production, and with regard to the species of animal at issue.[132] For example, "[e]missions from the production, processing and transport of feed account for about 45 percent of [livestock] sector emissions."[133] The methane gas emissions from ruminant digestion—which in climate policy is obscured by the

126. Marco Springmann et al., *Analysis and Valuation of the Health and Climate Change Cobenefits of Dietary Change*, 113 PROC. NAT'L ACAD. SCI. 4146, 4146 (2016); Schwarzer, *supra* note 109, at 4.

127. P.J. Gerber et al., *Tackling Climate Change Through Livestock – A Global Assessment of Emissions and Mitigation Opportunities*, FAO 1, 17 (2013).

128. *See* Robert Goodland & Jeff Anhang, *Livestock and Climate Change: What If the Key Actors in Climate Change are Cows, Pigs, and Chickens?*, WORLD WATCH 11 (Nov./Dec. 2009) ("[O]ur analysis shows that livestock and their byproducts actually account for at least 32,564 million tons of CO_2e per year, or 51 percent of annual worldwide GHG emissions.").

129. *See* Smith et al., *supra* note 124, at 499 ("Agriculture accounted for an estimated emission of . . . 10-12% of total global anthropogenic emissions of greenhouse gases (GHGs) . . . agriculture accounts for . . . about 50% of CH_4 [emissions].").

130. *Id*.

131. EPA, *supra* note 46, at ES-8.

132. Herrero et al., *supra* note 111, at 453 ("We estimate that total [global] emissions from livestock from 1995 to 2005 were between 5.6 and 7.5 GtCO2e yr^{-1} (Table 1). The most important sources of emissions were enteric CH4 (ECH4; 1.6–2.7 GtCO2e yr^{-1}; refs 9–13,15), N2O emissions associated with feed production (1.3–2.0 GtCO2e yr^{-1}; ref. 15) and land use for animal feed and pastures, including change in land use ($\sim$1.6 GtCO2e $yr^{-1;}$ ref. 15).").

133. Gerber, *supra* note 127, at 17; Myers, *supra* note 121, at 35 ("Next, animal feed production is a significant but overlooked pathway for the emission of livestock GHGs. The majority of livestock production in the United States follows an industrial model where feed is grown elsewhere and transported to the animal facility. More corn is grown in the United States for animal feed than for any other purpose, including for ethanol production, and livestock consume 97 percent of soybean meal. That feed was almost certainly genetically modified and was produced through the application of

sanitized descriptor "enteric fermentation"—is "the second largest source of emissions, [and] contribut[es] about 40 percent to total emissions."[134] The third largest source is manure management, which makes up 10 of the remaining 15% of methane emissions.[135]

There are also significant differences in the level of methane emissions from different types of animal agriculture, which make generalizations about livestock methane emissions difficult. The science is clear however that "cattle are the main contributor to the sector's emissions with about 4.6 gigatonnes CO_2-eq, representing 65 percent of sector emissions."[136] Other common food animals, including "pigs, poultry, buffaloes and small ruminants have much lower emission levels, with each representing between 7 and 10 percent of sector emissions."[137] Poultry and egg production are also contributors, making up about 8% of methane emissions.[138]

While it is certainly true that the vast majority of agricultural contributions to methane emissions come from the livestock sector, it would be a mistake to simplistically conclude that these emissions are solely a meat and dairy problem, and that plant-based agriculture plays no significant role. For example, rice production practices are major contributors to methane emissions worldwide.[139] As explained in the EPA's most recent draft inventory of GHG emission sources:

> Most of the world's rice is grown on flooded fields, and flooding creates anaerobic conditions that foster CH_4 production through a process known as methanogenesis. Approximately 60 to 90 percent of the CH_4 produced by methanogenic bacteria is oxidized in the soil and converted to CO_2 by methanotrophic bacteria. The remainder is emitted to the atmosphere or transported as dissolved CH_4 into groundwater and waterways. Methane is transported to the atmosphere primarily through the rice plants, but some CH_4 also escapes via ebullition (i.e., bubbling through the water) and to a much lesser extent by diffusion through the water . . . Upland rice fields are not flooded, and therefore do not produce CH_4, but large amounts of CH_4 can be emitted in

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fertilizer, pesticide, and herbicide, inputs that had to be manufactured and transported. Substantial amounts of CO2 and N2O are generated at this initial phase of livestock production.").

134. Gerber, *supra* note 127, at 17.

135. *Id.*; Schwarzer, *supra* note 109, at 5. ("China is a major source of enteric emissions and, while Indians are low meat consumers, India as a country also has high levels of CH4 emissions. Latin America follows with 24 percent and Africa with 14.5 percent. China, Western Europe and North America are the regions with the highest emissions from manure.").

136. Gerber, *supra* note 127, at 15.

137. *Id.*

138. *Id.* at 16.

139. Yam Kanta Gaihre et al., *Impact of Elevated Temperatures on Greenhouse Gas Emissions in Rice Systems: Interaction with Straw Incorporation Studied in a Growth Chamber Experiment*, 373 PLANT & SOIL 857, 858 (2013).

> continuously irrigated fields, which is the most common practices in the United States.[140]

Indeed, in some locations rice production emissions are the largest source of methane,[141] and the global average is approximately 20%.[142]

The key point is that every agricultural product in the world has a unique methane emission footprint—along a continuum from extraordinarily high food products like beef, lamb, and lobster, all the way down to grains, fruits, and vegetables.[143] But virtually none of these emissions are integrated into mandatory domestic or international GHG regulatory efforts, nor are they generally included in GHG trading markets.[144] And while there has been significant academic discussion concerning improved agricultural land management practices in order to mitigate these emissions, a recent analysis found "that current agronomic and policy interventions compatible with food production would achieve only 21–40% of the needed mitigation" to stay within the international target of 2°C by 2050.[145] In short, as domestic and international policymakers scramble to cap the major sources of planet-warming gases flowing into the atmosphere, gigatonnes of agricultural emissions (and particularly rapidly increasing livestock methane emissions) continue to billow into the atmosphere unabated, uncontrolled, and for the most part undiscussed.

This longstanding neglect of agricultural emissions in climate policy is particularly worrisome in light of recent research concluding that total animal agricultural emissions have been grossly underestimated for years.[146] According to researchers at the Joint Global Change Research Institute, "existing bottom-up

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140. U.S. ENVTL. PROT. AGENCY, DRAFT INVENTORY OF U.S. GREENHOUSE GAS EMISSIONS AND SINKS: 1990-2015, at 5-15, 5-16 (2017).

141. FAO, *supra* note 107, at 38 ("Rice cultivation is the most important source of agricultural emissions in Eastern and Southeast Asia (at 26 percent)").

142. Sandeep Malyan et al., *Methane Production, Oxidation and Mitigation: A Mechanistic Understanding and Comprehensive Evaluation of Influencing Factors*, 572 SCI. OF THE TOTAL ENV'T 874, 876 (2016) ("Agriculture sector alone contributes more than half (50.63%) of the anthropogenic CH_4 emissions at the global level out of which rice paddy fields contribute about 20%.").

143. Clune et al., *supra* note 123, at 766 ("The meta-analysis indicates a clear greenhouse gas hierarchy across the food categories, with grains, fruits, and vegetables having the lowest impact and meat from ruminants having the highest impact").

144. Although excluded from the Paris Climate Agreement, negotiators at the 23rd annual Conference of the Parties to the UNFCCC reached what some groups have called "an iconic decision" by having "agreed to new future negotiations" concerning agricultural emissions. *See* Chris Meyer, *Agriculture Negotiations Reach Agreement at COP23* ENVTL. DEF. FUND BLOG (Nov. 15, 2017), http://blogs.edf.org/climatetalks/2017/11/15/agriculture-negotiations-reach-agreement-at-cop23/. As a result, a series of sub-committee meetings will be convened, and will report back in 2020 with ideas for discussing agricultural emissions at future meetings under the Convention.

145. Wollenberg et al. *supra* note 7, at 3862.

146. Chris Mooney, *Scientists May Have Found a Solution to the Atmosphere's Methane Mystery*, WASH. POST (Sept. 29, 2017), https://www.washingtonpost.com/news/energy-environment/wp/2017/09/29/scientists-find-that-belching-cows-could-solve-a-key-mystery-about-the-atmosphere/?utm_term=.2dd5cdcf0caf.

inventories of livestock methane emissions in the US . . . are too low," and appear to be based on "outdated information used to develop these emissions factors."[147] After compiling "update[d] information for cattle and swine by region, based on reported recent changes in animal body mass, feed quality and quantity, milk productivity, and management of animals and manure," the team found global livestock emissions to be "11% greater than that obtained using the IPCC 2006 emissions factors, encompassing an 8.4% increase in enteric fermentation methane, a 36.7% increase in manure management methane, and notable variability among regions and sources."[148] Notably, the team found that, after accounting for underestimates, *revised manure management methane emissions for 2011 in the United States increased by 71.8%*.[149]

III. ALTERNATIVE METHANE EMISSIONS CONTROL TACTICS

Given the role of agriculture as a major source of methane emissions, and the importance of methane control for any near-term climate mitigation strategy, there is an urgent need to plug this agricultural "leak." As discussed above, there is a tremendous amount of work being done across many sectors to achieve long-term reductions in CO_2 emissions. While many of the proponents of these efforts promise to deliver results in time to stave-off (or in some cases "reverse") the impacts of climate change by 2050,[150] the available science suggests the results of efforts to mitigate CO_2 emissions will likely materialize too late to avert near-term climate damage.[151]

It is also increasingly clear that the traditional tools applied to climate advocacy are simply not going to be effective in reducing methane emissions from uncontrolled sources. The Trump Administration's efforts to dismantle federal GHG control efforts in the United States, the current impossibility of enacting new federal legislative or regulatory measures, and the international climate control communities' longstanding blindness to agricultural emissions, all counsel towards looking elsewhere for short-term climate mitigation.

The core question presented by this Article is whether the inherently short life-cycle of methane can be utilized as a stop-gap to delay the onset of major climate changes while longer-term CO_2 reduction strategies can come online, and have a significant impact. The goal would be to expand climate advocacy efforts to effectuate an immediate and drastic reduction of methane emission sources that might dissipate in time to mitigate some of the looming impacts of climate change—especially reductions of methane emissions from sources that are

147. Julie Wolf et al., *Revised Methane Emissions Factors and Spatially Distributed Annual Carbon Fluxes for Global Livestock*, 12 CARBON BALANCE AND MGMT. 1, 1 (2017).

148. *Id.*

149. *Id.*

150. *See, e.g.*, DRAWDOWN: THE MOST COMPREHENSIVE PLAN EVER PROPOSED TO REVERSE GLOBAL WARMING 220 (Paul Hawken et al. eds., 2017).

151. *See supra* notes 13–28 and accompanying text.

currently operating without any domestic or international controls. For all the reasons already discussed, methane reduction efforts could present an ideal strategic opportunity for near-term mitigation.[152]

This near-term methane strategy must be executed *in addition to* and without any reduction in efforts to effectuate long-term CO_2 emission reductions, including efforts to transition to clean energy sources. Especially in light of recent executive branch moves to dismantle the last eight years of progress toward developing a comprehensive federal regulatory scheme for energy sector emissions, any hope of mitigating near-term climate disasters in the current regulatory environment depends on adopting new consumer, corporate, and legal tactics. The question explored in this section is, therefore, whether the legal and policy tactics deployed by the animal protection movement over the last decade—wherein major animal abuses have been controlled through consumer campaigns, consumer protection litigation, investor advocacy, and corporate pressure—could be a model for an expanded, collaborative, and cross-disciplinary effort to control climate change emissions. After a review of how the animal protection movement has used these tactics with success, each major tactical approach must be evaluated in the context of climate change emissions control efforts, with an eye towards how it may or may not translate into potential action concerning near-term methane reduction.

A. ANIMAL PROTECTION CAMPAIGNS: LESSONS AND LIMITATIONS

Animal protection groups have used a number of different campaign tactics over the last fifty years, with varying degrees of success.[153] This discussion will focus on the last decade of farmed animal protection efforts because the campaign has been unique in both its tactical focus on consumers, corporations, and the courts, and its high degree of success without the need for state or federal legislation or the buy-in of domestic regulatory institutions.[154] The farmed animal campaign will be explored here as a potential model—rather than past and

152. As also noted above, there are strong preliminary indications that methane might provide a pathway to near-term climate change mitigation, that "the rapid rise in global methane concentrations is . . . most likely from agriculture," and that "[m]ethane mitigation offers rapid climate benefits." Saunois et al., *supra* note 6, at 1. Methane emissions from increasing agricultural activities seem to be a major, possibly dominate, cause of the atmospheric growth trends of the past decade. *Id*. at 6.

153. *See* Thomas Kelch, *A Short History of (Mostly) Western Animal Law: Part II*, 19 ANIMAL L. 347, 367 (2012); Jonathan Lovvorn, *Animal Law in Action: The Law, Public Perception, and the Limits of Animal Rights Theory as a Basis for Legal Reform*, 12 ANIMAL L. 133, 134 (2006).

154. *See* Sara Shields et al., *A Decade of Progress Toward Ending the Intensive Confinement of Farm Animals in the United States*, 7 ANIMALS 1, 1 (2017) (noting that "[o]ver the past ten years, unprecedented changes in the way farm animals are kept on intensive production facilities have begun to take hold" and describing "the background and history of the movement, the strategy and approach of the campaign, and the challenges that were overcome to enable this major shift in farming practices."); Daniel Engber, *Save the Chicken*, SLATE (Aug. 18, 2016), http://www.slate.com/articles/health_and_science/science/2016/08/animal_activists_crunched_the_numbers_to_learn_that_the_creature_most_in.html.

ongoing CO_2 reduction campaigns being carried out by environmentalists—because it is apparent from the foregoing discussion that the most pressing uncontrolled source of methane emissions is agriculture, and in particular high emission, low-efficiency food systems like livestock production. The question is whether the tactics deployed to address farmed animal *welfare* without action by, or even cooperation from, federal and state governments, can be adapted to address farmed animal *emissions* with similar rapid results.

One of the key elements of the modern farmed animal welfare campaign is its shift from hard science arguments about animal husbandry to carefully targeted arguments about animals' basic needs that trigger human emotional responses.[155] Unlike climate campaigns that rely on charts about sea-level rise and repeated pronouncements that this year is the hottest year on record, farmed animal campaigners made a conscious decision to move hidden animal suffering outside the walls of factory farms and into people's living rooms through the use of undercover investigations, whistle-blowers, and the media.[156] The campaign focused on transforming a monolithic block of ten billion farmed animals killed every year in the United States into individual suffering animal lives.[157] This personalization of the suffering and death associated with anti-social corporate and consumer behavior turned an abstraction into a reality, and modified individual and collective behavior accordingly.[158]

Surprisingly, the campaign also relied on some bedrock conservative values—market-controlled capitalism and personal responsibility. Rather than focusing on

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155. *See* Maggie Jones, *The Barnyard Strategist*, N.Y. TIMES MAG. (Oct. 24, 2008), http://www.nytimes.com/2008/10/26/magazine/26animal-t.html; *see also* Shields et al., *supra* note 154, at 4 (noting that "the idea that animals have behavioral needs (deeply engrained ancestral behavior patterns) in addition to the basic requirements for feed, water and shelter became a central tenet of the field"). As Shields et al. notes, while the campaign has always been firmly grounded in science, and ready to engage in scientific arguments as needed, it has rarely led with science as its core message. Thus, it is not a case of using emotion to overcome science, but rather a case of acknowledging that emotion is a more powerful tool to secure public acceptance of the conclusions offered by science—in this case, about the basic ethological needs of animals raised for food. *Id*. at 4–5.

156. *See* Shields et al., *supra* note 154 at 5–7 ("Investigations had become a powerful method for exposing inhumane practices" and "[e]ach investigation further offered the opportunity for public discussion of the state of farm animal production in America"); *see also* Jedediah Purdy, *Open the Slaughterhouses*, N.Y. TIMES (April 8, 2013), http://www.nytimes.com/2013/04/09/opinion/open-the-slaughterhouses.html; Paul Solotaroff, *In the Belly of the Beast*, ROLLING STONE (Dec. 10, 2013), https://www.rollingstone.com/feature/belly-beast-meat-factory-farms-animal-activists.

157. *See* Jones, *supra* note 155 (explaining how the campaign set out "to influence millions of animal lovers by pushing them to expand their concerns, moving beyond the cuddly dogs and cats —and the baby seals and dolphins—that capture Americans' attention to include the billions of less-visible and far-less-romanticized pigs, cows and chickens raised for food every year").

158. *See* Nico Pitney, *Revolution on the Animal Farm*, HUFFINGTON POST (Sept. 23, 2016), https://www.huffingtonpost.com/entry/farm-animal-rights-revolution_us_577304f6e4b0352fed3e5b16; Shields et al., *supra* note 154 at 1.

top-down federal regulatory solutions, farmed animal campaigners quickly zeroed in on the fact that nearly every act of farmed animal cruelty is placed into the stream of commerce, and sold to individual and institutional consumers who, in many cases, can choose whether to purchase the products of cruelty or not.[159] The Achilles Heel of large-scale animal abuse industries is and always has been that they are controlled to some extent by buyer preferences.[160] The fundamental premise of a demand-side animal protection campaign is that if the customer will not accept the animal suffering cost of a product, the industry cannot sell it, and will be forced to change its animal-treatment practices.[161]

Thus, the role of individual responsibility—long the rallying cry of the right—has been crucial to the farmed animal welfare campaign.[162] Individuals and institutions make choices all the time that affect animal welfare, and the campaign has been very effective in changing those choices to reflect humane ethics. Over the space of just ten years the campaign fundamentally changed the nature of how animal agricultural products are marketed, and moved "animal welfare" all the way to the number two consideration for food shoppers when making choices in the supermarket—second only to labor practices and numerous steps above environmental considerations.[163] The ability of the campaign to compel action from both Wall Street and Walmart has been a core element of its success.[164]

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159. *Id.; see also* Jones, supra note 155.

160. *See* Shields et al., *supra* note 154, at 12; Pitney, *supra* note 158.

161. *See id*. (noting that "[g]iven that brand image is vitally important to large companies, another way that activists engaged a company's attention was to link cruelty on farms (documented in undercover videos) to the retailers they supplied" and as a result "[c]ompanies began to focus on how to obtain animal products produced in alternative systems that could replace cages and crates"); For an innovative discussion of potential supply-side farmed animal protection tactics, *see* Lewis Bollard, *We're Going Beyond Coal. Could We Go Beyond Factory Farming?*, THE OPEN PHILANTHROPY PROJECT (Nov. 17, 2017), https://mailchi.mp/3bdc58236098/could-we-go-beyond-factory-farming?e=f2877a9613.

162. *See, e.g*., Lee Edwards, *The Origins of the Modern American Conservative Movement*, THE HERITAGE FOUND. (Nov. 21, 2003), https://www.heritage.org/political-process/report/the-origins-the-modern-american-conservative-movement (arguing that American conservativism is based on *The Conservative Mind* by Russell Kirk, which stated a central tenet of conservatism is "[m]an must control his will and his appetite, knowing that he is governed more by emotion than by reason.").

163. *See* FOOD MKTG. INST., U.S. GROCERY SHOPPER TRENDS 2015 EXECUTIVE SUMMARY 19 (2015), https://www.fmi.org/docs/default-source/document-share/fmitrends15-exec-summ-06-02-15.pdf; *see also Survey: More Consumers Concerned About Animal Welfare*, FEEDSTUFFS (Jun. 2, 2017), http://www.feedstuffs.com/news/survey-more-consumers-concerned-about-animal-welfare ("More than half of U.S. consumers (58%) are more concerned about food animal welfare now than they were just a few years ago, according to a recent report, 'Animal Welfare: Issues & Opportunities in the Meat, Poultry & Egg Markets in the U.S.'").

164. *See* Shields et al., *supra* note 154, at 18. The farmed animal welfare campaign has also relied on the citizen initiative process, and to a lesser degree on state legislatures, to solidify and enforce the emerging public consensus against cruel confinement of farmed animals. *See id*. at 7–11. The potential use of similar citizen initiatives to effectuate near-term reductions in methane and other GHG emissions should not be ruled out, but is not discussed in detail herein for several reasons, including the relatively long cycle of enactment and phase-in normally associated with such measures (six to eight years in most cases from filing of a petition to legal implementation), the fact that such measures are only available to advocates in a handful of states, and because any attempt to legislate the type of individual food choices

Many of these tactics have been deployed in the climate emissions control sector. Consumer and corporate based campaigns have been vigorously implemented for years.[165] But they have been primarily focused on CO_2 rather than methane, targeted at energy emission sources rather than low-hanging fruit like agriculture, and—as discussed in Part I of these articles—have not delivered the same level of transformational results that animal welfare campaigns have achieved in the last decade. There are several likely reasons for this, but most important is the distinction between science-based advocacy and emotion-based advocacy.

By and large, the work concerning climate change, like all environmental advocacy, is heavily laden with science. The conventional wisdom within environmental advocacy circles is that science is a refuge of legitimacy, while arguments that appeal to emotions are unpersuasive, unintelligent, or even somehow embarrassing. This predisposition to put all bets on science has made the climate advocacy community uniquely vulnerable to climate-denial counter-insurgency. As widely reported in popular works such as *Merchants of Doubt*, industries with a vested interest in continuing high emission commercial activities have largely succeeded in bamboozling climate advocates into conducting the debate on the preferred terms of the industry—*i.e.*, the degree to which the available science is reliable, indisputable, and 100% accurate.[166] This is a clever tactical choice, as any reputable scientist will admit that science is never 100% reliable, indisputable, or accurate. These imperfections are the very core of the scientific process, and the very tool climate reform opponents have seized upon to counter and muffle the impact of climate advocacy.

Science-based arguments have also failed to trigger the same sense of urgency and outrage that farmed animal advocates have been able to tap into over the last decade. This myopic reliance on science is actually anti-scientific. As discussed

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necessary to mitigate near-term climate impacts are likely to be met with considerable public backlash. Nevertheless, such measures should be given a fresh tactical examination once considerable progress has been made modifying both consumer and corporate decision-making.

165. *See, e.g.*, Emilie Prattico, *Investors, Consumers, and Markets Demand Climate Action: Four Trends for your Business to Know*, BUS. FOR SOC. RESP. (Mar. 22, 2017), https://www.bsr.org/our-insights/blog-view/investors-consumers-markets-demand-climate-action-four-trends-for-business; Sangwon Suh, *How the Investment Community May Save the Planet (And Your Retirement Funds) from Climate Change*, HUFFINGTON POST (Jan. 3, 2017), https://www.huffingtonpost.com/entry/how-investment-community-may-save-the-planet-and-your_us_5858451de4b0630a25423503; Marc Gunther, *General Mills Joins Climate Change Fight and Requires Pledges from Suppliers Too*, THE GUARDIAN (July 28, 2014), https://www.theguardian.com/sustainable-business/2014/jul/28/general-mills-climate-change-lobbying-suppliers-kelloggs-oxfam; Jesse Riseborough & Thomas Biesheuvel, *Coal Seen as New Tobacco Sparking Investor Backlash: Commodities*, BLOOMBERG (Nov. 20, 2013); Avery Fellow, *Investors Demand Climate-Risk Disclosure in 2013 Proxies*, BLOOMBERG (Feb. 25, 2013); Nelson D. Schwartz, *Banks Look to Burnish Their Images by Backing Green Technology Firms*, N.Y. TIMES (June 10, 2012), http://www.nytimes.com/2012/06/11/business/banks-look-to-burnish-their-images-by-backing-green-technology-firms.html; Stephanie Rosenbloom & Michael Barbaro, *Green-Light Specials, Now at Wal-Mart*, N.Y. TIMES (Jan. 24, 2009), http://www.nytimes.com/2009/01/25/business/25walmart.html.

166. *See* Naomi Orskes & Erik Conway, MERCHANTS OF DOUBT (2011).

in Part I of these Articles, human brains are predisposed from a very early age to take action to protect individual baby humans and non-human animals in distress.[167] This baby schema effect has played a major role in the success of the farmed animal campaign, and with the exception of polar bears (which tend to inspire some level of fear in humans) is largely absent from climate advocacy.[168] These emotional aspects of human behavior are a powerful potential force for public policy concerning climate change—far more so than abstract scientific arguments about rising sea levels, mean temperature indexes, or disappearing sea ice.[169]

This is a critical point to understanding the power and success of the farmed animal campaign, and its potential cross-application to GHG emissions control in general, and agricultural methane control in particular. When talking about changing human behavior, being "scientific" means deploying those techniques that are proven by science to be effective—*i.e.*, being more emotional.[170] Being scientific about either animal protection or climate change means triggering people's emotional desire to protect animals and their emotional desire to protect children.

This shift from science-based advocacy and collective loss of communities and species to concrete examples of individual lives in immediate jeopardy is absolutely critical to any new campaign to control methane emissions. The problem must be re-framed as something far more immediate and granular. Advocates need to seek out the current victims of the onset of climate change, and put them onto the front lines of climate advocacy in a way that resonates with ordinary Americans. An important component of this shift in focus is to disengage—to some extent—from the scientific argument over the existence and specific contours of climate change.[171]

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167. Marta Borgi et al., *Baby Schema in Human and Animal Faces Induces Cuteness Perception and Gaze Allocation in Humans*, 5 FRONTIERS PSYCHOL. 1, 1–2 (2014).

168. Kate Manzo, *Beyond Polar Bears? Re-envisioning Climate Change*, 17 METEOROLOGICAL APPLICATIONS 196, 198 (2010); Kate Monson, *Why Pictures of Polar Bears Don't Always Tell the Truth about Climate Change*, THE GUARDIAN (Feb. 2, 2015), https://www.theguardian.com/sustainable-business/2015/feb/02/images-climate-change-mislead-polar-bear ("Typical depictions of the issue, such as homeless polar bears . . . are failing to provoke meaningful engagement. Work needs to be done to find a new generation of images that can switch people on and encourage them to take action.").

169. Nicholas Smith & Anthony Leiserowitz, *The Role of Emotion in Global Warming Policy Support and Opposition*, 34 RISK ANALYSIS 937, 946 (2014); Anthony Leiserowitz, *Climate Change Risk Perception and Policy Preferences: The Role of Affect, Imagery, and Values*, 77 CLIMATIC CHANGE 45, 46, 54, 63 (2006).

170. Vicky Lehmann et al., *The Human and Animal Baby Schema Effect: Correlates of Individual Differences*, 94 BEHAVIOURAL PROCESSES 99, 99–100 (2013); Borgi et al., *supra* note 167 at 1–2, 10; Hiroshi Nittono et al., *The Power of Kawaii: Viewing Cute Images Promotes a Careful Behavior and Narrows Attentional Focus*, 7 PLOS ONE 1, 6 (2012).

171. A major part of the problem is certainly the climate change advocacy community's focus on science. But it also stems from the inherently abstract nature of climate change, the hidden nature of climate impacts, and the obvious fact that, in most cases, climate change arguments are grounded in probabilistic arguments about what "is likely to happen" or other easily dismissed pronouncements

The common criticism of this line of thinking is to decry how people seem to care a lot more about the plight of animals than they do about entire human communities being wiped out in the U.S. and other countries.[172] But whether it is equitable and rational or not, these are the pathways that work. The question then is whether these tactics from the farmed animal campaign can be adapted to encourage action on reducing methane emissions over the near-term. The answer, as discussed further below, is both yes and no.

B. THE ROLE OF CONSUMERS

As has been the case with the farmed animal campaign, individual and institutional consumers must be key players in any effort to significantly reduce unregulated methane emissions over the near-term. So what specific tactics should be deployed concerning unregulated methane emissions? As a threshold matter, the tactics deployed in farmed animal advocacy can do little to address sources of methane that are not subject to traditional market forces. While substantial progress can be made with regard to methane emissions from landfills by advocating for waste reduction and composting, consumer and corporate based strategies are not likely to deliver meaningful near-term reductions from this particular major methane emissions source, which is already regulated at both the state and federal level.[173] The same is true with regard to oil and gas production. Again, arguments for personal and institutional reduction can be made, and some pressure can be brought to bear on oil and gas companies to reduce supply-side emissions, but energy as a commodity does not seem to be subject to significant consumer-choice driven impacts.[174]

The major opportunity, it would seem, is within the agricultural sector. Unlike landfills and oil and gas, high-methane emission agricultural products are directly marketed to individual and institutional consumers, and in a format

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about impending doom. Part I of this series of Articles suffers from some of those limitations, since it necessarily relies on predictive science and models to describe the on-the-ground impacts of climate change on different public interest constituencies. But it also made the case for translating future predictions about sea level rise, heat waves, climate-driven armed conflict, and species loss into concrete numbers of individual human and animal lives lost. *See* Lovvorn, *supra* note 1, at 17–53.

172. *See, e.g.*, Farai Mutsaka, *Zimbabweans Can't Understand Why Everyone is so Upset over 'Cecil the Lion' When There are so Many Bigger Problems in the Country*, BUS. INSIDER (Jul. 30, 2015), http://www.businessinsider.com/zimbabweans-cant-understand-why-americans-are-so-upset-over-cecil-the-lion-when-there-are-so-many-bigger-problems-in-the-country-2015-7; Aja Romano, *The Harambe Meme is Still Going Strong. And It's About a Lot More than a Dead Gorilla*, VOX (Sep. 13, 2016), https://www.vox.com/2016/8/17/12457468/harambe-meme-social-commentary-explained.

173. *See supra* notes 83–100 and accompanying text.

174. MATHEW J. MOREY ET AL., ELECTRIC MKT. RES. FOUND., *Executive Summary to* RETAIL CHOICE IN ELECTRICITY: WHAT HAVE WE LEARNED IN 20 YEARS? at v (2016) ("Fourteen U.S. states and the District of Columbia presently have retail choice, and eight states have suspended or rescinded retail choice."); *State-by-State Information, American Coalition of Competitive Energy Suppliers*, AM. COALITION OF COMPETITIVE ENERGY SUPPLIERS, http://competitiveenergy.org/consumer-tools/state-by-state-links/ (last visited Jan. 27, 2018).

that promotes choice and selection—*i.e.*, large-scale procurement contracting and neighborhood supermarkets. Consumers make choices all the time between high emission food and low emission food, they are just doing it with little or no awareness of the impacts on the things they are emotionally predisposed to care about—children and animals in distress. But simply saying that we need to shift people from high methane food products to low methane products is an oversimplification for a number of reasons, the chief one being the central role that eating high methane foods like meat, rice, and dairy plays in many cultures.

Indeed, it is no overstatement to say that human society was founded on the consumption of meat. Human civilization's earliest origins can be seen in loose bands of hunters following herds of animals during their migrations, and then ultimately capturing and domesticating animals.[175] Human energy sources were mostly animal-dependent for thousands of years.[176] The original oil products came from whales.[177] We relied on horses for thousands of years as our primary mode of transportation.[178] Technological innovation and the invention of the internal combustion engine may have liberated many animals from the grasp of human energy use (most notably horses and whales), but was also largely responsible for the bulk of our current climate change crisis, which now threatens those very same animals as well as billions more.[179] At the same time, the available data suggests a relatively low level of awareness of the connection between diet and climate change, but a strong willingness to make changes.[180] Thus, if we could somehow overcome this strong predisposition and blind-spot with regard to food consumption, the benefits could be substantial within the climate advocacy space.[181]

The current resistance to discussions about shifting from high emission animal-based food choices to low emission plant-based choices is so strong that some people are seriously discussing eating crickets and mealworms as an

175. *See* YUVAL NOAH HARARI, SAPIENS: A BRIEF HISTORY OF HUMANKIND 77–84 (2015).

176. *Id.*

177. H. SCHOBERT, ENERGY AND SOCIETY: AN INTRODUCTION, SECOND EDITION 285 (2014).

178. *Id.* at 18.

179. *See* Lovvorn, *supra* note 1, at 40–53.

180. *See* LAURA WELLESLEY ET AL., CHANGING CLIMATE, CHANGING DIETS: PATHWAYS TO LOWER MEAT CONSUMPTION VIII (Chatham House Report, 2015) (finding that "[p]ublic understanding of livestock's role in climate change is low relative to that for comparable sources of emissions" but that "[i]ncreased understanding of the link between livestock and climate change is associated with greater willingness to reduce consumption" and that "people were more likely to back government action after being exposed to information about the role of livestock in climate change").

181. *See* Springmann et al., *supra* note 126, at 4146 (estimating that food-related greenhouse gas emissions could account for half of the 2˚C world emissions budget by 2050, and that transitioning to a vegetarian diet would cut emissions by 63%, and that transitioning to a vegan diet would cut emissions by 70%); *see also* DRAWDOWN, *supra* note 150, at 39 (ranking plant-based eating as the fourth ranked pathway to GHG reductions, before energy conservation and dozens of other more commonly discussed mitigation tactics).

alternative and more efficient protein source.[182] The fact that people seem more comfortable exploring bug-eating than heeding their parents' admonishment to finish their veggies not only demonstrates the cultural gridlock around this issue,[183] but is also particularly irrational when transposed into the context of any other major GHG source.

For example, imagine that Exxon decided to develop a new gasoline product: scented gas. The product would be marketed to consumers as a luxury choice, to avoid having to drive a car that smells like gasoline combustion. Instead, for a premium, consumers could have banana smell coming out of the tailpipe, or strawberry, or lavender. Exxon announces it is going to extract petroleum, ship it to a refinery, refine it, but then not send it to gas stations for use in cars. Instead, they are going to ship it again to a secondary refinement process where for every four to seven gallons of regular gas they put in, they produce one gallon of premium, scented gas out. Then Exxon is going to put it back on trucks, ship it again to gas stations and sell it at a higher cost so that drivers can have aesthetically pleasing gas.

Simply describing this product idea highlights its absurdity. No one would stand for Exxon doing this in the energy sector. But in simplified form this is exactly what we do in the food sector. We already grow enough food to feed the entire world, but we do not send it to the grocery store or other food distribution outlets.[184] Instead, we ship it sometimes halfway around the world to provide feed for meat production.[185] China alone imports fifty million tons of soy beans from the Amazon every year to feed livestock.[186]

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182. *See* Claire Martin, *Jiminy Cricket! Bugs Could Be Next Food Craze*, N.Y. TIMES, Aug. 2, 2014; Arnold van Huis, *Edible Insects Are the Future?*, 75 PROC. OF THE NUTRITION SOC'Y 294, 299 (2016); Jiri Mlcek et al., *A Comprehensive Look at the Possibilities of Edible Insects as Food in Europe – A Review*, 84 POLISH J. OF FOOD & NUTRITION SCI. 147, 147 (2014); Wim Verbeke, *Profiling Consumers Who Are Ready to Adopt Insects as a Meat Substitute in a Western Society*, FOOD QUALITY & PREFERENCE 147, 153 (2015).

183. For an excellent discussion of the cultural and sociological aspects of meat-eating, *see* M. Joy, WHY WE LOVE DOGS, EAT PIGS, AND WEAR COWS: AN INTRODUCTION TO CARNISM (2009); *see also* Christopher A. Monteiro & Tamara M. Pfeiler et al., *The Carnism Inventory: Measuring the Ideology of Eating Animals*, 113 ELSEVIER 51, 52 (2017); Jesse Singal, *The 4 Ways People Rationalize Eating Meat*, N.Y. MAG., June 4, 2015; Steve Loughnan et al., *The Psychology of Eating Animals*, 23 CURRENT DIRECTIONS IN PSYCHOLOGICAL SCI. 104 (April, 2014).

184. Emily S. Cassidy et al., *Redefining Agricultural Yields: From Tonnes to People Nourished per Hectare*, 8 ENVTL. RES. LETTERS 1 (2013) ("We find that, given the current mix of crop uses, growing food exclusively for direct human consumption could, in principle, increase available food calories by as much as 70%, which could feed an additional 4 billion people (more than the 2-3 billion people arriving through population growth [by 2050])").

185. *Id*. at 4 ("More than half of crop production by mass in the United States is directed to animal feed, which represents 67% of produced calories and 80% of produced plant protein").

186. Hallie Gu & Naveen Thukral, *Soy Source: Brazil's Share of Soybean Exports to China Hits Record*, REUTERS (Jan. 25, 2018), https://www.reuters.com/article/us-china-economy-trade-soybeans/soy-source-brazils-share-of-soybean-exports-to-china-hits-record-idUSKBN1FE111; *see* Michael J Lathuillière et al., *Environmental footprints Show China and Europe's Evolving Resource Appropriation for Soybean Production in Mato Grosso, Brazil*, 9 ENVTL. RES. LETT. 07400 (2014).

We put that food through a secondary processing in animal confinement and slaughter facilities where, for every four to seven calories of plant protein we put in, we get one calorie of animal protein out,[187] plus a large amount of manure which itself generates methane emissions.[188] We put it back on trucks and send it to supermarkets and institutional food-providers so people can consume inefficient, high-emission, and aesthetically pleasing meat-based food products. The amount of inefficiency, waste, and increased GHG emissions is massive in scale. A 2017 study of waste in the global food system examined total loss of calories from six key causes—crop production, livestock feeding, handling and transportation, processing, consumer waste, and over-consumption—and found that "the highest loss rate [of calories produced] for the stages considered occurs for livestock production, with losses of 81–94%," and that "*livestock production accounts for 40.4–60.8% of all losses from crop harvest to food consumption" worldwide*.[189] When you add it all up from a GHG perspective, it is approximately forty times more emissions per gram of chicken protein versus most common plant-based foods.[190] For pork, it is also approximately a forty to one waste ratio.[191] And for beef and lamb, the increase in GHG emissions is a whopping 250 times the baseline for plant-based food.[192]

The scented gas example seems absurd because no one thinks about agricultural emissions in these terms. The unlimited consumption of meat is a given, and the idea of conservation and efficiency do not even enter the equation. Given the political difficulty of addressing this issue, and the deep cultural issues associated with eating meat, it is tempting to simply leave this issue alone—as the EPA has done in the United States for the last twenty years.[193] But we can no longer afford to do so because agriculture sector emissions are not only the only major uncontrolled source of methane emissions that can have near-term mitigation effects, but are also (unlike energy, landfills, and other sources) rising quickly throughout

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187. *See* Cassidy et al., *supra* note 184, at 3.

188. *See* Wolf et al., *supra* note 147 and accompanying text (noting that methane emissions from manure from animal agriculture are likely 70% higher than previously reported).

189. Peter Alexander et al., *Losses, Inefficiencies and Waste in the Global Food System*, 153 ELSEVIER 190, 193 (2017) ("Only 19.2-31.9% - less than a third – of biomass harvested from crops or grass is finally consumed by humans") (emphasis added); Doug Boucher, *You Might Be Wasting Food, Even If You're Not Throwing It Away*, UNION OF CONCERNED SCIENTISTS, Nov. 29, 2017 ("neither overconsumption nor consumer waste are the largest way we waste the resources that can be used to produce food. That turns out to be livestock production").

190. David Tilman & Michael Clark, *Global Diets Link Environmental Sustainability and Human Health*, 515 NATURE 518, 518 (2014); *see also* BAILEY ET AL., *supra* note 7, at 4.

191. *Id.*

192. *Id.*

193. As discussed above, the EPA's inaction was not entirely by choice. *See supra* note 105 and accompanying text*; see also 2017 Anti-Environmental Budget Rider*, *supra* note 105 ("A rider in the House Interior and Environment appropriation (Sec. 418) prevents the EPA from requiring the reporting of greenhouse gas emissions from manure management systems. A similar provision was included in the Senate Interior and Environment appropriation (Sec. 417).").

the world, especially in countries like China that are racing to catch up to western levels of meat consumption.[194]

Indeed, a report published shortly before the 2017 Conference of the Parties to U.N. Climate Convention found that just "three meat companies, JBS, Cargill, and Tyson, are estimated to have emitted more greenhouse gases last year than all of France and nearly as much as some of the biggest oil companies like Exxon, BP, and Shell."[195] The report also noted that "the top 20 meat and dairy companies emitted more greenhouse gases than all of Germany, Europe's biggest climate polluter by far," and that "[i]f these companies were a country, they would be the world's seventh largest greenhouse gas emitter."[196] JBS alone emitted more than 280,000,000 tons of GHG emissions in 2016, with Tyson and Cargill coming in second and third place with approximately 180,000,000 and 86,000,000 tons respectively.[197]

In the face of such overwhelming data, the question becomes: how do we overcome the institutional gridlock concerning overlooked and rapidly rising agricultural emissions, and how might the various tactics deployed by the animal protection movement to address agricultural cruelty provide a model? Surprisingly, there are a number of options and opportunities that have either not yet been deployed, or have not yet gained sufficient traction. As with the farmed animal cruelty campaign, the most likely path to success is to use a combination of these tools in order to leverage impacts beyond the power of any one tool working in isolation.

With regard to consumers, there are several tactical "keys" to unlocking the problem of high emission food products. The first key to reducing consumption of high emission food products is to rebrand low methane emission food sources as "clean food," the same way climate campaigners talk about "clean energy." The clean versus dirty dichotomy resonates effectively in the energy sector, so much so that coal-burning advocates have tried to rebrand certain types of coal sources "clean coal."[198] This same dynamic should be created within the food space, with low emissions foods promoted as clean human-energy sources, and high emissions foods taking their rightful place in the public's mind alongside dirty energy sources like coal-fired power plants and diesel generators.

The second key is linking over-consumption and waste as morally equivalent anti-social behavior. Whether you apply an environmental, animal welfare, or

194. *See* Cassidy et al., *supra* note 184, at 5–6.

195. Juliette Majot & Devlin Kuyek, *Big Meat and Big Dairy's Climate Emissions Put Exxon Mobile to Shame*, THE GUARDIAN, Nov. 7, 2017; INSTITUTE FOR AGRICULTURE & TRADE POLICY ET AL., BIG MEAT AND DAIRY'S SUPERSIZED CLIMATE FOOTPRINT – THE TOP 20 MEAT AND DAIRY CORPORATIONS EMIT MORE GREENHOUSE GASES THAN GERMANY (2017), https://www.grain.org/article/entries/5825-big-meat-and-dairy-s-supersized-climate-footprint.

196. *Id*. at 1.

197. *Id*.; INSTITUTE FOR AGRICULTURE & TRADE POLICY ET AL., *supra* note 195.

198. *See* Jonathan Lovvorn, *Clean Food: The Next Clean Energy Revolution*, 37 YALE L. & P. REV. – (forthcoming 2018).

any other related ethical framework, the act of wasting dirty food energy has just as much ethical significance as consuming it. However, in the mind of the typical consumer, including those trying to eat responsibly, personal choice is the most important issue, and waste is more of an afterthought.[199] This is a side effect of the deeply personal nature of food consumption, and a social and psychological frame we need to modify in order to make progress on this front.[200] The consumption of food needs to be depersonalized, and like energy, treated as a question of clean versus dirty and waste versus conservation. Indeed, at least one recent study suggests that reducing waste of high emission food sources could have as much of an effect on total emissions as dietary choices.[201]

Along these same lines, the third key is dismantling the meat versus meatless eating dichotomy currently deployed by advocates working to reduce meat consumption. While it is certainly true, as discussed above, that emissions from animal agriculture are far and away the largest within the food sector, there are still plenty of high-emission plant food sources (like wet-production rice and greenhouse tomatoes) that need to be curtailed.[202] Moreover, the stark divide drawn by vegan and vegetarian activists between meat eating and plant-based eating—and the concomitant declaration of moral superiority—frustrates efforts to achieve meaningful reductions within the clean food space. The personal identity (and purity) of the consumer—vegan, vegetarian, omnivore, or carnivore—is an irrelevancy, and should be treated as such. Instead, these terms need to be redefined as adjectives rather than nouns—i.e., different types of dining choices, like Italian, Mexican, Indian, or Vegetarian, rather than personal political identities.[203] As with food waste, the problem is the overall production and consumption of high emission food products. The need for reduction and conservation to reduce

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199. *See, e.g.*, Roni A. Neff et al., *Wasted Food: U.S. Consumers' Reported Awareness, Attitudes, and Behaviors*, 10(6) PLOS ONE 1, 16 (2015) (reporting that among consumers only "42% indicated they had seen or heard information about wasted food" and only "16% had sought information about reducing it").

200. *See* Joop de Boer & Harry Aiking, *Pursuing a Low Meat Diet to Improve Both Health and Sustainability: How Can We Use the Frames that Shape Our Meals?*, 142 ECOLOGICAL ECON. 238, 243 (2017) (discussing the application of frame theory to modify diets and noting that "studies showed that the willingness to curtail one's consumption and to use fewer environmental resources was intrinsically appealing to some people and that this was also positively related to intentions to eat less meat" and that "[t]hese findings are important clues to the development of new frames (products, recipes) that build on the familiar culinary principles of variety, balance, and moderation, offer a moderate amount of novelty, and enable consumers to coherently interpret the health and sustainability benefits of plant-based proteins") (citations omitted).

201. *See* DRAWDOWN, *supra* note 150, at 43 (identifying food waste reduction as the third ranked pathway to GHG reductions, before dietary change, energy conservation, and dozens of other familiar tactics.).

202. *See supra* note 135 and accompanying text.

203. *See* Boer & Aiking, *supra* note 200, at 243 (discussing how the term "vegetarian" can be "reframed to highlight the position of meat-eaters who do not eat meat every day," make it more of a practice than a personal identity, and how "more consumers might become aware of the fact that plant-based diets are not exclusively for vegetarians").

methane emissions over the near-term is the core goal. The fact that animal-based foods have some of the highest emission outputs is relevant insofar as reducing those food items provide the highest level of benefits. But the problem is not as simplistic as meat-bad/plants-good, and presenting the case as a confrontational battle between good and evil frustrates the goal of overall reduction.[204]

The fourth key, which at first glance may seem in tension with the third, is to move beyond commendable, but primarily symbolic reductions—i.e. meatless Monday campaigns[205]—and other minor adjustments in diet, and advocate for a deep decarbonization style drawdown in total agricultural methane emissions as a time-sensitive imperative. According to a number of recent studies, wealthy nations are quite literally eating the world to death from a climate change standpoint.[206] Shifting from dirty to clean human energy sources is not only urgently necessary, it needs to be carried out on an unprecedented scale if there is to be any chance of meeting the estimated 69% more calories needed for worldwide consumption of nearly ten billion people by 2050.[207] As part of this process, it is imperative that the campaign does not simply promote (or accept) consumers and corporations substituting moderately high emission foods like rice, nuts, fish, and dairy for astronomically high emission foods like beef, lamb, and lobster.[208] No responsible clean energy advocate would propose switching from traditional coal to "clean coal," or ask drivers to trade in their Hummer for an Escalade. The same should be true in the climate-friendly food space. Although advocates need to be sensitive to the danger of absolutism discussed with respect to the third key above, they also need to guard against small-scale, small-impact shifts in diets that do not make serious headway in the effort to transition to clean food sources, and thus curtail methane emissions over the near-term.

The fifth key is developing a clear and granular connection between consumer action and its impact on animals, people, and the environment. As discussed in Part I, a core component of developing a more concrete narrative between consumption and impact is to link the public's strong, long-held desire to prevent wildlife despoliation with the consumption and waste of high emissions foods.[209] Advocates need to seek out the current victims of the onset of climate change,

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204. For an excellent example of advocacy for this alternate "frame" for meat reduction, *see* BRIAN KATEMAN, THE REDUCETARIAN SOLUTION: HOW THE SURPRISINGLY SIMPLE ACT OF REDUCING THE AMOUNT OF MEAT IN YOUR DIET CAN TRANSFORM YOUR HEALTH AND THE PLANET (2017).

205. Janet Ranganathan, *The Global Food Challenge Explained in 18 Graphics*, WORLD RES. INST. (Dec. 03, 2013), http://www.wri.org/blog/2013/12/global-food-challenge-explained-18-graphics; *see* KRISTIE MIDDLETON, MEATLESS: TRANSFORM THE WAY YOU EAT AND LIVE—ONE MEAL AT A TIME (2017).

206. Tilman & Clark, *supra* note 190, at 519; *see* Springmann et al., *supra* note 126, at 4146.

207. *See* FAO HOW TO FEED THE WORLD IN 2050, at 2 (2009); *see also* Cassidy et al., *supra* note 184, at 1; Helen Harwatt et al., *Substituting Beans for Beef as a Contribution Toward U.S. Climate Change Targets*, 143 CLIMATIC CHANGE 261, 261 (2017).

208. Clune et al., *supra* note 123, at 766, 770.

209. *See* Lovvorn, *supra* note 1, at 54–59.

and put them onto the front lines of climate advocacy in a way that resonates with ordinary Americans. In the farmed welfare campaign, this was done by investigating and publicizing conditions inside animal factories, and presenting these images to consumers and corporations so they could internalize the impacts of their individual consumption and business purchasing decisions.[210] Drawing these types of concrete connections to the loss of human and animal lives will be more difficult in the climate space. But there are already numerous examples of human and animal communities suffering and dying because of the impacts of climate change manifesting across the globe.[211] Campaigners will need to engage these victims more closely, and shift their focus from debating the scientific evidence concerning climate change causation and modeling, to making an emotional connection in consumers' minds between their food choices and visually stimulating impacts on vulnerable populations of people and animals.

The sixth key is to depolarize the politics of climate emissions reduction by expanding the advocacy tent to include conservative voices, and formulating "climate conservation" messages that resonate with conservative values. Given the deep political polarization of environmental issues in general, and climate change in particular, it would be naive to suggest that this divide can be bridged with a simple change in messaging. Nevertheless, we must do something about how deeply the issue of climate is identified with elitist, liberal, upper-class white values.[212] There is certainly no factual reason why it need be this way. As described in Part I of these Articles, the far-reaching impacts of climate change already taking place have no particular political valence, nor will they be limited to adherents to any particular political philosophy. Here again, the animal protection movement has provided an example by consciously building and nurturing the conservative case for animal protection, and carefully avoiding the appearance of extreme partisanship.[213] Most notable among the conservative voices for animal

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210. *See supra* notes 155–164 and accompanying text.

211. *See* Lovvorn, *supra* note 1, at 17–53.

212. *See* Kate Aronoff, *The Politics of Climate Change Need to be Anti-Elitist*, THE INTERCEPT (Nov. 28, 2017), https://theintercept.com/2017/11/28/climate-change-cop23-michael-bloomberg-jerry-brown/ (noting that "[c]limate change uniquely lends itself to an anti-elite narrative: A handful of industries have gotten us into this challenge for the benefit of a few corporate executives," and "[t]he solution could form the basis for the biggest jobs program America has ever seen," but that "having some of the most visible faces of the climate fight be a handful of Davos-frequenting 1-percenters—almost universally housed in coastal cities—presents some obvious challenges" in the current political climate of right-wing populism).

213. *See* John Connor Cleveland, *Why Animal Welfare Is a Conservative Cause*, NAT'L REV. (Apr. 19, 2016), http://www.nationalreview.com/article/434213/why-animal-welfare-conservative-cause ("[W]e must abolish the partisan divide when it comes to animal protection. Preventing cruelty to animals is philosophically consistent with the economic and moral principles of conservatism. Beyond these considerations, showing mercy toward all God's creatures is the human—and humane—thing to do.").

protection is Mathew Scully, a former speechwriter for President George W. Bush, who has argued:

> We are cautioned in some quarters that a concern for animals—especially if carried to eccentric extremes like not eating them any more because the brutality involved is morally untenable—is somehow "anti-human," coming at the expense of our human dignity and moral concern for one another . . . It gets us nowhere to diminish animal welfare as a moral concern by changing the subject to instances of great human affliction, as if we cannot be expected to care about both, or as if those very afflictions are a constant preoccupation in our daily lives . . . Compassion for animals doesn't drain away some finite reserve of moral energy and idealism, to the detriment of human welfare, but surely adds to the supply.[214]

While some notable conservative voices are being raised on climate change,[215] they continue to be drowned out by the deafening din of conservative climate skepticism and hostility. The new climate coalition proposed by these Articles simply cannot succeed in the current political climate without expanding the tent beyond the white upper-middle class liberal base of the environmental movement.

The seventh and final key discussed herein (there are likely many more to be discovered and discussed) is education and alternatives. Individual and institutional consumers will not make the decision to seek out climate-friendly food sources unless they (1) know what climate-friendly food is; and (2) are presented with acceptable, affordable alternatives. While considerable progress can be made along the lines of the fifth key in drawing connections in people's minds and activating their emotional concern for the victims of climate change, such efforts can only resonate with that portion of society who can be "triggered" to understand the ethical implications of their energy consumption choices—mechanical and biological.[216]

Although the idea of federally labeling products' GHG emissions is a political non-starter, voluntary labeling programs should be pursued in earnest. In the

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214. Matthew Scully, *Pro-Life, Pro-Animal: The Conscience of a Pro-Life, Vegan Conservative*, NAT'L REV. (Oct. 7, 2013), http://www.nationalreview.com/article/359761/pro-life-pro-animal-matthew-scully; *see also* MATTHEW SCULLY, DOMINION: THE POWER OF MAN, THE SUFFERING OF ANIMALS, AND THE CALL TO MERCY (2002); Matthew Scully, *Unthinkable Today, Obvious Tomorrow: The Moral Case for the Abolition of Cruelty to Animals*, NAT'L REV. (Dec. 19, 2016), http://www.nationalreview.com/article/443161/animal-welfare-standards-rise-evolve-and-should.

215. *See, e.g.*, Chris Megerian, *Arnold Schwarzenegger Talks Bipartisanship and Climate Change*, L.A. TIMES (July 18, 2017), http://www.latimes.com/politics/la-pol-ca-schwarzenegger-republican-climate-change-20170718-htmlstory.html; George P. Shultz & James A. Baker III, Opinion, *A Conservative Answer to Climate Change: Enacting a Carbon Tax Would Free Up Private Firms to Find the Most Efficient Ways to Cut Emissions*, WALL ST. J. (Feb. 7, 2017), https://www.wsj.com/articles/a-conservative-answer-to-climate-change-1486512334.

216. *See* Boer & Aiking, *supra* note 200, at 239 ("just a few cues (a word or the opposite of that word) may trigger whole frames that shape food choices.").

farmed animal welfare space, efforts to achieve mandatory labeling of products as "caged" and "cage-free" have failed to gain traction at the federal level.[217] However, as consumers and other market forces have spurred a transition away from cruel confinement methods, voluntary labeling has vastly expanded within the industry.[218] These labeling efforts are far more specific than the generic "green" and "sustainable" claims that have been adopted within the climate space—about which there is more to be said below. A renewed effort to get specific, measurable GHG emissions labeling could be critical to any successful push for low-emission, clean food consumer choices.[219]

Finally, the importance of developing climate friendly food alternatives to traditional, dirty food sources is hard to overstate. Despite all the tactics discussed above, many consumers make food choices without regard to science, ethics, or emotion.[220] For many, the questions of taste, price, and convenience are far more important drivers of behavior.[221] For these consumers, providing affordable clean food analogs for traditional, high-emission food items will be the key to success.[222] Whether it is plant-based alternatives to staples like beef, chicken, pork, and dairy, or the rapidly emerging field of cellular-cultured meat products, the development of and investment in such alternatives needs to be greatly advanced if we are to achieve the kind of drastic reduction in methane emissions necessary to impact near-term climate change.[223]

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217. *See, e.g.*, Egg Products Inspection Act of Amendments of 2012, H.R. 3798, 112th Cong. (as introduced and referred to H. Comm. on Agric., Jan. 23, 2012); EGG PRODUCTS INSPECTION ACT AMENDMENTS OF 2013, S. 820, 113TH CONG. (as introduced and referred to S. Comm. on Agric., Nutrition, & Forestry, Apr. 25, 2013).

218. *See, e.g.*, AM. SOC'Y FOR THE PREVENTION OF CRUELTY TO ANIMALS [ASPCA] & VT. LAW SCH.'S CTR. FOR AGRIC. & FOOD SYS., FARM ANIMAL WELFARE CERTIFICATION GUIDE: A FARMER'S TOOL FOR UNDERSTANDING WELFARE CERTIFICATION PROGRAMS (2017), https://www.aspca.org/sites/default/files/frm-wlfr-cert-guide-feb2017.pdf.

219. *See* Boer & Aiking, *supra* note 200, at 242 ("Simple labels may be of help; a recent experiment with a controlled introduction of a climate-friendly choice label in the university canteen of a large university in Switzerland resulted in an increased number of climate-friendly meal purchases.").

220. *See* Janet Ranganathan et al., *Shifting Diets For a Sustainable Food Future* 11–12, 21 (World Res. Inst., Working Paper, Installment 11 of *Creating a Sustainable Food Future*, Apr. 2016), http://www.wri.org/sites/default/files/Shifting_Diets_for_a_Sustainable_Food_Future_0.pdf; Jayson Lusk, *Trends in Animal Welfare Concerns and Meat Demand*, JAYSON LUSK.COM: BLOG (July 26, 2017), http://jaysonlusk.com/blog/2017/7/26/trends-in-animal-welfare-concerns-and-meat-demand.

221. *See, e.g.*, Mark J. Post, *Cultured Meat from Stem Cells: Challenges and Prospects*, 92 MEAT SCI. 297, 298 (2012) (highlighting "mimicry," especially of taste, as a requirement for consumer acceptance of meat alternatives); Uyen T.X. Phan & Edgar Chambers IV, *Motivations for Choosing Various Food Groups Based on Individual Foods*, 105 APPETITE 204, 207–08 (2016) (noting "liking" and "convenience" as some of the strongest motivations driving people's food choices).

222. *See* Boer & Aiking, *supra* note 200, at 242 ("To reach many consumers, therefore, it is vital not just to highlight foods that should be reduced, but also to develop concrete frames that stimulate in positive terms what they – in particular regular meat eaters – could choose instead.").

223. For an overview of the meat-alternative development efforts already underway, *see* LIZ SPECHT & CHRISTIE LAGALLY, THE GOOD FOOD INST., MAPPING EMERGING INDUSTRIES: OPPORTUNITIES IN CLEAN MEAT (2017), http://www.gfi.org/images/uploads/2017/06/Mapping-Emerging-Industries.pdf (last updated June 6, 2017); *Silicon Valley Gets a Taste for Food*, ECONOMIST, (Mar. 5, 2015), https://www.

C. THE ROLE OF CORPORATIONS

The tactical keys with regard to corporations are remarkably similar to those for consumers, and in some ways more important. As a number of experts have pointed out, foisting all responsibility for environmental protection (or animal protection for that matter) upon individual consumers is neither an ideal nor effective strategy.[224] This is why those engaged in the farmed animal campaign have focused on *both* consumer choice and corporate responsibility.[225] In addition to reshaping institutional and individual consumer purchasing decisions, they have also sought and obtained commitments from producers, retailers, and food service suppliers to modify their corporate practices to match those preferences.[226] While climate activists have extensive experience with negotiating corporate pledges to reduce GHG emissions generically,[227] a number of more specific corporate campaign goals can be pursued on the issue of methane reduction. This presents something of a problem however for environmental groups that have already negotiated and won generic GHG concessions from various corporations.[228] Having entered into agreements outlining the reduction commitments for a particular corporation or industry, it might be more difficult for the NGO parties to such agreements to come back and ask for additional, targeted reductions in methane emissions now. There is, however, a pathway around this conundrum.

As discussed in Part I, if we expand the circle of climate stakeholders beyond environmentalism, and draw together a broad coalition of other public interest causes traditionally absent from the climate debate, that new climate coalition could seek to negotiate methane-specific concessions from producers, retailers, and food service companies. These efforts will no doubt be resisted on the grounds that many corporations have already made corporate concessions to the environmental community. However, the unique opportunity for near-term methane mitigation, combined with the central role of clean food choices in achieving near-term mitigation, could trigger additional corporate changes and concessions.

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economist.com/news/technology-quarterly/21645497-tech-startups-are-moving-food-business-make-sustainable-versions-meat. Jon Card, *Lab-Grown Food: 'The Goal is to Remove the Animal from Meat Production,'* THE GUARDIAN (July 24, 2017), https://www.theguardian.com/small-business-network/2017/jul/24/lab-grown-food-indiebio-artificial-intelligence-walmart-vegetarian; Leanna Garfield, *Hampton Creek Says It's Making Lab-Grown Meat That Will Be in Supermarkets by 2018*, BUS. INSIDER (June 27, 2017), http://www.businessinsider.com/hampton-creek-lab-grown-meat-2017-6.

224. *See* JENNIFER JACQUET, IS SHAME NECESSARY? NEW USES FOR AN OLD TOOL (2015) (comparing the power and limits of consumer guilt and corporate shame-based public interest campaign strategies, including efforts on climate change).

225. *See* Shields et al., *supra* note 154 and accompanying text.

226. *Id*.

227. *See* OECD TRANSITION TO A LOW-CARBON ECONOMY: PUBLIC GOALS AND CORPORATE PRACTICES 19, 22 (2010), http://dx.doi.org/10.1787/9789264090231-en.

228. *Id*. at 22.

This same new climate coalition could move to bring agricultural emissions within the voluntary cap and trade emissions markets at the state, regional, and international level. With the exception of some limited efforts to mitigate emissions from the dairy industry in California,[229] both plant and animal based agricultural emissions are excluded from cap and trade programs. By requiring high-emission food sources to offset their emissions in the trading market, and by allowing climate-friendly alternative food sources (including start-up plant and cellular based meat alternatives) to sell their emissions credits, the emissions trading markets can help drive transformational change. While such market-based trading schemes are inadequate on their own to effectuate the level of emissions reductions necessary, they can be a powerful auxiliary tool in the larger toolbox for bringing agricultural methane emissions under control.[230]

Third, as has been the case in the farmed animal campaign, investor and shareholder activism can also play a major role in reforming corporate behavior. Strategic investment and divestiture have proven to be powerful tools for corporate change in the farmed animal space.[231] The decisions by many major fast-food companies to phase out cruel methods of farmed animal confinement and production have been strongly influenced by such efforts.[232] Here again, traditional climate stakeholders are no stranger to these tactics, and have used them to obtain generalized commitments to GHG reductions and sustainability pledges.[233] However, a new coalition of non-traditional climate stakeholders could launch a second-wave effort, carefully targeted at agricultural methane emissions, and potentially yield significant near-term results.[234]

All of these tactics and proposals are dependent on corporations and government agencies being trustworthy and reliable partners in change. They also require monitoring and enforcement to ensure that corporate commitments and

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229. *See* Alejandro Lazo, *How Cap-and-Trade Is Working in California*, WALL ST. J. (Sept. 28, 2014), https://www.wsj.com/articles/how-cap-and-trade-is-working-in-california-1411937795.

230. *See* Adam Ashton, *Cap-and-Trade Market Could Raise Pressure on Dairies, Jet Makers and Refineries*, SACRAMENTO BEE (July 23, 2016), http://www.sacbee.com/news/local/article91372272.html.

231. *See* Seth Goldman, *How Entrepreneurship Can Be a Force for Social Good*, INC. (Sept. 19, 2016), https://www.inc.com/seth-goldman/a-tale-of-two-henrys-how-activists-and-entrepreneurs-really-impact-the-world.html; *see also* Shields et al., *supra* note 154 and accompanying text.

232. *See* Shields et al., *supra* note 154 and accompanying text.

233. Avery Fellow, *Investors Demand Climate-Risk Disclosure in 2013 Proxies*, BLOOMBERG (Feb. 25, 2013), https://www.bloomberg.com/news/2013-02-25/investors-demand-climate-risk-disclosure-in-2013-proxies.html; Prattico, *supra* note 165 ("In 2016, shareholders filed 175 climate-related resolutions, up from 167 in 2016 and 148 in 2015, and resolutions are expected to exceed 200 this year. This trend is especially strong in the oil and gas sector, where shareholders at Exxon and Chevron, for instance, are formally recognizing climate change as a major risk.").

234. *See* FARM ANIMAL INVESTMENT RISK & RETURN [FAIRR], FACTORY FARMING: ASSESSING INVESTMENT RISKS (2016), http://www.fairr.org/wp-content/uploads/FAIRR_Report_Factory_Farming_Assessing_Investment_Risks.pdf.

representations concerning methane and other GHG emissions are truthful and faithfully carried out. The enforcement piece of this puzzle—which must be carried out hand-in-hand with efforts to change consumers and corporations—is largely the dominion of the courts. In the farmed animal campaign, it has been this tripartite strategy—consumers, corporations, and the courts—that has yielded such a high degree of success over such a short period of time.[235] When it comes to a low-emission, clean food campaign, the courts have a similar, critical role to play.

D. THE ROLE OF THE COURTS

The judicial landscape with regard to farmed animal welfare and climate emissions is remarkably similar in some respects. For both farmed animal welfare and GHG emissions, it seems unlikely that major results will be delivered in the typical high court showdown type cases popularized by the Civil Rights movement, and most recently accomplished by marriage equality advocates in the U.S. Supreme Court.[236] At least in the United States, efforts to apply sweeping litigation test-case strategies in isolation are not likely to have a substantial impact in either arena.

In the case of animals, novel and well-fought challenges to the status of animals as economic instruments devoid of any inherent rights have been filed, but repeatedly rejected by the courts.[237] While not impossible, the likelihood of such sweeping legal efforts yielding results any time soon appears very low.[238] Nevertheless, over the last fifteen years, the courts have played a major role in helping to solidify and enforce changes that the animal protection movement has

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235. *See generally*, Jonathan Lovvorn & Nancy Perry, *California Proposition 2: A Watershed Moment For Animal Law*, 15 ANIMAL L. 149 (2009) (describing the integrated legislative, media, and litigation strategy advocates deployed to enact the nation's first comprehensive state ballot measure to prevent farmed animal cruelty); *see also* Shields et al., *supra* note 154 at 4 ("The campaign work was set out in four pillars: public policy, corporate engagement, litigation, and investigations, all of which were to play major roles in the significant advancements for farm animals that unfolded over the next decade").

236. Obergefell v. Hodges, 135 S. Ct. 2584 (2015).

237. *See., e.g.*, Nonhuman Rights Project, Inc., ex rel Tommy v. Lavery, 54 N.Y.S.3d 392, 397 (N.Y. App. Div. 2017) (rejecting habeas corpus petition filed in New York state seeking to challenge the captivity of individual chimpanzees in violation of their asserted legal rights); Tilikum et al. v. Sea World Parks & Entm't Inc., 842 F. Supp. 2d 1259, 1264–65 (S.D. Cal. 2012) (rejecting claim that killer whales are persons being held captive as "slaves" in violation of the 13th Amendment to the U.S. Constitution); The Cetacean Cmty. v. Bush, 386 F.3d 1169, 1179 (9th Cir. 2004) (rejecting claim that "the cetacean community" of whales can seek redress in federal court for U.S. Navy training exercises that harm whales); Citizens to End Animal Suffering & Exploitation v. New England Aquarium, 836 F. Supp. 45, 59 (D. Mass. 1993) (rejecting claim that a dolphin can seek redress in federal court to block transfer to another display facility).

238. *See, e.g.*, Lovvorn, *supra* note 153, at 142 (discussing the advantages and disadvantages of different strategic approaches to animal protection litigation, and concluding that lawsuits seeking to establish human rights or human-type rights for animals are unlikely to yield practical results for animals over the near-term).

achieved with consumers and corporations with respect to farmed animal abuse,[239] including major rulings and settlements that halted false "humane" labeling of farmed animal products,[240] blocked corporations from interfering with shareholder resolutions demanding humane treatment of farmed animals,[241] vindicated the First Amendment rights of advocates to purchase advertisements in public fora[242] and to conduct undercover investigations,[243] held individuals criminally responsible for farmed animal cruelty,[244] forced factory farms to pay for damages inflicted on rural communities and homeowners,[245] blocked the illegal diversion of $3,000,000 a year in federal funds to a factory farm lobbying group,[246] required producers and trade associations to disgorge more than $125,000,000 in profits for misusing an animal welfare certification program to

239. *See* Shields et al., *supra* note 154 at 6, 9–10; *see also* Joe Satran, *Humane Society's Litigation Arm Walks Tightrope Between Radicalism, Complaisance*, HUFFINGTON POST (Oct. 2, 2012), https://www.huffingtonpost.com/2012/10/02/humane-society-litigation_n_1933863.html.

240. *See* Joanna Rothkopf, *Perdue Forced to Remove "Humanely Raised" Labels from Chickens-Two Class Action Lawsuits Allege that the Company's Practices are Far From Kind*, SALON (Oct. 13, 2014), https://www.salon.com/2014/10/13/perdue_forced_to_remove_humanely_raised_labels_from_chicken/; Lynne Terry, *Kroger Removing 'Humanely Raised' on Chicken Labels in Settlement Following Perdue Deal*, THE OREGONIAN (Oct. 15, 2014), http://www.oregonlive.com/health/index.ssf/2014/10/kroger_removing_humanely_raise.html.

241. *See* Shields et al., *supra* note 154, at 6, 9–10; *see also U.S. Securities and Exchange Commission Rules in The HSUS' Favor and Against Bob Evans in Dispute over Animal Cruelty Proposal-SEC Rules that Restaurant Chain Must Allow Shareholders to Vote on HSUS Proposal*, THE HUMANE SOCIETY (June 13, 2011), http://www.humanesociety.org/news/press_releases/2011/06/BobEvans_SEC_061311.html.

242. *See* Colin Campbell, *Humane Society Sues Raleigh for Rejecting Bus Ad About Caged Pigs*, THE NEWS & OBSERVER (Aug. 22, 2013), http://www.newsobserver.com/news/local/community/midtown-raleigh-news/article10278050.html; *Raleigh Transit Authority Settles Lawsuit Over Ads Exposing Pig Abuse-Buses Will Display Ads Exposing Pork Industry's Inhumane Confinement of Pigs*, THE HUMANE SOCIETY (Oct. 13, 2013), http://www.humanesociety.org/news/press_releases/2013/10/raleigh_pig_bus_ads_101413.html.

243. *See* Bill Chappell, *Judge Overturns Utah's 'Ag-Gag' Ban On Undercover Filming At Farms*, NPR (July 8, 2017), https://www.npr.org/sections/thetwo-way/2017/07/08/536186914/judge-overturns-utahs-ag-gag-ban-on-undercover-filming-at-farms; Luke Runyon, *Judge Strikes Down Idaho 'Ag-Gag' Law, Raising Questions For Other States*, NPR (Aug. 4, 2015), https://www.npr.org/sections/thesalt/2015/08/04/429345939/idaho-strikes-down-ag-gag-law-raising-questions-for-other-states.

244. *See* Cheryl Leahy, *Large-Scale Farmed Animal Abuse and Neglect, Law and its Enforcement*, 4 J. ANIMAL L. & ETHICS 63, 80–125 (2011) (assimilating the results of more than two-dozen major animal cruelty actions against factory farms); *see also* Ellen Jean Hirst *Workers at Former Nestle-Linked Farm Convicted of Animal Cruelty*, THE CHICAGO TRIBUNE (April 22, 2014), http://articles.chicagotribune.com/2014-04-22/business/chi-dairy-farm-workers-animal-cruelty-20140422_1_wiese-farm-wiese-brothers-misael-monge-minero ("Mercy for Animals . . . said this is the fifth investigation that has led to animal cruelty convictions against dairy farm workers in recent years.").

245. *See, e.g.*, E. Fuchs, *Calif. Egg Ranch Emissions Are Nuisance, Jury Says*, LAW360 (May 26, 2011), https://www.law360.com/articles/247513/calif-egg-ranch-emissions-are-nuisance-jury-says ("A federal jury found Tuesday that Olivera Egg Ranch LLC neglected to reduce ammonia emissions at a French Camp, Calif., egg-laying facility, awarding $544,000 in damages in a suit launched by residents and The Humane Society of the United States.").

246. Steve Davies, *Pork Board Payments to NPPC for Trademarks Must Cease, Judge Says*, AGRI-PULSE (Feb. 1, 2018), www.agri-pulse.com/articles/10559-pork-board-payments-to-nppc-for-trademarks-must-cease-judge-says ("A federal judge in Washington, D.C., has ordered a halt to annual payments from the

fix consumer prices for animal commodities,[247] and saddled the owners of a slaughterhouse with a record-breaking $155,000,000 consent judgment for fraudulently certifying compliance with federal rules requiring humane treatment of animals by USDA meat suppliers.[248] Each of these victories, while not transformative of the entire industry in and of themselves, reinforced the key messages and goals of the campaign, and enforced the social norms that the farmed animal campaign has helped emerge over the last decade.

The courts have a similar, supporting role to play in any campaign to reduce high emission food consumption and waste. As with consumer and corporate campaigns, climate advocates have already vigorously engaged the judiciary, filing hundreds of lawsuits on a variety of topics.[249] However, the vast majority of these actions have been initiated in an effort to improve administration and enforcement of the Clean Air Act, the Endangered Species Act, and other federal environmental laws which have, for the reasons discussed in Part I of these Articles, proven structurally inadequate to the task of addressing the diffuse, transboundary nature of climate change emissions.[250] The litigation associated with the farmed animal campaign has, by necessity, focused instead on corporate

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National Pork Board to the National Pork Producers Council," which totaled "$3 million annually for 20 years").

247. *See* P.J. D'Annuzio, *Judge Approves $75M Settlement in Eggs Antitrust Litigation*, PITT. POST-GAZETTE (Nov. 28, 2017), http://www.post-gazette.com/business/legal/2017/11/28/Judge-Approves-75M-Settlement-in-Eggs-Antitrust-Litigation/stories/201711280007; Saabira Chaudhuri & David Kesmodel, *Egg Giant Settles Antitrust Claims-Suits Alleged Cal-Maine Conspired to Curtail Supplies to Inflate Prices*, WALL ST. J. (July 23, 2013), https://www.wsj.com/articles/SB10001424127887324328904578623683374193720 ("One of the nation's biggest egg producers said Tuesday it had agreed to pay $28 million to settle class-action claims in a series of antitrust lawsuits."); Elaine Meyer, *Land O'Lakes Settles Egg Antitrust Action For $25M*, FORBES (June 8, 2010), https://www.forbes.com/sites/docket/2010/06/08/land-olakes-settles-egg-antitrust-action-for-25m/#1fce72494f28. A similar action concerning dairy industry price-fixing resulted in a settlement of over $50,000,000 in 2016. *See* Janet Burns, *Got Price-Fixing? Big Dairy To Fork Over $52M In Rebates For Killing Cows*, FORBES (Jan 29, 2010), https://www.forbes.com/sites/janetwburns/2017/01/29/got-price-fixing-big-dairy-to-fork-over-52m-in-rebates-for-killing-cows/#3d0ee0097c02.

248. James Barragan, *Meatpacking Firms Reach Settlement on Animal Cruelty Charges*, L.A. TIMES (Nov. 27, 2013), http://articles.latimes.com/2013/nov/27/local/la-me-ln-beef-school-lunch-program-20131127; *Former Suppliers of Beef to National School Lunch Program Settle Allegations of Improper Practices and Mistreating Cows*, U.S. DEP'T OF JUSTICE (Nov. 27, 2013), https://www.justice.gov/usao-cdca/pr/former-supplier-beef-national-school-lunch-program-settle-allegations-improper ("Under the settlements, Westland Meat Co., based in Corona Del Mar, Calif., and its owner Steve Mendell will pay $240,000, and Westland will enter into a consent judgment for $155.68 million.").

249. For a comprehensive inventory of all climate-related litigation in the United States, see *U.S. Litigation Database*, THE SABIN CTR. FOR CLIMATE CHANGE LAW, http://columbiaclimatelaw.com/resources/u-s-litigation-database/ (last visited Mar. 17, 2018); *see also Climate-change lawsuits: Global warming is Increasingly Being Fought in the Courtroom*, THE ECONOMIST (Nov. 2, 2017), https://www.economist.com/news/international/21730881-global-warming-increasingly-being-fought-courtroom-climate-change-lawsuits.

250. *See* Lovvorn, *supra* note 1, at 11–17. This Article is by no means a criticism of these cases, which serve an important function by acclimating courts to the importance of climate change, and raising public awareness. *See* R. HENRY WEAVER & DOUGLAS A. KYSAR, COURTING DISASTER: CLIMATE CHANGE AND THE ADJUDICATION OF CATASTROPHE 66 (May 8, 2017), https://ssrn.com/abstract=2965084. To the contrary, advocates should continue these more conventional cases while

transparency, consumer protection, and public disclosure that promotes the core strategic goals of the campaign.

As is the case with farmed animal welfare, the likelihood of sweeping climate reform being precipitated by legal action also appears very low. For example, it is now widely accepted that trying to apply tort theory to climate change is not likely to be a fruitful avenue of development.[251] Given the diffuse nature of the tortfeasors, the significant causation problems, and the case law generated to date, tort theories will likely not be a fruitful avenue for development.[252] Likewise, the issue of holding climate polluters responsible for federal common law nuisance is essentially decided, and absent Congressional action excluding certain emitters (perhaps factory farms) from the scope of the Clean Air Act, that pathway also appears blocked.[253]

The legal successes in the Netherlands and Pakistan suggest some possibility of applying international principles and duties in climate change cases against state or federal governments. In the Netherlands case, the non-governmental organization Urgenda filed an action in the Hague District Court on behalf of both present and future citizens of the country, alleging that the Dutch Government was failing to meet its international pledges to reduce GHG emissions, and that this failure to take serious action on climate change violated international human rights law.[254] Remarkably, the court ruled in favor of the plaintiffs, finding that the Dutch government owes a "duty of care" to its citizens under both international human rights and environmental norms, and ordered the government to cut emissions by 25% from 1990 levels.[255]

According to reports of the ruling, the court found that "the possibility of damages for those whose interests Urgenda represents, including current and future generations of Dutch nationals, is so great and concrete that given its duty of care, the state must make an adequate contribution, greater than its current contribution, to prevent hazardous climate change."[256] The ruling was widely heralded as a landmark accomplishment among climate litigators and activists. Counsel for Urgenda explained to the media that "[t]his is the first time a court has determined that states have an independent legal obligation towards their citizens. That must inform the reduction commitments in Paris because if it doesn't, they

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developing more impactful strategies, as they help integrate and foster collective action among the lawyers and organizations currently working on climate change litigation.

251. Douglas Kysar, *What Climate Change Can Do About Tort Law*, 41 ENVTL. L. 1, 3–4 (2011).

252. *Id.*; *see also* WEAVER & KYSAR, *supra* note 250, at 20–38.

253. *See* Native Village of Kivalina v. ExxonMobil Corp., 696 F.3d 849 (9th Cir. 2012); American Electric Power Company v. Connecticut, 564 U.S. 410 (2011).

254. John Schwartz, *Ruling Says Netherlands Must Reduce Greenhouse Gas Emissions*, N.Y. TIMES (June 24, 2015), https://www.nytimes.com/2015/06/25/science/ruling-says-netherlands-must-reduce-greenhouse-gas-emissions.html.

255. *Id.*

256. *Id.*

can expect pressure from courts in their own jurisdictions."[257]

In the Pakistan case, a young farmer filed a petition with the high court arguing that the government's failure to meaningfully address the problem of climate change violated his fundamental rights.[258] The plaintiff argued that "his family relies on the income it gets from its more than 500-acre sugarcane farm in Rahimyar Khan," but "water scarcity and temperature changes in the Punjab region are stressing crops and making it impossible for some farmers to continue to make a living."[259] The court agreed and ordered the government to form a Climate Change Commission to implement policies to address the plaintiff's injuries.[260] Similar cases have been filed in other countries as well.[261]

But the fundamental differences between the U.S. legal system and that of these other countries suggest that a similar approach will not be a fruitful path in the United States. The available causes of action against the federal government are actually quite few, and the doctrine of sovereign immunity presents a substantial hurdle to replicating these kinds of sweeping challenges to national government inaction on climate change.[262] The long-standing difficulty of establishing Article III injury, causation, and redressability also presents a significant hurdle.

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257. Arthur Nelsen, *Dutch Government Ordered to Cut Carbon Emissions in Landmark Ruling*, THE GUARDIAN (June 24, 2015), https://www.theguardian.com/environment/2015/jun/24/dutch-government-ordered-cut-carbon-emissions-landmark-ruling.

258. Anam Gill, *Farmer Sues Pakistan's Government to Demand Action on Climate Change*, REUTERS (Nov. 13, 2015), https://www.reuters.com/article/pakistan-climatechange-lawsuit-idUSL8N1383YJ20151113.

259. *Id*.

260. *Id*.; *see also* Julien Bouissou, *First the Netherlands, Now Pakistan's High Court Comes to Defence of Climate*, THE GUARDIAN (Oct. 7, 2015) ("In a recent ruling, the judge said that the government had not made any concrete steps to enact the national climate change policy, approved in 2012. The judged [sic] added, 'for Pakistan, climate change is no longer a distant threat – we are already feeling and experiencing its impacts across the country and the region.' The judge's proposed 'climate council' would bring together representatives from various ministries and civil society, including NGOs, and be headed by a lawyer specialising in environmental law. He or she will have to report back to legal officials and oversee a number of initiatives.").

261. *Youth Files Case with India's Environmental Court*, OUR CHILDREN'S TRUST (Mar. 30, 2017), https://www.ourchildrenstrust.org/india/ ("Nine-year-old Ridhima Pandey filed a petition against the Indian government last week, asserting that the Indian government has failed to fulfill its duties to her and the Indian people to mitigate climate change. The case includes allegations based on India's Constitution, the Public Trust Doctrine, Intergenerational Equity, but also alleges the non-implementation of four environmental laws dating as far back as 1980, has contributed to the adverse impacts of climate change across India."); Press Release, *Our Children's Tr., Nature & Youth, Greenpeace, Youth File Lawsuit Against Norwegian Government Over Arctic Oil* (Oct. 18, 2016) ("Today young people filed a constitutional climate lawsuit against the Norwegian government for allowing oil companies to drill for new oil in the Arctic Barents Sea, endangering young people and future generations with more climate pollution. The plaintiffs, Nature and Youth – the largest youth-led organization in Norway – and Greenpeace Norway, argue that Norway has violated citizens' and future generations' constitutional right to a healthy environment, joining youth around the world who are taking actions against their governments.").

262. *See* WEAVER & KYSAR, *supra* note 250, at 37–38.

The most notable case attempting to overcome these difficulties is *Juliana v. United States*, wherein a group of twenty-one youths represented by Our Children's Trust filed suit against the United States government in Eugene, Oregon under the public trust doctrine.[263] Despite recent Supreme Court and Ninth Circuit case law holding that federal common law causes of action have been displaced by the Clean Air Act, the plaintiffs in *Juliana* have made remarkable and unexpected progress with their case.[264] In a lengthy order, the district court refused to dismiss the action and held instead that the case could proceed because "[t]his action is of a different order than the typical environmental case," and "alleges that defendants' actions and inactions—whether or not they violate any specific statutory duty—have so profoundly damaged our home planet that they threaten plaintiffs' fundamental constitutional rights to life and liberty."[265] The case could fundamentally change current assumptions about the role of the federal courts as a venue for game-changing climate litigation in the United States. Or it could very well join the *Kivalina* and *Connecticut* cases in the category of well-meaning cases that inadvertently slammed the door shut on federal climate litigation for the foreseeable future.[266]

The opportunities at the state level in the United States look somewhat more promising. A number of cases have been filed under the state public trust doctrine.[267] State public nuisance actions also hold some promise, since both state public trust and nuisance actions are unaffected by the federal common law displacement problems that have stymied previous federal public trust climate cases.[268] One of the more successful cases in this regard is *Kain et al. v. Massachusetts Department of Environmental Protection*, in which the

263. Juliana v. United States, 217 F. Supp. 3d 1224 (D. Or. 2016); Michelle Nijhuis, *The Teen-Agers Suing Over Climate Change*, THE NEW YORKER (Dec. 6, 2016), https://www.newyorker.com/tech/elements/the-teen-agers-suing-over-climate-change (The suit "alleges that the U.S. government has violated the public-trust doctrine—the principle, dating back to Roman law, that some resources cannot be appropriated by private interests and are instead held in trust by the government for public use. The doctrine has been part of federal case law since 1892, when the Supreme Court ruled that the state of Illinois could not grant a chunk of Lake Michigan shoreline to a railroad company. In more recent years, the doctrine has been used to prevent private landowners from blocking access to Oregon's beaches, and to stop the city of Los Angeles from exhausting the supply of water in California's Mono Lake.").

264. Chelsea Harvey, *Trump Could Face the 'Biggest Trial of the Century' – Over Climate Change*, WASH. POST (Dec. 1, 2016), https://www.washingtonpost.com/news/energy-environment/wp/2016/12/01/trump-could-face-the-biggest-trial-of-the-century-over-climate-change/?utm_term=.904913e4a125.

265. *Juliana*, 217 F. Supp. 3d at 1250. In her ruling, Judge Akien offered an interesting analogy to the marriage equality line of cases, observing that "I have no doubt that the right to a climate system capable of sustaining human life is fundamental to a free and ordered society" and that "[j]ust as marriage is the foundation of the family, a stable climate system is quite literally the foundation of society, without which there would be neither civilization nor progress."

266. *See* WEAVER & KYSAR, *supra* note 250, at 35, 38.

267. *See Sabin U.S. Litigation Database*, *supra* note 249.

268. Native Vill. of Kivalina v. ExxonMobil Corp., 663 F. Supp. 2d 863 (N.D. Cal. 2009), *aff'd*, 696 F.3d 849 (9th Cir. 2012); Connecticut v. Am. Elec. Power Co., 406 F. Supp. 2d 265 (S.D.N.Y. 2005), *vacated and remanded*, 582 F.3d 309 (2d Cir. 2009), *rev'd*, 564 U.S. 410 (2011); WEAVER & KYSAR, *supra* note 250, at 56–57.

Massachusetts Supreme Court issued an order directing state regulators to carry out their legal obligations to reduce GHG emissions, and ordered the agency to "promulgate regulations that address multiple sources or categories of sources of greenhouse gas emissions, and impose a limit on emissions that may be released."[269]

Also promising and mostly unexplored is the entire area of false advertising and consumer protection claims—ether on a class action basis or by way of mass joinder. Given the dizzying array of products advertised as "sustainable," "green," or "environmentally friendly," there are numerous examples of GHG unfriendly products being promoted based on questionable environmental claims.[270] At least one petition based on such false assertions has already been submitted to the FTC.[271] The use of class action consumer actions has been highly effective in the field of animal welfare over the last ten years, and could prove fertile ground for emerging litigation over climate change.[272] Litigation that forces corporate disclosure of emissions and truthful advertising promotes consumer knowledge and choice, and helps reinforce other consumer and corporate-focused campaign strategies.[273]

Closely related to consumer-based deception litigation is the area of securities regulation. Corporations involved in major GHG emissions are constantly making legally reviewable assertions of fact to their shareholders and regulators about climate change. In 2015, the Attorney General of New York launched an

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269. Kain v. Dep't of Envtl. Prot., 49 N.E.3d 1124, 1131 (Mass. 2016). For an additional discussion of this developing line of cases, *see* Mary Christina Wood & Charles W. Woodward, IV, *Atmospheric Trust Litigation and the Constitutional Right to a Healthy Climate System: Judicial Recognition at Last*, 6 WASH. J. ENVTL. L. & POL'Y 634, 669 (2016). A flurry of additional cases have been filed in 2017 and 2018 by several California cities and counties. *See* Chris Mooney & Brady Dennis, *This Could be the Next Big Strategy for Suing Over Climate Change*, WASH. POST (July 20, 2017), https://www.washingtonpost.com/news/energy-environment/wp/2017/07/20/this-could-be-the-next-big-strategy-for-suing-over-climate-change/?utm_term=.21d3ea9ca0db; *Sabin U.S. Litigation Database*, *supra* note 249.

270. *See, e.g.*, Dan Charles, *Does "Sustainability" Help the Environment, or Just Agriculture's Public Image?*, NPR (Aug. 22, 2017), http://wypr.org/post/does-sustainability-help-environment-or-just-agricultures-public-image; Tom Philpott, *How Factory Farms Play Chicken With Antibiotics*, MOTHER JONES (May/June 2016), https://www.motherjones.com/environment/2016/05/perdue-antibiotic-free-chicken-meat-resistance/; Elle Hunt, *Meatonomics' David Robinson Simon: Everything I Envision for Meat has Happened with Tobacco*, THE GUARDIAN (June 6, 2017), https://www.theguardian.com/lifeandstyle/2017/jun/07/meatonomics-david-robinson-simon-everything-i-envision-for-meat-has-happened-with-tobacco. Indeed, given crop waste rates from harvest to table of 81-94%, *see* Alexander et al., *supra* note 189, at 192, a 250-to-1 ratio of GHG per calorie compared to plant-based food, and an overall GHG emissions footprint rivaling a major oil company, *see* INSTITUTE FOR AGRICULTURE & TRADE POLICY ET AL., *supra* note 195, any use of the words "sustainable" and "beef" in the same sentence by a large-scale meat producer or retailer seems inherently false and misleading.

271. F.T.C., *Petition Regarding Deceptive Marketing Practices Of Green Mountain Power in the Marketing of Renewable Energy to Vermont Consumers* (Sept. 16, 2014), http://blogs2.law.columbia.edu/climate-change-litigation/wp-content/uploads/sites/16/case-documents/2014/20140915_docket-na_petition.pd.

272. *See* Shields et al., *supra* note 154, at 6; *see also supra* notes 9–10, and accompanying text.

273. *Id.*

investigation into whether ExxonMobil misled shareholders and regulators about the company's own research on global warming. According to media reports, "[t]he investigation focuses on whether Exxon Mobil intentionally clouded public debate about science and hid from investors the risks that climate change could pose to its business, according to a person familiar with the matter."[274] The investigation drew a counter-suit by Exxon, which was filed in Texas, transferred to a far less sympathetic court in New York City, and then dismissed.[275] The action by the New York Attorney General has precipitated a much wider set of legal actions by Attorneys General in other states, similar to the joint tobacco proceedings in prior decades.[276] Similar actions could be developed with regard to false and misleading food sustainability and agricultural investor representations, both as administrative matters before the SEC, and within the context of shareholder litigation. These types of actions can help frame and publicize the larger effort to shift consumers and corporations away from high-methane emission food sources, and reduce the overall GHG footprint of the agricultural sector in the United States.

In short, there is a vast array of potential legal actions that can and should be further developed and deployed in support of a larger campaign to force reductions in methane emissions. But as with other tactical approaches—including consumer education and corporate campaigns—any effective legal action must be conceptualized as an integrated part of an overall strategy. The traditional

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274. Chris Mooney, *New York is Investigating Exxon Mobil for Allegedly Misleading the Public About Climate Change*, WASH. POST (Nov. 5, 2015), https://www.washingtonpost.com/news/energy-environment/wp/2015/11/05/exxonmobil-under-investigation-for-misleading-the-public-about-climate-change/?utm_term=.63084cb5b9d2; John Schwartz, *Exxon Mobil Fraud Inquiry Said to Focus More on Future than Past*, N.Y. TIMES (Aug. 19, 2016), https://www.nytimes.com/2016/08/20/science/exxon-mobil-fraud-inquiry-said-to-focus-more-on-future-than-past.html ("the investigation is scrutinizing a 2014 report by Exxon Mobil stating that global efforts to address climate change would not mean that it had to leave enormous amounts of oil reserves in the ground as so-called 'stranded assets.' But many scientists have suggested that if the world were to burn even just a portion of the oil in the ground that the industry declares on its books, the planet would heat up to such dangerous levels that 'there's no one left to burn the rest,' Mr. Schneiderman said." 'If, collectively, the fossil fuel companies are overstating their assets by trillions of dollars, that's a big deal,' Mr. Schneiderman said. And if the company's own internal research shows that Exxon Mobil knows better, he added, 'there may be massive securities fraud here.'").

275. Erik Larson, *Exxon Dealt a Blow as Texas Judge Sends Climate Suit to N.Y.*, BLOOMBERG NEWS (Mar. 29, 2017), https://www.bloomberg.com/news/articles/2017-03-29/exxon-dealt-a-blow-as-texas-judge-sends-climate-suit-to-new-york ("Exxon Mobil Corp.'s attempt to derail a multistate fraud probe into whether the company fully disclosed to investors the financial risks of climate change was dealt a major blow after a Texas judge moved the case from its home turf to a federal court in Manhattan."); John Schwartz, *Court Dismisses Exxon's Effort to Block Climate Investigation*, N.Y. TIMES (Mar. 30, 2018), https://www.nytimes.com/2018/03/29/climate/exxon-climate-change.html.

276. Kate Sheppard, *State Attorneys General Pledge to Crack Down on Climate Fraud*, HUFFINGTON POST (Mar. 29, 2016), https://www.huffingtonpost.com/entry/attorneys-exxon-probe_us_56fab959e4b0a372181b113d ("A coalition of state attorneys general announced Tuesday that they will be working together to investigate corporations who may have misled the public about climate change. Massachusetts Attorney General Maura Healey said her office would formally join previously announced investigations in New York and California into ExxonMobil.").

environmental litigation model has been to look for cases—like *Kivalina* or *Juliana*—which seek a grand, public showdown of climate right and wrong in the model of *Brown v. Board of Education*, but which often have the opposite effect of solidifying the *status quo*. By adopting a more integrated and holistic approach to the courts, consumers, and corporations, a new climate coalition might have more success. But in order to do so, major elements of the traditional environmental law model—including a heavy reliance on complex federal regulatory action and civil rights era test cases—will have to be left behind in favour of new strategic and tactical ideas.

CONCLUSION

Decades of traditional climate change advocacy has failed to stabilize, much less reduce, GHG emissions in the United States or worldwide. While some sources and sectors have reduced emissions, total atmospheric CO_2 concentrations have exceeded 400 parts-per-million, and (absent some transformational new carbon capture technology) will not dissipate for hundreds of years, even if drastic and unrealistic emission cuts happen immediately. Part I of this series described the intersectional threats presented by these emissions, their discriminatory impacts upon the economically disadvantaged, people of color, women, children, and animals; and the unique role animals play as both a cause of climate change emissions and some of its front-line victims. Part I also demonstrated the inability of legislative and regulatory institutions to provide meaningful solutions to the climate change problem, and argued for the immediate engagement of the animal protection community as a first step towards a more holistic and inclusive climate coalition effort.

The purpose of this second Article was to explore both a new climate policy strategy and potential operational tactics for not only environmental and animal advocates, but also a broad coalition of public interest groups who are facing a major crisis as the impacts of climate change continue to materialize. There is significant and promising work being done to develop long-term carbon reduction solutions, but the available science suggests these strategies, even if fully implemented, will take decades or more to effectuate meaningful reductions in CO_2 levels. Such efforts will not avert the impending climate disasters described in Part I of this series—including annual deaths from extreme heat in the United States exceeding those from gun violence, the mass relocation of millions of Americans of limited economic means to higher ground, and the irretrievable loss of billions of wild animals and many entire species. Accordingly, we must turn elsewhere for near-term mitigation options.

Methane emission control provides a good opportunity for expanding climate advocacy efforts to buy more time for developing strategies for long-term carbon reduction, and to mitigate some near-term impacts of climate change. In order to do this, advocates need to tackle head on the problem of animal and plant

agricultural emissions—which remain essentially unregulated and often ignored in climate policy discussions. There is no serious potential for addressing this problem via existing regulatory institutions. The limited methane regulations already in place are being rolled-back or eliminated entirely, and thus the need for climate advocates to develop new tools to address GHG emissions is greater than ever. Advocates need to adopt a more comprehensive view of the GHG emission problem, combined with new consumer, corporate, and legal strategies to move control efforts forward.

The legal and policy tactics deployed by the animal protection movement over the last decade—wherein major animal abuses have been controlled through consumer campaigns, consumer protection litigation, investor advocacy, and corporate pressure—provide a promising model for a new collaborative and cross-disciplinary effort to control climate change emissions in an era where the existence of regulatory control measures are in doubt. An aggressive consumer choice, corporate pressure, and market-based litigation campaign focused on unregulated sources of methane emissions should be developed and deployed as a more effective tool than the traditional and dysfunctional regulatory methods applied to the climate change problem over the last several decades.