

Oil and Gas, Natural Resources, and Energy Journal

Volume 5 | Number 4

April 2020

Budding Marijuana Industry Meets Climate & Environmental Crisis: A Call to Legislative Action

Spencer Gill

Follow this and additional works at: <https://digitalcommons.law.ou.edu/onej>



Part of the [Energy and Utilities Law Commons](#), [Natural Resources Law Commons](#), and the [Oil, Gas, and Mineral Law Commons](#)

Recommended Citation

Spencer Gill, *Budding Marijuana Industry Meets Climate & Environmental Crisis: A Call to Legislative Action*, 5 OIL & GAS, NAT. RESOURCES & ENERGY J. 661 (2020), <https://digitalcommons.law.ou.edu/onej/vol5/iss4/4>

This Article is brought to you for free and open access by University of Oklahoma College of Law Digital Commons. It has been accepted for inclusion in Oil and Gas, Natural Resources, and Energy Journal by an authorized editor of University of Oklahoma College of Law Digital Commons. For more information, please contact darinfox@ou.edu.

ONE J

Oil and Gas, Natural Resources, and Energy Journal

VOLUME 5

NUMBER 4

BUDDING MARIJUANA INDUSTRY MEETS CLIMATE & ENVIRONMENTAL CRISIS: A CALL TO LEGISLATIVE ACTION

SPENCER GILL

I. Introduction

What was an entirely illegal industry in the United States just a few decades ago has morphed into one of the largest political and social issues of this generation. Although marijuana, also referred to as cannabis, is typically discussed within the criminal or medicinal context, there is an important national conversation yet to be had concerning marijuana cultivation's current contributions to climate change and environmental degradation. To add some substance to this debate, this comment will explore the rapidly growing marijuana industry in the United States and discuss its effects on the ongoing climate and environmental issues. Specifically, this comment will analyze the various opportunities available to legislatures to benefit the swiftly expanding marijuana industry while simultaneously mitigating the negative effects of marijuana cultivation in the United States.

This comment is not intended to cast blame on the marijuana industry as the exclusive or even a primary contributor to the ongoing climate crisis or to environmental destruction and pollution. Nor is its purpose to unfairly single out the marijuana industry as particularly inefficient or excessively damaging to the earth. Rather, this comment's purpose is to acknowledge the arbitrariness of marijuana laws governing the U.S. over the last eighty years; to emphasize the severity of the escalating climate and environment crises; to convey the unique position of the marijuana industry as an energy

intensive, rapidly evolving sector that is ripe for legislative involvement because of its ability to single-handedly impact Earth's wellbeing; to educate marijuana growers and policymakers about cultivation best practices; to offer solutions to legislatures to encourage the growth of the marijuana industry while ensuring that the climate and environment are protected in the process; and above all, to advocate for the federal legalization of marijuana so that a meaningful solution is made possible.

Not only does the rising popularity of marijuana rank it among the fastest growing industries in the United States, marijuana is also one of the most energy-intensive crops to grow.¹ For example, marijuana cultivation comprises over 1% of total U.S. electricity use, and over 3% of California's overall electricity consumption.² Marijuana's massive energy demand combined with the rapid proliferation of marijuana cultivation in the U.S. and the widespread usage of nonrenewable energy sources in marijuana growing operations is certain to result in significant greenhouse gas emissions with damaging climactic and environmental implications if left unregulated.³ Whether cultivated indoors, in greenhouses, or in outdoor gardens, if marijuana continues to be produced in an environmentally unconscious manner, marijuana growers will increasingly jeopardize the planet's wellbeing.

Indoor marijuana growing operations pose a considerable risk to the wellbeing of Earth's climate because this method of growing commonly utilizes nonrenewable energy sources and inefficient equipment and techniques to transform empty rooms into environments conducive to marijuana cultivation.⁴ Growing marijuana indoors can require enormous amounts of artificial lighting, fans, HVAC, and water.⁵ On the other hand, manipulating the land to create a marijuana-conducive environment suitable for outdoor cultivation can result in extensive environmental degradation in the form of deforestation and destruction of wildlife habitats, introduction

1. See *Energy for Growing and Harvesting Crops is a Large Component of Farm Operating Costs*, U.S. ENERGY INFO. ADMIN. (Oct. 17, 2014), <https://www.eia.gov/todayinenergy/detail.php?id=18431>; see also Johnathan Caulkins, *Estimated Cost of Production of Legalized Cannabis*, RAND DRUG POL'Y RES. CTR. (July 2010), https://www.rand.org/content/dam/rand/pubs/working_papers/2010/RAND_WR764.pdf.

2. See Jocelyn Durkay & Duranya Freeman, *Electricity Use in Marijuana Production*, 24 LEGISBRIEF (Aug. 2016), <https://www.ncsl.org/research/energy/electricity-use-in-marijuana-production.aspx>.

3. See Evan Mills, *The Carbon Footprint for Indoor Cannabis Production*, 46 ENERGY POL'Y 58, 59 (July 2012), <https://eta.lbl.gov/publications/carbon-footprint-indoor-cannabis>.

4. Durkay & Freeman, *supra* note 2.

5. *Id.*

of pesticides and insecticides harmful to both plants and animals as well as marijuana consumers, and diversion and contamination of water sources.⁶

Where marijuana remains illegal, government officials lack the power to create and enforce effective measures to combat the increasing climate and environmental problems caused by its cultivation. Conversely, as a result of marijuana becoming increasingly legal and thus increasingly regulated, government policymakers have unique opportunities to better understand the marijuana industry, work with cultivators to create effective incentives and disincentives intended to encourage best practices, and monitor the ongoing effects of the policies and adjust them accordingly. When legislatures act proactively to introduce climate and environmentally beneficial legislation into budding industries like the marijuana industry, the result is often an easier and more effective implementation than when attempting to improve the practices of pre-existing industries with age-old traditions and customs.

The unique combination of the marijuana industry's relative infancy, marijuana's rapidly increasing popularity, and marijuana cultivation's substantial energy demand has created a situation that beckons for immediate legislative action in a time of increasing environmental and climate concern. Fortunately, there are many options available for policymakers to devise plans to mitigate the negative impacts of marijuana cultivation while simultaneously contributing to the growth and success of the industry. A few such alternatives are to (1) accumulate research regarding environmentally-friendly marijuana cultivation best practices and offer this free and easily-accessible information to growers, (2) offer financial incentives to cultivators in the form of subsidies and rebates, (3) disincentivize growers who use nonrenewable energy sources and inefficient cultivation equipment through penalties and taxation, (4) implement licensing frameworks and marijuana tracking systems to monitor all stages of marijuana production, and (5) any other method that supports the wellbeing of the climate and environment but does not unduly restrain the marijuana industry.

Although a multitude of ways exist that policymakers can reduce the negative impacts of marijuana cultivation on Earth's climate and environment and thereby take a necessary step toward global stability, these ideas remain ineffective without the federal legalization of marijuana. The damage caused by many marijuana growers will continue without any

6. Jodi Helmer, *The Environmental Downside of Cannabis Cultivation*, JSTOR DAILY (June 18, 2019), <https://daily.jstor.org/the-environmental-downside-of-cannabis-cultivation/>.

means for government agencies to enforce environmental best practices, for banks to work with marijuana growers to finance energy efficient cultivation equipment, or for utility companies to incorporate growers into their energy conservation efforts. Consequently, many marijuana cultivators will continue to operate as cost-efficiently as possible by using environmentally unfriendly equipment, energy sources, and cultivation practices with very little incentive or without the knowledge needed to change. Additionally, many growers are being forced to operate under the radar of law enforcement and have avoided connecting to the electrical grid out of fear of law enforcement detection.⁷ Thus, it is essential that marijuana is made federally legal so that policymakers and utilities have the ability to contribute to a long-lasting and mutually beneficial solution to the ongoing problems associated with marijuana cultivation.

II. General Overview

A. Growing Marijuana Industry

The modern understanding of marijuana in the United States was largely introduced as a result of Mexican immigration during the Mexican Revolution beginning in 1910.⁸ Prior to this period, Americans living in the United States had been using marijuana as a medical treatment and growing hemp for commercial applications.⁹ Hemp is a fellow strain of the cannabis plant with trace amounts of tetrahydrocannabinol (“THC”), the primary psychoactive compound in marijuana, and is used in a variety of industries including rope, textile, clothing, and food.¹⁰ The concept of growing and smoking marijuana for its psychoactive effects, however, was relatively unknown to U.S. citizens prior to Mexican immigration during the early twentieth century.¹¹

Unfortunately for marijuana advocates, due to American prejudices and fears of Mexican immigrants, large populations of American people began associating their disdain for the immigrants with the immigrants’ preferred

7. See Mills, *supra* note 3.

8. ERIC SCHLOSSER, REEFER MADNESS: SEX, DRUGS, AND CHEAP LABOR IN THE AMERICAN BLACK MARKET 19–22 (2004).

9. Becky Little, *Why the US Made Marijuana Illegal*, HISTORY (Aug. 31, 2018), <https://www.history.com/news/why-the-u-s-made-marijuana-illegal>.

10. *Hemp*, ENCYCLOPEDIA BRITANNICA, <https://www.britannica.com/plant/hemp> (last visited Jan. 25, 2020).

11. See Little, *supra* note 9.

means of intoxication: marijuana.¹² For example, during this period of Mexican immigration, some Texas police officers claimed that the consumption of marijuana “incited violent crimes, aroused a lust for blood, and gave its users superhuman strength.”¹³ There were also rumors among American citizens that Mexican immigrants were distributing this “killer weed” to the nation’s youth.¹⁴ Even a federal district court judge at the time held the belief that “marijuana destroys life.”¹⁵ It did not take long before a multitude of state legislatures began outlawing cannabis in all forms.¹⁶ By 1931, twenty-nine states had banned the cultivation, distribution, trafficking, usage, and possession of marijuana.¹⁷ Six years later, marijuana was effectively banned nationwide with the passage of the Marihuana Tax Act of 1937 (“Marijuana Tax Act”).¹⁸ While hemp and marijuana were still technically legal following the passage of the Marijuana Tax Act, an enormous tax was imposed on physicians prescribing marijuana, retail pharmacists selling marijuana, the manufacturing of hemp, and the cultivation and possession of marijuana.¹⁹ Additionally, substantial administrative compliance requirements were imposed with harsh penalties such as thousands of dollars in fines and years in prison if not precisely followed, which resulted in the practical prohibition of marijuana in the United States.²⁰

State and federal marijuana laws in the United States only continued to increase in severity until the 1960s.²¹ While commonly held attitudes toward marijuana began shifting and state support of relaxed marijuana laws began growing throughout the second half of the twentieth century, the federal government stood firmly in its anti-marijuana position. Although the Supreme Court in 1969 invalidated the Marijuana Tax Act by holding that it was a violation of individuals’ Fifth Amendment protection against self-

12. *Id.* (citation omitted).

13. *Id.* (citation omitted).

14. *Id.*

15. Brian Trembath, *Denver’s Other Marijuana First*, DENVER PUB. LIBR. (Sept. 30, 2014), <https://history.denverlibrary.org/news/denvers-other-marijuana-first>.

16. *See Little, supra note 9.*

17. *Id.*

18. *Did You Know... Marijuana Was Once a Legal Cross-Border Import?*, U.S. CUSTOMS AND BD. PROT. (Dec. 20, 2019), <https://www.cbp.gov/about/history/did-you-know/marijuana>.

19. *Id.*

20. *Id.*

21. *See Little, supra note 9.*

incrimination,²² in its place came the modern framework for marijuana legalization which was established by the Controlled Substances Act of 1970.²³ According to the United States Controlled Substances Act: the manufacture, importation, distribution, possession, and use of specified classes of drugs is illegal.²⁴ This act categorizes drugs into classes, called schedules, which rank substances according to their potential for abuse and addiction and whether there exists any accepted medical use for the drug.²⁵ Per the Schedule of Controlled Substances, marijuana is a Schedule I controlled substance, ranking it in the most severe category of drugs with no currently accepted medical use and a high potential for abuse, and in same category of severity as heroin and peyote and in a more severe classification than cocaine, methamphetamine, and oxycodone.²⁶ Although many credible studies lend credence to the theory that marijuana offers medicinal benefits,²⁷ marijuana has remained at the top of the of the Controlled Substances Act's most dangerous drugs since the act's inception half a century ago.

Public opinion began to transform in the late 1960s and early 1970s when a revival swept the nation giving rise to a change in the political and cultural attitude towards marijuana.²⁸ Young people across the nation, notably those within the white upper middle class, beginning smoking marijuana in droves.²⁹ Although the federal government remained vocal about its opposition to marijuana and persistent in its use of anti-marijuana rhetoric, the states, both through citizen-initiated votes and legislative action, began fighting back.³⁰ During the mid-1970s, practically all states softened the penalties for violating marijuana laws.³¹ Oregon

22. *Leary v. United States*, 395 U.S. 6, 52–53 (1969).

23. *Drug Scheduling*, U.S. DRUG ENF'T ADMIN., <https://www.dea.gov/drug-scheduling> (last visited Jan. 25, 2020).

24. *Id.*

25. *Id.*

26. *Id.*

27. Peter Grinspoon, *Medical Marijuana*, HARVARD HEALTH PUBL'G (Jan. 15, 2018), <https://www.health.harvard.edu/blog/medical-marijuana-2018011513085>.

28. *Marijuana Timeline*, PUB. BROAD. SERV., <https://www.pbs.org/wgbh/pages/frontline/shows/dope/etc/cron.html> (last visited Jan. 25, 2020).

29. *Id.*

30. Brent Staples, *The Federal Marijuana Ban is Rooted in Myth and Xenophobia*, THE N.Y. TIMES (July 29, 2014), <https://www.nytimes.com/2014/07/30/opinion/high-time-federal-marijuana-ban-is-rooted-in-myth.html>.

31. *Id.*

became the first state in 1973 to decriminalize marijuana.³² Although marijuana was not made legal, the Oregon Decriminalization Bill of 1973 abolished criminal penalties and jail time for possession of small amounts of marijuana in lieu of civil fines.³³ Two years later, states such as Alaska and Colorado followed in Oregon's path of marijuana decriminalization.³⁴

Due to this rise in recreational drug use, however, President Richard Nixon began focusing on targeting substance abuse.³⁵ In 1971, following the passage of the Controlled Substances Act, President Nixon declared a "War on Drugs" by asserting that drug abuse was "public enemy number one."³⁶ In furtherance of this "war," President Nixon established the Drug Enforcement Agency, dramatically increased federal funding for anti-drug agencies, and advocated for mandatory prison sentencing and steep fines for drug crimes.³⁷ Although the "war on drugs" gradually waned in importance over the years following its inception, President Ronald Reagan reinvigorated President Nixon's campaign which resulted in a significant increase in incarcerations for marijuana users and possessors.³⁸ The Reagan administration launched the "Just Say No" campaign and passed the Anti-Drug Abuse Act which further increased the criminal penalties for nonviolent drug offenses.³⁹ While the U.S. government contends that its harsh anti-drug campaign has meritorious intentions, many believe otherwise. For example, John Ehrlichman, President Nixon's domestic policy chief, claims that the true purpose of the "War on Drugs" was to target African Americans and pacifists.⁴⁰ Ehrlichman admitted about the Nixon administration that:

We knew we couldn't make it illegal to be either against the war or black, but by getting the public to associate the hippies with marijuana and blacks with heroin, and then criminalizing both

32. *Marijuana*, ASS'N OF OREGON CTYS., <http://oregoncounties.org/news/publications/marijuana/> (last visited Jan. 25, 2020).

33. *Id.*

34. Emilee Scott, *Marijuana Decriminalization*, CONN. GEN. ASSEMB. (May 5, 2010), <https://www.cga.ct.gov/2010/rpt/2010-R-0204.htm>.

35. *War on Drugs*, HISTORY (May 31, 2017), <https://www.history.com/topics/crime/the-war-on-drugs>.

36. *Id.*

37. *Id.*

38. *Id.*

39. *Id.*

40. *Id.*

heavily, we could disrupt those communities. We could arrest their leaders, raid their homes, break up their meetings, and vilify them night after night on the evening news. Did we know we were lying about the drugs? Of course, we did.⁴¹

While the federal government continues fighting its “war on drugs,” states have simultaneously continued to make progress toward marijuana legalization. In 1996 marijuana legalization took arguably one of its biggest strides to-date when California voters passed Proposition 215 that allowed for the medicinal use of marijuana for patients with particular ailments.⁴² Two years later, Oregon, Alaska, and Washington all legalized marijuana in some form through ballot measures.⁴³ Currently, a total of thirty-three states have medical marijuana programs and eleven states and Washington D.C. have legalized marijuana entirely, with nearly all states allowing for some degree of medical exception for or decriminalization of marijuana.⁴⁴

Although marijuana has remained illegal at the federal level for over eighty years, due to the rapidly expanding marijuana industry at the state level, some are speculating that marijuana will be federally legal within the next few years.⁴⁵ There has been a steady increase in support for marijuana legalization over the past few decades, with nearly two-thirds of Americans currently supporting its legalization.⁴⁶ Additionally, many 2020 presidential hopefuls are outwardly pro-marijuana legalization.⁴⁷ For example, senator and presidential candidate Bernie Sanders has advocated for the U.S. government to fully legalize marijuana, expunge the records of non-violent marijuana related offenders, and provide resources “for people to start

41. *Id.*

42. *Marijuana Timeline*, *supra* note 28.

43. *State Medical Marijuana Laws*, NAT’L CONF. OF ST. LEGIS. (Oct. 10, 2019), <https://www.ncsl.org/research/health/state-medical-marijuana-laws.aspx>.

44. *Id.*

45. Mona Zhang, *Marijuana Legalization May Hit 40 States. Now What?*, POLITICO (Jan. 20, 2020), <https://www.politico.com/news/2020/01/20/marijuana-legalization-federal-laws-100688>.

46. Andrew Daniller, *Two-thirds of Americans Support Marijuana Legalization*, PEW RES. CTR. (Nov. 14, 2019), <https://www.pewresearch.org/fact-tank/2018/10/08/americans-support-marijuana-legalization/>.

47. Paul Dimko, *Legalizing Marijuana*, POLITICO (Jan. 13, 2020), <https://www.politico.com/2020-election/candidates-views-on-the-issues/marijuana-cannabis-legalization/legalizing-marijuana/>.

cooperatives and collective nonprofits as marijuana businesses that will create jobs and economic growth in local communities.”⁴⁸

As of 2018, the legal marijuana industry in the United States was estimated to exceed \$11 billion.⁴⁹ Also that year, Congress passed the 2018 Farm Bill that legalized low-THC (0.3% THC or less) hemp nationwide and effectively de-scheduled hemp-derived cannabidiol (“CBD”) from the Controlled Substances Act.⁵⁰ While substantial progress has been made over the last fifty years at the state level regarding marijuana legalization, the federal government continues to engage in an anti-marijuana campaign with origins in “racism and xenophobia and whose principal effect has been to ruin the lives of generations of people.”⁵¹ With different strains of the cannabis plant becoming federally legal, and a substantial majority of the American population and states in support of marijuana legalization, the legalization of marijuana for all of the United States in some manner or another seems practically inevitable, and possibly more important than ever.

B. Escalating Climate and Environmental Problems

Among the most pressing issues for the United States, and the world in general, are global warming and environmental degradation. The primary cause of global warming is the widespread burning of nonrenewable energy sources, such as coal, oil, and natural gas that emit harmful greenhouse gases, such as carbon dioxide, mercury, nitrogen oxide, sulfur dioxide, methane, and water vapor into the atmosphere when burned to produce energy.⁵² Once emitted into the atmosphere these gases accumulate into a thick layer that traps the sun’s ultraviolet rays in the earth’s atmosphere and causes a gradual increase in global temperatures.⁵³ Some of the issues associated with the ongoing global warming crisis concern whether and to what degree we should regulate the use of nonrenewable energy sources, how we are going to repair the already apparent effects of climate change,

48. *Legalizing Marijuana*, BERNIE 2020, <https://berniesanders.com/issues/legalizing-marijuana/> (last visited Jan. 25, 2020).

49. *U.S. Cannabis Market Size, Share & Trends Analysis Report*, GRAND VIEW RES. (July 2019), <https://www.grandviewresearch.com/industry-analysis/us-cannabis-market>.

50. H.R. 5485, 115th Cong. (2018).

51. Staples, *supra* note 30.

52. *The Causes of Climate Change*, NAT’L AERONAUTICS & SPACE ADMIN., <https://climate.nasa.gov/causes/> (last visited Jan. 25, 2020).

53. *Id.*

and how we should manage the negative impacts caused by the ongoing and future use of nonrenewable energy sources, among many others.

Greenhouse gases are not harmful at moderate levels, but after continuous accumulation over a long period of time, they can prove catastrophic.⁵⁴ As manufacturing, production, and the population increases, so too will the widespread use of polluting nonrenewable energy sources to satisfy the increasing energy demand. The nonrenewable energy sources contributing to the significant increase in greenhouse gases are most commonly used to generate electricity for human activities such as driving vehicles and powering businesses and homes.⁵⁵ In the U.S., the electricity generation sector is the largest contributor of these harmful greenhouse gas emissions into the atmosphere at 28%, followed by the industry sector at 22%, and then the agriculture sector at 9% of total CO₂ emissions.⁵⁶ In addition to substantially contributing to global warming, other commonly cited effects of greenhouse gasses include mercury poisoning, smog, acid rain, and respiratory disease.⁵⁷

While nonrenewable energy sources have contributed exponentially to the escalating global warming and climate change crisis; renewable energy sources such as solar, wind, hydro, geothermal, and biomass energy offer a solution to satisfy the increasing energy demand in an environmentally sustainable way.⁵⁸ Contrary to greenhouse gas-producing nonrenewable energy sources, renewable energy sources offer environmentally friendly energy that does not emit harmful greenhouse gases into the atmosphere.⁵⁹ Renewable energy production also does not damage natural resources to the extent that nonrenewable fossil-fuel extraction does.⁶⁰ Additionally, renewable energy sources naturally replenish themselves and are theoretically unlimited, which helps preserve the stability of the climate and

54. *Id.*

55. *Climate Change*, SOLAR ENERGY INDUS. ASS'N, <https://www.seia.org/initiatives/climate-change> (last visited Jan. 25, 2020).

56. *Id.*

57. *See Benefits of Clean Energy*, GREEN MOUNTAIN ENERGY, <https://www.greenmountainenergy.com/why-renewable-energy/benefits-of-clean-electricity/> (last visited Jan. 25, 2020).

58. *See Renewable Energy Explained*, U.S. ENERGY INFO. ADMIN., <https://www.eia.gov/energyexplained/renewable-sources/> (last visited Jan. 25, 2020).

59. Christina Nunez, *Renewable Energy, Explained*, NAT'L GEOGRAPHIC (Jan. 30, 2019), <https://www.nationalgeographic.com/environment/energy/reference/renewable-energy/>.

60. *Non-renewable Energy*, NAT'L GEOGRAPHIC <https://www.nationalgeographic.org/encyclopedia/non-renewable-energy/> (last visited Jan. 25, 2020).

health of the environment for future generations.⁶¹ The amount of U.S. energy consumption currently generated from renewable energy sources is only about 11% of total U.S. energy consumption and about 17% of electricity generation.⁶² While renewable energy sources do suffer from some downsides such as the current inability to generate power on the same large scale as nonrenewable energy sources and intermittent availability with respect to solar and wind energy, they also present opportunities to dramatically reduce the greenhouse gas emission rate and mitigate the negative consequences associated with producing nonrenewable resources.

Due to the relative infancy of the renewable energy industry, the global demand for energy is currently outpacing the available supply of renewable energy, causing a continual reliance on nonrenewable energy sources.⁶³ Until society is able to either limit its overall energy demand to a lower level than what can be produced with renewable energy sources, or increase its supply of available renewable energy to the level required to satisfy the current demand, we will continue to jeopardize the planet's future.

Greater than the mere uncomfortable situation posed by increased temperatures and environment degradation, many scientists acknowledge the possibility that rapidly growing global temperatures may be approaching a point of no return.⁶⁴ As is largely considered to have contributed to the scorching Venus atmosphere we observe today, some scientists believe that there is a real possibility of a similar runaway greenhouse gas phenomenon on Earth.⁶⁵ A runaway greenhouse effect occurs when there is enough greenhouse gas in a planet's atmosphere to block thermal radiation from escaping, thereby preventing the planet from cooling and not allowing liquid water to form on its surface.⁶⁶ According to climate scientist Dr. James Hansen, "if we burn all reserves of oil, gas, and coal, there's a substantial chance that we will initiate the runaway greenhouse. If we also burn the tar sands and tar shale, I believe

61. *Renewable Energy Explained*, *supra* note 58.

62. *How Much of U.S. Energy Consumption and Electricity Generation Comes from Renewable Energy Sources?*, U.S. ENERGY INFO. ADMIN. (June 4, 2019), <https://www.eia.gov/tools/faqs/faq.php?id=92&t=4>.

63. *Global Energy Demand Rose by 2.3% in 2018, its Fastest Pace in the Last Decade*, INT'L ENERGY AGENCY (Mar. 26, 2019), <https://www.iea.org/news/global-energy-demand-rose-by-23-in-2018-its-fastest-pace-in-the-last-decade>.

64. Kendall Powell & John Bluck, *Tropical 'Runaway Greenhouse' Provides Insight to Venus*, NAT'L AERONAUTICS & SPACE ADMIN. (May 15, 2002), https://www.nasa.gov/centers/ames/news/releases/2002/02_60AR.html.

65. *Id.*

66. *Id.*

the Venus syndrome is a dead certainty.”⁶⁷ While this phenomenon is not widely considered to be an urgent threat by most, the exponential increase of nonrenewable energy production and use means that the possibility of irreparable climate and environmental harm persists and will only continue to pose an increasing threat.

Even if Earth’s climate does not experience a runaway greenhouse gas effect like the one currently plaguing Venus, environmental catastrophe still looms large if the widespread use of nonrenewable energy and subsequent pollution of the atmosphere persists. According to the National Academy of Sciences, unless substantial carbon emission reductions occur, there is a risk of Earth entering an irreversible state known as “Hothouse Earth.”⁶⁸ At the current estimated rate, a Hothouse Earth climate will result in a higher average global temperature which would increase the risk of damage caused by more extreme weather, severe wildfires, insect attacks, widespread river flooding, deadly heat waves, increased droughts, and deforestation and harming of wildlife habitats.⁶⁹ When this scenario occurs, the amount of forced inland migration will be massive for the United States and the number of lost environmental ecosystems and manmade infrastructure will likely be enormous.⁷⁰ Roughly 40% of the U.S. population lives near the coast,⁷¹ and as many as 13.1 million Americans are projected to be in the direct path of flooding by 2100.⁷² Additionally, popular U.S. cities such as Miami Beach and Key West, FL; Atlantic City, NJ; Galveston, TX; and Long Beach, NY are in the direct path of flooding beginning as early as the next few decades.⁷³

As the global temperature continues to increase credited to the widespread use of nonrenewable energy, the negative effects will actually compound themselves. For instance, as wildfires burn because of intense

67. JAMES HANSEN, STORMS OF MY GRANDCHILDREN 152 (2009).

68. Will Steffen et al., *Trajectories of the Earth System in the Anthropocene*, PROC. OF THE NAT’L ACAD. OF SCI. OF THE U.S.A. (Aug. 6, 2018), <https://www.pnas.org/content/115/33/8252>.

69. See *id.*

70. Michon Scott & Rebecca Lindsey, *2017 State of the Climate: Sea Level*, NAT’L OCEANIC & ATMOSPHERIC ADMIN. (Aug. 1, 2018), <https://www.climate.gov/news-features/featured-images/2017-state-climate-sea-level>.

71. *Id.*

72. Marianne Lavelle, *Americans in Danger From Rising Seas Could Triple*, NAT’L GEOGRAPHIC (Mar. 14, 2016), <https://www.nationalgeographic.com/news/2016/03/160314-rising-seas-US-climate-flooding-florida/>.

73. See *Underwater*, UNION OF CONCERNED SCIENTISTS, <https://www.ucsusa.org/sites/default/files/attach/2018/06/underwater-analysis-full-report.pdf> (last visited Jan. 25, 2020).

weather patterns and long term droughts, the burning trees release massive amounts of carbon into the atmosphere.⁷⁴ Additionally, as global temperatures continue to rise, permafrost and ice sheets will begin to melt and release built-up methane.⁷⁵ This carbon and methane will be released into the environment and accumulate with other greenhouse gases, thus furthering the current global warming crisis.⁷⁶ As the change in temperature becomes larger, the negative consequences exponentially increase in magnitude and severity, resulting in a seemingly unstoppable domino effect.⁷⁷ Before long, places on Earth will become uninhabitable and the planet will continue to warm with no sign of reversal.⁷⁸

Assuming the ultimate goal of the United States, and the world in general, is to use 100% clean energy and maintain a planet free of pollution and large scale environmental destruction, society has much work to do to transition away from its current dependence on nonrenewable energy and its largely apathetic attitude towards the health of the planet. This goal can likely only be achieved by a coordinated and deliberate effort among citizens and government to work together to implement a solution. Although easier said than done, the world must begin to decarbonize the global economy, end purposeful deforestation and mitigate the chance for accidental deforestation, improve farming and recycling techniques, invest in renewable energy and carbon-capture research and technologies, among many other substantial changes. These adjustments will not happen overnight, but it is imperative that the government begins acting in response to the increasing rates of environmental destruction and escalating threat of irreversible global warming, and that people begin taking accountability for their contributions to the escalating environmental problems.

III. Issues

A. Where the Green Rush Meets Struggling Energy and Natural Resource Sectors

As the areas of global warming and environmental destruction continue to worsen, the pressure to increase environmental responsibility at all stages of the supply chain will be felt across a vast array of industries. This is

74. See *Overview of Greenhouse Gases*, U.S. ENV'T'L. PROT. AGENCY, <https://www.epa.gov/ghgemissions/overview-greenhouse-gases> (last visited Jan. 25, 2020).

75. Steffen et al., *supra* note 68.

76. *Id.*

77. *Id.*

78. See *Underwater*, *supra* note 73.

particularly true for the marijuana industry given its comparatively massive carbon footprint and its rapidly increasing demand. As the U.S. demand for marijuana continues to rise, increased strain will be placed on growers to create the corresponding supply. In doing so, many growers will engage in cultivation practices that are harming the planet by contributing substantially to the current climate crisis and ongoing environmental problems. While indoor cultivation corresponds with climate concerns and the overuse of nonrenewable energy, outdoor cultivation largely solves the problems associated with indoor cultivation; however, outdoor cultivation causes the increased likelihood of damage to natural resources.⁷⁹ Because all marijuana cultivation results in some type of negative impact on society, it is vital that legislatures act proactively to remediate the problems associated with marijuana cultivation in the United States.

1. Energy and Climate

Energy consumption associated with state-legalized marijuana in the aggregate has not gone unnoticed. For example, indoor marijuana grow operations can require a similar energy intensity to data centers, which themselves require anywhere from “50 to 200 times” the energy consumption of a typical office building.⁸⁰ A large reason for marijuana’s substantial influence on overall energy demands is due to indoor grow operation’s energy costs comprising “between 20-50%” of the overall total cultivation costs.⁸¹ Compared to the average medium to large-size brewery whose operation’s energy costs account for a mere “6-12% of total operating costs,” this difference is massive.⁸² Growing high-quality marijuana and maximizing the amount of production per square foot of grow space are two of the main priorities of commercial marijuana cultivators.⁸³ These goals create a demand by indoor marijuana growers for a substantial amount of energy with often little concern for the

79. See Helmer, *supra* note 6.

80. Kelly Crandall, *A Chronic Problem: Taming Energy Costs and Impacts of Marijuana Cultivation*, EQ RESEARCH, LLC (Sept. 2016), <http://eq-research.com/wp-content/uploads/2016/09/A-Chronic-Problem.pdf>.

81. Neil Kolwey, *A Budding Opportunity: Energy Efficiency Best Practices for Cannabis Grow Operations*, SOUTHWEST ENERGY EFFICIENCY PROJECT (Dec. 2017), <https://www.swenergy.org/data/sites/1/media/documents/publications/documents/A%20Budding%20Opportunity%20%20Energy%20efficiency%20best%20practices%20for%20cannabis%20grow%20operations.pdf>.

82. *Id.* (citation omitted).

83. See JORGE CERVANTES, MARIJUANA HORTICULTURE: THE INDOOR/OUTDOOR MEDICAL GROWER’S BIBLE 76–78 (2006).

environmental friendliness of their cultivation practices. At the end of the day, what matters most to marijuana cultivators is profit, and any steps that can be taken to increase profits and decrease costs are likely to be taken.

Credited to marijuana's comparatively high energy demand, the energy sources and cultivation equipment chosen are among the most important areas for improving the energy efficiency of a grower's indoor grow operation. Although most states have legalized marijuana in some form and thus already have an established industry of cultivators, there are still huge untapped markets that could be influenced to substantially mitigate the negative impact on the environment and atmosphere in the long term by implementing environmentally friendly practices and purchasing energy efficient equipment at the outset. While the market for marijuana is largely saturated in many areas of California, Colorado, and Oregon, states with developing recreational and medicinal marijuana markets such as Illinois and Oklahoma, respectively, as well as states without existing medicinal or recreational frameworks such as Texas and North Carolina, represent incredible opportunities for legislatures to implement proactive policies on behalf of the climate and environment.

It is generally best to take advantage of energy efficient opportunities during the "new construction" phase of a grow operation, i.e., the time of "designing, acquiring, and installing the equipment" for the new operation.⁸⁴ Upon marijuana legalization, entrepreneurs routinely rush into the market to satisfy the new demand, and rather than taking the time to plan a grow operation in accordance with energy efficiency standards and environmental best practices, "most new operations start out by leasing empty warehouse space and setting up equipment using a quick and dirty approach."⁸⁵ These industry pioneers often rely on less efficient, but trusted, cultivation methods and technologies with lower initial set-up costs.⁸⁶ Consequently, these new growers frequently miss out on many energy efficiency opportunities that could benefit their bottom lines and society's wellbeing.⁸⁷

When analyzing the energy consumption of a marijuana growing operation, the main areas of emphasis are lighting, heating and cooling equipment, ventilation, and the infrastructure of the operation (indoors, greenhouse, outdoors, etc.).⁸⁸ The average grow operation consists of some

84. . Kolwey, *supra* note 81.

85. *Id.*

86. *Id.*

87. *Id.*

88. Cervantes, *supra* note 83, at 98–103.

variation of the following equipment: high-powered lights on timers to replicate the seasons of the marijuana growth cycle, carbon dioxide regulation equipment, oscillating fans, humidifiers and dehumidifiers for the different stages of the marijuana growth cycle, air conditioners and heaters for particular temperatures, regulatory equipment for specific water temperatures and precise pH levels, etc.⁸⁹ Even small scale marijuana cultivation requires significant lighting, fans, HVAC systems, humidifiers and dehumidifiers, and other equipment to grow marijuana.⁹⁰ The equipment's cost is often the most important factor for marijuana cultivators when deciding what equipment to purchase for their grow operation, with the equipment's environmental friendliness often taking a backseat. While the average marijuana cultivation operation is not operating at or near peak efficiency, there are many alterations growers can make to their facilities and processes to decrease their carbon footprints and reduce the negative effects on Earth's natural resources.⁹¹

Regarding infrastructure, there are many important decisions to make when designing and operating a marijuana cultivation operation. One such decision is choosing where to grow the marijuana, be it indoors, a greenhouse, or in an outside garden.⁹² This decision is important because the facility in which the marijuana will be cultivated will dramatically impact the amount of energy required, the type of equipment used in the process, and the quality and type of the marijuana produced.⁹³ There are many considerations involved with selecting the marijuana grow facility such as the suitability of the particular climate to support year-round outdoor or greenhouse cultivation and the existence of strict local regulations that require cultivators to grow indoors. Additionally, it is also important to consider that the quantity of marijuana produced outdoors or in greenhouses is traditionally much less than marijuana grown indoors, and the fact that some consumers claim that marijuana grown indoors is simply better.⁹⁴ While using renewable energy such as solar energy to power an indoor marijuana cultivation operation is preferable to utilizing nonrenewable energy sources, using the sun's energy directly by growing outdoors or in greenhouses is an even more environmentally sustainable practice. Not only is foregoing electricity to use the sun's energy better for

89. *Id.*

90. *See id.*

91. . Kolwey, *supra* note 81.

92. See Cervantes, *supra* note 83, at 98, 116.

93. *Id.* at 98–145.

94. *Id.*

the earth, but it is also free and maximizes the potential of marijuana plants by exposing them to a wider array of colors in the red and blue range of the light spectrum, the parts of the spectrum most conducive for maximum chlorophyll and photosynthetic response which promotes marijuana growth.⁹⁵

Although using greenhouses or growing outdoors can both help save growers money and make for a more energy efficient operation, much of the marijuana in the United States is currently grown indoors.⁹⁶ The popularity of indoor marijuana cultivation stems largely from its illegality and the resulting need of cultivators to grow marijuana discretely, indoor operations being a safer and more concealed option than outdoor gardens or greenhouses.⁹⁷ Indoor grow operations are substantially more expensive and energy intensive because they require the perpetual maintenance of an artificial ecosystem to ensure that the marijuana plants are growing in the optimal environment. Comparatively, greenhouse grow operations typically require between 60-75% less energy to cultivate the same amount of marijuana.⁹⁸ The main reason for this staggering difference is indoor cultivation's dependence on artificial, high-powered lighting. Although this type of artificial lighting demands a substantial amount of energy, indoor grows do allow for greater yields compared to outdoor grows because the high-powered lighting expedites the marijuana growth time and thereby increases the number of annual harvests.⁹⁹ Because indoor growing offers better control over the quality of the marijuana and allows for quicker growing cycles, growing indoors is the preferred means for most commercial marijuana cultivators.¹⁰⁰ While indoor growers can generally produce more marijuana per square foot with greater quality than their outdoor grower counterpart, all things being equal, it is not clear that this higher production justifies the negative effects on the climate and environment associated with growing indoors.

To illustrate the considerable lighting requirements of marijuana, the marijuana growth cycle is commonly divided into three growth stages: seedling, vegetative, and flowering.¹⁰¹ The seedling phase only lasts around three to ten days on average, and requires anywhere between sixteen to

95. *Id.* at 160.

96. Kolwey, *supra* note 81.

97. *Id.*

98. *Id.*

99. *Id.*

100. *See id.*

101. *See* Cervantes, *supra* note 83, at 2–8.

twenty four hours of light per day to maintain proper growth.¹⁰² Most strains of marijuana will remain in the vegetative stage for around four to eight weeks while an eighteen to twenty-four hour light photoperiod is maintained.¹⁰³ Flowering, on the other hand, is most efficiently induced with a precise twelve hour light cycle followed by twelve hours of uninterrupted darkness in a 24-hour photoperiod, and traditionally lasts between six to ten weeks.¹⁰⁴ To increase the rate of plant growth, most indoor grow operations inject carbon dioxide into the plant's ecosystem during light periods of while the plants are in their vegetative and flowering states.¹⁰⁵

Lighting often comprises over one-third of a cannabis grower's energy demand because of the need to replicate natural growing conditions.¹⁰⁶ Although inefficient lights such as incandescent, fluorescent, or high-pressure sodium ("HPS") lights are still commonly being used to grow marijuana, light-emitting diode ("LED") lights should be used instead because they are generally a more energy efficient alternative.¹⁰⁷ HPS lights are commonly used in commercial grow operations and are similar to those found in hospital operating rooms and emit hundreds of times the illumination recommended for reading.¹⁰⁸ While HPS lights are considered superior for growing marijuana compared to standard fluorescent lights, double-ended HPS fixtures have been reported to save 20-25% on energy compared to standard HPS fixtures when used in flowering rooms.¹⁰⁹ Although the double-ended HPS fixtures cost about twice as much, they should last at least twice as long as well.¹¹⁰

An even more energy efficient alternative, some growers are also using LED fixtures or a combination of LED and HPS lights in flowering rooms for energy savings up to 40%.¹¹¹ LED lighting fixtures are similarly being applied in vegetative rooms in lieu of traditional inefficient lighting, saving up to 50% of the energy costs in some instances.¹¹² The use of LED lighting in marijuana grow operations is a relatively uncommon phenomenon, but

102. *Id.*

103. *Id.*

104. *Id.*

105. Kolwey, *supra* note 81.

106. *Id.*

107. *Id.*

108. *Id.*

109. *Id.*

110. *Id.*

111. *Id.*

112. *Id.*

improvements in LED technology are establishing LED lighting as the clear environmentally conscious alternative.¹¹³ As the technology advances, LED lights are emitting more of the full light spectrum rather than focusing on only the red and blue wavelengths, declining in cost, providing significantly longer life, and emitting substantially lesser heat.¹¹⁴ Because the application of LED lights in marijuana growing operations is not yet the norm, the price for LED lights is typically many times higher than traditional HPS lights or other inefficient lights.¹¹⁵ The higher price charged for LED grow lights can prove to be an insurmountable obstacle for many growing operations, but LED's lower electricity requirement represents an opportunity for long-term savings in energy costs. Although artificial lighting typically only delivers a portion of the light needed for marijuana to grow, most of light required for marijuana to grow properly can be satisfied this way without resorting to direct sunlight, and marijuana grown indoors can certainly be performed in an environmentally sustainable way using energy efficient lighting if that lighting is made accessible to all growers.

With lighting potentially comprising over one-third of a marijuana grower's energy demands, and greenhouses' ability to provide natural sunlight in lieu of energy intensive lighting, it is evident why greenhouses or outdoor growing operations can be attractive options for environmentally conscious growers. However, if a marijuana cultivator chooses to or is required by lawmakers to grow indoors, they should consider employing a few simple modifications to ensure that their marijuana is grown with the most energy efficient means possible. In addition to the immense energy cost savings that can be achieved by growing in a greenhouse or through employing energy efficient lighting, the areas of cooling and dehumidification are other major components of a marijuana grow operation that offer great potential for an immediate and impactful change.

Cooling and dehumidification are important because the heat emitted from the intense lighting can easily damage a marijuana plant, and the moisture constantly evaporating from the soil and the marijuana plants themselves can cause humidity which results in mold and mildew formation on the plants.¹¹⁶ Cooling and dehumidification typically consumes over half

113. *Id.*

114. *Id.*

115. *Id.*

116. Duane Jonlin & Duane Lewellen, *A Low-Energy High Managing Energy Use for Commercial Indoor Cannabis Cultivation*, ASS'N OF ENERGY ENG'RS, http://portal.aeecenter.org/files/newsletters/FMI/FMISummer_DuaneJonlin.pdf (last visited Jan. 25, 2020).

of an indoor marijuana grow operation's energy requirement, followed only slightly by the energy required for lighting, with the remaining percentages allotted to things like space heating, water pumping, carbon dioxide injection, etc.¹¹⁷ For smaller-sized grow operations, energy savings have been reported by using ductless, mini split-system air conditioning units in place of standard rooftop units.¹¹⁸ Medium and large grow operations have employed chilled water systems to satisfy both cooling and dehumidification requirements, "with energy savings of up to 40% compared to the standard practice."¹¹⁹ By implementing energy efficient changes such as these mentioned, marijuana grow operations can achieve incredible long-term savings that benefit both their bottom line and Earth's wellbeing. Although these energy efficiency upgrades sound great in theory, practically speaking, many marijuana growers either do not know these improvements exist, do not want to change, or cannot afford to immediately upgrade to these more expensive environmentally conscious alternatives.

2. *Environment and Natural Resources*

In addition to the negative effects on the climate due to the use of energy inefficient equipment and nonrenewable energy sources involved in the indoor cultivation of marijuana, the natural ecosystem can also be negatively impacted by the widespread unregulated outdoor cultivation of marijuana. Although outdoor cultivation is generally a more environmentally friendly practice when compared to indoor cultivation, negative effects ranging from deforestation and land degradation, to water shortages and contamination, to endangering wildlife are all potential implications of unregulated outdoor marijuana cultivation.¹²⁰ Regarding outdoor marijuana cultivations' effects on the land, deforestation and soil erosion are two of the biggest concerns.¹²¹ While deforestation removes native vegetation and can harm the land's ability to retain water, thus worsening future flooding, erosion can clog waterways by causing an increase in pollution and sedimentation, which then results in declining

117. Kolwey, *supra* note 81.

118. *Id.*

119. *Id.*

120. *See* Helmer, *supra* note 6.

121. Jennifer Carah et al., *High Time for Conservation: Adding the Environment to the Debate on Marijuana Legalization*, NAT'L CTR. FOR BIOTECH. INFO. (Aug. 1, 2015), <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4776720/>.

animal populations because of damage to their spawning and rearing habitats.¹²²

Not only does renewable energy use benefit Earth's climate, but there is research that supports the idea that renewable energy sources also substantially benefit the water sector as well. For example, billions of gallons of water have been saved by replacing coal and other dirty nonrenewable energy sources with renewable energy sources.¹²³ This savings in water usage is due in large part to renewable energy sources like solar or wind requiring just 1%-2% of the total water required to produce nonrenewable energy sources like coal or natural gas.¹²⁴

California, the top marijuana-producing state in the country, is responsible for cultivating between 60%-70% of all marijuana consumed in the United States.¹²⁵ Compared to other traditional California-grown crops, such as grapes and tomatoes, marijuana is estimated to require almost twice as much water.¹²⁶ Further, between 2012 and 2016, the number of California marijuana facilities increased by 58%, while the total number of cannabis plants cultivated increased by 183%.¹²⁷ Although the California marijuana industry has been booming in recent years, California has been plagued with severe droughts and wildfires. During summer months when the water supply is at its lowest, the water demand for marijuana cultivation has exceeded the supply available in many areas.¹²⁸ The illegality of marijuana has further complicated this issue because of the lack of water use regulations associated with marijuana cultivation. Although some growers in more established agricultural industries conserve abundant winter stream water for drier summer months, oftentimes because they are required to by regulation, many marijuana growers irrigate during the summer months with water diverted directly from streams and springs.¹²⁹ The negative effects associated with water shortage are compounded as a

122. *Soil Erosion and Degradation*, WORLD WILDLIFE FUND, <https://www.worldwildlife.org/threats/soil-erosion-and-degradation> (last visited Jan. 25, 2020).

123. Avner Vengosh & Dalia Patino-Echeverri, *Replacing Coal with Gas or Renewables Saves Billions of Gallons of Water*, DUKE U. NICHOLAS SCH. OF THE ENV'T (Oct. 21, 2019), <https://nicholas.duke.edu/news/replacing-coal-gas-or-renewables-saves-billions-gallons-water>.

124. *Id.*

125. Carah et al., *supra* note 121.

126. *See Id.*

127. *See Helmer, supra* note 6.

128. *Id.*

129. *Id.*

result of cultivators removing water at the time when water levels are already at their lowest.

Dry farming is one viable strategy to mitigate the negative impact of marijuana cultivation on the water supply in areas where the practice is possible.¹³⁰ Dry farming involves tilling the top few inches of soil to break it up into a fine layer so that water can more easily move toward and be absorbed by the plant's roots.¹³¹ Dry farming allows the soil to retain water extremely well and therefore does not require as much or potentially any irrigation during the plant's growth cycle.¹³² Many dry farmers actually believe that plants like marijuana prefer less water and less fertilizer than is traditionally used.¹³³ By electing to dry farm, marijuana cultivators can lower the threat to local wildlife by reducing the risk of diverting water away from streams and rivers.

Removing water directly from rivers and streams during dry summer months, as is the current practice among many illegal growers, not only reduces the water supply available for other agricultural needs, but it also jeopardizes the existence of many species of fish.¹³⁴ Similarly harmful to wildlife, outdoor marijuana cultivation can also result in negative effects such as deforestation and erosion. To avoid law enforcement detection, illegal marijuana growers often choose discrete, forested areas of public and tribal lands to hide their operations,¹³⁵ but establishing cultivation sites in these areas often results in deforestation that reduces the available habitat for wildlife, disrupting the migratory patterns of many diverse classes of animals and threatening their existence by requiring them to relocate considerable distances to breed and locate new sources of food, water, shelter.¹³⁶

Additionally, the extensive use of harmful chemicals associated with outdoor marijuana cultivation is another problematic area plaguing wildlife. Many illegal grow operations use massive quantities of harmful pesticides

130. Brie Mazurek, *Farming without Water*, CTR. FOR URBAN EDUC. ABOUT SUSTAINABLE AGRIC. (Aug. 3, 2012), <https://cuesa.org/article/farming-without-water>.

131. *Id.*

132. *Id.*

133. Claire Weissbluth, *Some Farming in Humboldt are Growing Marijuana – without any Water*, CANNABIS NOW (Oct. 5, 2018), <https://cannabisnow.com/watch-dry-farming-cannabis/>.

134. Helmer, *supra* note 6.

135. *Id.*

136. *Cannabis and the Environment – Habitat Loss and Fragmentation*, CAL. DEP'T. OF FISH & WILDLIFE, <https://wildlife.ca.gov/Conservation/Cannabis/Environment#536582108-habitat-loss-and-fragmentation> (last visited Jan. 25, 2020).

and rodenticides to keep animals from interfering with their marijuana crop and equipment, but these same chemicals have been linked widespread wildlife deaths.¹³⁷ Pesticides and rodenticides, used heavily in black-market marijuana cultivation on public and tribal land, are consumed by a variety of animals that “make their way into terrestrial food chains, posing significant risks to mammalian and avian predators.”¹³⁸ It was reported that over 80% of deceased Pacific fishers, a small, carnivorous mammal, recovered by researches in California were exposed to rodenticides.¹³⁹ Even if pesticide or rodenticide consumption does not always kill the animal, low doses can still lead to “reduced immune response, decreased reproductive potential, and increased susceptibility to predation” with far-reaching negative effects to the ecosystem.¹⁴⁰

From land degradation in the form of deforestation and soil erosion, to water shortages, to damage to wildlife habitat and the animals directly, outdoor marijuana cultivation poses a continual and ever-increasing threat to the natural ecosystem so long as its cultivation remains illegal and unregulated. While some state-level legislatures have enacted policies that largely serve as band-aids to the issues posed by marijuana cultivation, the cultivation-induced climate and environmental problems can be only truly be solved once marijuana is federally legalized. Government officials and agencies will then finally be able to begin implementing effective regulations designed to reduce the negative implications of marijuana cultivation on the environment and natural resources without fear of violating any federal laws.

IV. Potential Solutions

A. How Lawmakers Can Encourage the Green to be Grown Greener

When it comes to tackling marijuana cultivation’s negative impacts, that job is best left to the legislature. Although government intervention is a debatable topic, it is evident that policymakers are in the best position to effectuate a sustainable and not unduly interfering solution to the issues posed by marijuana cultivation given the government’s position of authority and its ability to influence the actions of individuals and organizations that

137. *Cannabis and the Environment – Pesticides and Fertilizers*, CAL. DEP’T. OF FISH & WILDLIFE, <https://wildlife.ca.gov/Conservation/Cannabis/Environment#536582111-pesticides-and-fertilizers> (last visited Jan. 25, 2020).

138. Carah et al., *supra* note 121.

139. *Id.*

140. *Cannabis and the Environment*, *supra* note 137.

might otherwise go uncorrected. There exist ample methods for legislatures to regulate the individual and organizational cultivation of marijuana to ensure that its negative effects on Earth's climate and environment are reduced, while simultaneously mitigating the negative effects on those participants within the marijuana cultivation industry so they can continue accruing profits with minimal interference. Upon federal legalization, a few such mutually inclusive avenues for government involvement are to perform marijuana research concerning best practices and use that information to educate cultivators, to offer financial incentives and disincentives designed to encourage the use of renewable energy and environmentally friendly equipment, and to carefully monitor the industry to ensure compliance and its initiative's effectiveness.

Due to marijuana's classification as a Schedule I controlled substance, policymakers at all levels are unable to effectuate any meaningful change in the marijuana industry on behalf of Earth's climate and natural resources. Additionally, the federal prohibition of marijuana means that energy companies and banks are at risk of violating the law when they work with marijuana growers. This risk has resulted in energy companies' unwillingness to offer their services to marijuana growers out of fear of losing federal funding,¹⁴¹ as well as banks lacking the ability to assist with marijuana growers' initial and ongoing cultivation costs.¹⁴² This lack of access to capital typically forces new marijuana growers to purchase cheaper and less energy efficient cultivation equipment, even though the savings in renewable energy costs, lighting efficiency improvements, and utility demand charges would undoubtedly repay the investment if conventional banking services were available. Additionally, because marijuana remains federally illegal, less interest is garnered by individuals and companies to invest in and research energy efficient marijuana grow equipment, thus compounding the detrimental effect of marijuana prohibition in the United States.

Policymakers should feel at liberty to select among many different strategies or combinations of strategies to effectuate a meaningful change; however, it is imperative that a decision is made. The primary method to help promote the environmental sustainability of the marijuana industry is to legalize cannabis at the federal level. Until there is a real incentive for cultivators to alter their current means of production, environmentally

141. Ryan Dadgari, *Powering Mary Jane: Marijuana and Electric Public Utilities*, 10 *GOLDEN GATE U. ENVTL. L.J.* 55, 66 (2018).

142. *See Cannabis Banking*, AMERICAN BANKERS ASS'N, <https://www.aba.com/advocacy/our-issues/cannabis> (last visited Jan. 25, 2020).

unfriendly practices will continue to be used if they remain the cheapest and most efficient means of production. Currently, many of the issues arising out of this industry stem from unregulated, inefficient, and environmentally dangerous illegal grow operations that possess these characteristics largely because they need to stay under the radar of law enforcement.¹⁴³ The rapidly evolving but still infant marijuana industry will have an increasingly negative impact on the planet's wellbeing if left unregulated. While government intervention is certainly warranted in this case, it is important that legislatures do not stifle the newly emerging marijuana market by creating overly aggressive policies aimed at curbing the negative effects associated with its cultivation.

1. Educate the Cultivator

At the outset, it is imperative that free information concerning marijuana cultivation best practices is promulgated to all current and future marijuana cultivators to help mitigate the issues posed by the unregulated cultivation of marijuana before unfavorable cultivation practices are adopted at a large scale. To help educate marijuana growers about best practices and avoid the initial establishment of environmentally unfriendly equipment and techniques, it is important that the government de-schedules marijuana from the controlled substances list, engages in extensive marijuana research, and promulgates this information pertaining to equipment and infrastructure efficiency and environmentally friendly cultivation best practices in an easily accessible format. Efficiency upgrades concerning infrastructure, lighting, heating and air, and energy sources such as those discussed in Section III of this comment are just some examples of the information that the government should provide to those interested in endeavoring into the marijuana cultivation sector.¹⁴⁴ In addition to spreading this information to cultivators, many independent utility companies have already begun providing direct technical assistance to marijuana growers to help them improve their grow operation's efficiency.¹⁴⁵ A couple of examples of such utilities are Tacoma Power in Washington and Energy Trust of Oregon, which provide free technical assistance and grow operation-design review and analysis with the marijuana growing operator free of charge.¹⁴⁶

143. See Helmer, *supra* note 6.

144. See discussion *infra* Section III.A.1.

145. Kolwey, *supra* note 81.

146. *Id.*

Ironically, one of the biggest obstacles in the way of legalization is the scarcity of information concerning marijuana. Because marijuana has been on the Schedule I list of controlled substances for the last fifty years, research concerning marijuana's medicinal properties and effects or the plant's optimal growth cycle has been severally inhibited because of the difficulty and potential legal liability associated with obtaining marijuana for such studies.¹⁴⁷ Although marijuana is deemed by the federal government to have no currently accepted medical use and a high potential for abuse, federal agencies such as the Drug Enforcement Administration ("DEA"), Department of Justice ("DOJ"), Food and Drug Administration ("FDA"), and National Institutes of Health ("NIH") have been participating in obtaining information from the public regarding marijuana and its medicinal properties.¹⁴⁸ The DEA has recently published in the Federal Register requesting assistance from the public to perform research involving marijuana and its "chemical constituents," stating that the DEA "fully supports expanding research into the potential medical utility of marijuana."¹⁴⁹ Within the last year, the FDA and Department of Health and Human Services ("HHS") have also announced public hearings to obtain information concerning marijuana cultivation, product quality, and the sale of products containing marijuana.¹⁵⁰ If marijuana were made federally illegal, these governmental agencies would not need to rely on the public for information concerning marijuana's benefits, thus increasing the speed at which research can be obtained and publicized as well as the accuracy of this research. The information could then be spread to marijuana growers across the country to help improve the industry and reduce the establishment of inefficient growing practices.

147. *The Health Effects of Cannabis and Cannabinoids: The Current State of Evidence and Recommendations for Research*, NAT'L ACAD. OF SCI. (Jan. 12, 2017), <https://www.ncbi.nlm.nih.gov/books/NBK425757/>.

148. Drug Enf't Admin., *Applications To Become Registered Under the Controlled Substances Act To Manufacture Marijuana To Supply Researchers in the United States*, FED. REGISTER (Aug. 12, 2016), <https://www.federalregister.gov/documents/2016/08/12/2016-17955/applications-to-become-registered-under-the-controlled-substances-act-to-manufacture-marijuana-to>.

149. *Id.*

150. Food & Drug Admin., *Scientific Data and Information About Products Containing Cannabis or Cannabis-Derived Compounds; Public Hearing; Request for Comments*, FED. REGISTER (April. 3, 2019), <https://www.federalregister.gov/documents/2019/04/03/2019-06436/scientific-data-and-information-about-products-containing-cannabis-or-cannabis-derived-compounds>.

2. *Government Financial Incentives*

In addition to educating the public, another method for mitigating the negative impacts caused by marijuana and encouraging desirable cultivation choices is using government financial incentives in the form of subsidies and rebates. Subsidies and rebates can be offered to cultivators who invest in energy efficient equipment purchases and renewable energy use to persuade them to cultivate in ways that are in the best interest of the planet's wellbeing. A subsidy is a form of government incentive that functions as financial support extended to either individuals or businesses with the purpose of promoting an enterprise deemed advantageous to the public, such as in the fields of climate change and environmental sustainability.¹⁵¹ Subsidies in the marijuana cultivation context can come in various forms including direct methods like cash grants when purchasing governmentally approved equipment and interest-free and low-interest loans to assist in financing capital-intensive cultivation infrastructure, or indirect methods such as tax credits, deductions, accelerated depreciation for accounting purposes, or rebates. A rebate is another form of government incentive that acts as a return of part of a payment that can be applied on the back-end to repay growers for the purchase of environmentally friendly equipment.¹⁵² Tax credits are more favorable to taxpayers than deductions because they reduce tax liability dollar for dollar, but deductions also reduce tax liability, which allows growers to maximize their profits.¹⁵³

Unlike the cultivation of other crops where tax credits can be obtained for using renewable energy sources and re-claimed water, there is little to no financial incentive for growers to abide by environmentally friendly practices given marijuana's illegality in many areas of the country. However, once marijuana is made legal at the federal level, all U.S. marijuana cultivators will be able to connect to the electrical grid and be integrated into utilities' energy conservations programs. These utilities can then incentivize maximum renewable energy use as well as environmentally sustainable upgrades like solar panels. Although many electric utilities have been reluctant to offer financial incentives to marijuana cultivators who perform energy-efficiency upgrades because of

151. *Subsidy*, MERRIAM-WEBSTER, <https://www.merriam-webster.com/dictionary/subsidy> (last visited Jan. 25, 2020).

152. *Rebate*, MERRIAM-WEBSTER, <https://www.merriam-webster.com/dictionary/rebate> (last visited Jan. 25, 2020).

153. *Tax Credits and Deductions*, U.S. GOV'T, <https://www.usa.gov/tax-benefits> (last visited Jan. 25, 2020).

the federal prohibitions against subsidizing marijuana operations,¹⁵⁴ there are numerous examples of private utilities successfully employing these incentive programs in the marijuana industry. A few such examples of utilities that offer incentives for marijuana cultivators using more efficient lighting and HVAC systems are Xcel Energy in Colorado, National Grid in Massachusetts, and Puget Sound Energy in Washington, which derives more than a third of its electricity from hydropower.¹⁵⁵ These utilities' incentive programs cover 60%, 75%, and 100%, respectively, of the cultivator's incremental cost of production when transitioning to more energy-efficient equipment.¹⁵⁶ Further, Puget Sound Energy estimated that its energy efficiency program had resulted in energy savings of over thirty-five gigawatt hours ("GWh") as of 2017.¹⁵⁷ To put that into perspective, cannabis grow operations in Colorado consume about 300 GWh of electricity in total per year.¹⁵⁸

Policymakers have many options at their disposal for dealing with the increasing problems posed by marijuana cultivation in the U.S. once marijuana prohibition ceases. But so long as the the cost of new energy efficient cultivation equipment remains comparatively high and the access to commercial funding by marijuana cultivators remains nonexistent, private utility incentives will remain as essential tools for attracting marijuana cultivators to invest in energy efficient equipment and energy sources. Once marijuana is made legal, the remaining federally run utilities will also be able to incorporate marijuana cultivators into their energy efficiency programs.

3. *Government Financial Disincentives*

Along with promulgating information to the public as well as providing financial incentives to growers that use clean energy and efficient equipment, another tool that legislatures can use within the marijuana cultivation context is some type of financial disincentive in the form of a penalty or a tax, applied to growers that choose not to participate in conservation efforts. Much like the problem with incorporating marijuana cultivators into utilities' energy conservation programs, because marijuana is an illegal and unregulated market in many areas of the country, marijuana

154. Dadgari, *supra* note 141.

155. *Hydroelectric Power*, PUGET SOUND ENERGY, <https://www.pse.com/pages/energy-supply/hydro-power> (last visited Jan. 25, 2020).

156. Kolwey, *supra* note 81.

157. *Id.*

158. *Id.*

is being grown in secrecy without any formal database of cultivators. Since the government does not know the existence of these illicit cultivator's operations, growers that violate federal efficiency, health, or safety legislations such as the National Environmental Policy Act; Clean Water Act; Clean Air Act; Pollution Prevention Act; Resource Conservation and Recovery Act; and Federal Insecticide, Fungicide, and Rodenticide Act cannot be penalized as would a traditional company that does not comply with these federal regulations. Once marijuana is made federally legal, however, these acts as well as others designed to protect societal interests can be formally applied to the marijuana cultivation industry.

As for now, some states and municipalities are taking it upon themselves to implement health and safety measures applicable to the marijuana cultivation industry. For example, indoor grow operations in Boulder, Colorado, are required by municipal code to offset 100% of their electricity use with renewable energy,¹⁵⁹ or face a penalty of 2.16 cents per kWh which is placed into the Boulder County Energy Impact Offset Fund for the purpose of facilitating reductions in fossil fuel energy consumption.¹⁶⁰ Regarding outdoor grow operations, California has established the Water Boards Cannabis Cultivation Program that subjects growers to penalties for not abiding by strict water use and surface water diversion restrictions with the purpose of correcting potential water quality and quantity issues posed by marijuana cultivation.¹⁶¹

While other forms of punishments such as cultivation license suspension or mandated environmental remedial action exist, taxation has long been one of the most effective and commonly used tools for government policymakers to regulate behavior and recoup losses associated with the taxed behavior.¹⁶² While taxing the sale of marijuana at the retail stage is commonplace among many states that have legalized marijuana, another tool to encourage the use of energy efficient cultivation equipment and

159. *Boulder Marijuana Cultivation Facilities Energy Requirements*, CITY OF BOULDER, COLO., <https://bouldercolorado.gov/planning/boulder-marijuana-facility-energy-requirements> (last visited Jan. 25, 2020).

160. *Cannabis Energy Impact Offset Fund*, BOULDER CTY., <https://assets.bouldercounty.org/wp-content/uploads/2017/03/energy-impact-offset-fund-res-2014-41.pdf> (last visited Jan. 25, 2020).

161. *Water Boards Cannabis Cultivation*, CAL. STATE WATER RES. CONTROL BD., https://www.waterboards.ca.gov/water_issues/programs/cannabis/ (last visited Jan. 25, 2020).

162. *Economics of Taxation*, U.S. DEP'T OF THE TREASURY, <https://www.treasury.gov/resource-center/faqs/Taxes/Pages/economics.aspx> (last visited Jan. 25, 2020).

upgrades is to impose an ever-increasing tax at the cultivation stage. A cultivation tax can come in the form of taxing a grower who does not comply with energy efficient cultivation equipment or environmentally sustainable practices, or in the form of a carbon tax on cultivators based on the amount of carbon-based fuel, i.e. nonrenewable energy, used during the growing process. Because lawmakers cannot legislate where businesses and individuals invest their money, carbon taxing exists as an effective tool for encouraging environmentally irresponsible marijuana growers to utilize more efficient technology, as well as for internalizing the negative externalities imposed on society by these growers' operations.¹⁶³ California is one such state that has successfully enacted a marijuana cultivation tax.¹⁶⁴ Additionally, there is an ongoing movement in support of treating marijuana similarly to alcohol from a regulatory and excise tax perspective.¹⁶⁵ A bill titled "Regulate Marijuana Like Alcohol Act" was introduced in the House of Representatives in 2019 with the aim to decriminalize marijuana at the federal level and establish the Bureau of Alcohol, Tobacco, Firearms and Explosives as the agency to oversee the U.S. marijuana industry.¹⁶⁶ The effect of this bill would be to apply a special excise tax, like an alcohol excise tax, to increase the tax burden on those within the marijuana industry.¹⁶⁷

The revenue generated from taxing marijuana is certainly not an insignificant source of funds. For example, Colorado made over \$300,000,000 in 2019 alone from the imposition of marijuana taxes, licenses, and fees.¹⁶⁸ While the revenues generated from taxation are important because they can be used to fund environmental restoration projects and promote the use of clean energy, it is vital that lawmakers do not overburden marijuana growers with tax liabilities so as to make it economically infeasible for law-abiding growers to compete against black-market growers. Government financial disincentives can play important roles in correcting unwanted behavior, but they should not be abused to economically suffocate the legal marijuana industry. Although it is

163. *See What's a Carbon Tax?*, CARBON TAX CTR., <https://www.carbontax.org/whats-a-carbon-tax/> (last visited Jan. 25, 2020).

164. *Tax Guide for Cannabis Business*, CAL. DEP'T OF TAX & FEE ADMIN., <https://www.cdtfa.ca.gov/industry/cannabis.htm> (last visited Jan. 25, 2020).

165. H.R. 420, 116th Cong. (2019).

166. *Id.*

167. *Id.*

168. *Marijuana Tax Data*, COLO. DEP'T OF REVENUE, <https://www.colorado.gov/pacific/revenue/colorado-marijuana-tax-data> (last visited Jan. 25, 2020).

impossible to determine whether the societal benefit derived from providing financial incentives like subsidies and rebates to marijuana growers outweighs the direct monetary gain associated with the imposition of penalties or taxation, incentivizing behavior rather than punishing it should be the preferred means to achieve climate and environmental goals in the least restrictive way.

4. *Monitoring Systems*

Once lawmakers have implemented their chosen means of marijuana cultivation regulations, it is important that effective monitoring systems are established to ensure that the newly enacted policies are having their intended effects. With marijuana legalization comes the ability for the government to establish a licensing framework used to monitor the industry's participants and require environmentally friendly practices or 100% carbon-free energy use before a grow license is granted. Additionally, the collection of licensing fees allows for internalizing the cost of marijuana cultivation's negative external effects at the front-end, thereby ensuring that some financial reserves exist that can help compensate for future climate and environmental damage.

Once marijuana cultivators are appropriately licensed, lawmakers can then subject these growers to a marijuana inventory tracking system that monitors marijuana from the cultivation stage through the supply chain until the final retail sale. Colorado and California, for example, have enacted similar "seed-to-sale" monitoring frameworks that require cultivators to maintain and disclose accurate records to a state licensing authority concerning a myriad of different compliance metrics dating from the purchase of the seed to the sale of the matured plant.¹⁶⁹ Colorado's marijuana monitoring system imposes stringent waste disposal standards; sanitary guidelines; renewable energy reporting requirements; and strict disclosure of cultivation chemicals, such as pesticides, used in growing marijuana.¹⁷⁰ Colorado's system also requires the mandatory production of product samples to ensure that the marijuana produced by each grower satisfies health and safety standards.¹⁷¹

169. COLO. CODE REGS. § 212-2 (2018) (repealed 2020); *Frequently Asked Questions about the California Cannabis Track-and-Trace System*, CAL. DEP'T OF FOOD & AGRIC., https://cannabis.ca.gov/wp-content/uploads/sites/13/2019/08/CCTT_FAQ_8.1.19.pdf (last visited Jan. 25, 2020).

170. *Id.*

171. *Id.*

Unlike the unregulated black-markets that are currently distributing marijuana across much of the United States, the federal legalization of marijuana will allow many more of the industry's largest participants to be formally licensed and closely regulated to ensure that they are acting in accordance with governmentally promulgated frameworks. In addition to being able to monitor the immensely important areas of marijuana product safety and advertising on the retail end, marijuana's negative effects on natural resources and the climate can be dramatically reduced when the cultivation process is monitored through a seed-to-sale tracking system.

5. *Other Solutions*

Lawmakers could also take advantage of the growing emphasis of social responsibility, a self-regulating business model that encourages an entity to be socially accountable. One way of doing this is to implement policies that have no direct financial impact on the use of environmentally sustainable marijuana cultivation equipment or methods, but are instead intended to "name and shame" growers that engage in environmentally unfriendly practices.¹⁷² For example, policymakers could require marijuana producers to publicly disclose whether they complied with the particular environmental standards promulgated by the legislature concerning pesticide use, carbon-free emissions, water and energy efficiency, etc. For those marijuana growers who abide by their governing cultivation standards, a certification could be awarded denoting to the public that the cultivator's marijuana was grown in an environmentally responsible way. While marijuana cultivators will not feel any negative effects from this legislation on the front end, the theory is that the market, with minimal support from the government, will be the force asserting the pressure on marijuana producers to comply with environmentally sustainable practices or risk losing out on sales as a result.¹⁷³ Because the effectiveness of this strategy depends on a particularly negative public reaction upon learning that specific marijuana growers are not using clean energy or environmentally sustainable equipment, as well the strategy's reliance on the public at large performing the investigative work to learn about each producers' cultivation practices, this option should not be relied upon as the sole means of solving the ongoing climate and environmental issues.

172. See Margaret Ryznar & Karen Woody, *A Framework on Mandating Versus Incentivizing Corporate Social Responsibility*, 98 MARQ. L. REV. 1667, 78 (2015).

173. *Id.* at 1678.

While the ideas listed in this section are just a few tools that have been, or could be, used by legislatures to mitigate the negative effects of marijuana cultivation on the climate and environment, they should not be misconstrued as the only viable solutions to counter this growing problems. As the size of the marijuana market increases and the threat of irreversible climate and environmental decay looms larger, it is increasingly important that policymakers continue to brainstorm and test new theories for encouraging cultivation best practices among marijuana growers.

V. Conclusion

With the increasing trend of marijuana legalization in the United States, the issues posed by marijuana cultivation on Earth's climate and natural resources will only continue to garner attention and increase in magnitude. Due to global warming increasing in severity and the escalating problems associated with environmental degradation in its many forms, the budding U.S. marijuana industry is an industry that is increasingly in need of government involvement. While the industry is still in its early stages, legislatures should take advantage of the opportunity to work together with marijuana cultivators to promote their economic ventures while simultaneously reducing cultivation's negative external effects in the least cumbersome way. A few such options to satisfy these joint goals are to compile research concerning environmentally sustainable marijuana cultivation best practices to provide to marijuana growers, offer financial incentives to entice growers to use environmentally friendly cultivation means, enforce financial disincentives to pressure growers to upgrade their equipment and transition to renewable energy, and monitor the marijuana industry using a seed-to-sale tracking system. Additionally, the government should be encouraged to implement all other proactive measures that do not inordinately infringe on the marijuana industry.

Energy and natural resource conservation efforts are not all-or-nothing; even one grower using more energy efficient means to cultivate their marijuana is one less contributor to the ongoing climate and environmental problems. No matter the chosen means of government involvement, it is imperative that marijuana is de-scheduled from the Schedule 1 List of Controlled Substances and made legal at the federal level. Any legal standard applied to marijuana short of full legalization will likely result in an increase in demand for marijuana without a similar increase in legal supply, thus increasing the black-market activity that is primarily contributing to the ongoing climate and environmental issues. While

policymakers at all levels should strive to devise a solution, they are severely handicapped and unable to enact a meaningful change so long as the prohibition on marijuana continues. It is only upon legalization that legislative action can be of any long-lasting solution to the issues posed by the marijuana industry.

Until the government sheds its misguided beliefs surrounding marijuana and begins acknowledging its positive benefits to the U.S. economy, the nation's health, and its people's sense of autonomy, it is likely that little impact will continue to be made in promoting the industry or reducing cultivation's negative external effects. This is not to mention the massive amount of black-market violence and the immense damage that unregulated marijuana products have on society that will be reduced upon federal legalization.¹⁷⁴ Although the subject of this paper has been marijuana cultivation, this industry is just one of many industries that presents an opportunity for proactive government involvement rather than retroactive attempts to diminish the ongoing negative effects on the environment and climate. As the environmental and climate landscapes worsen, it will become increasingly vital that the government mitigates the negative effects posed by both pre-existing and newly formed industries through some form of legislative action. Marijuana cultivation is the quintessential industry for establishing the positive benefits of governmental involvement owing to the industry's relative infancy, incredible growth projections, and significant potential for negative effects on the climate and the environment in comparison to other industries.¹⁷⁵ Marijuana legalization is likely the only avenue for devising a solution to this escalating problem, and it is time that lawmakers confront the issue head-on.

174. See Norman Sharpless, *Statement on Consumer Warning to Stop using THC Vaping Products Amid Ongoing Investigation into Lung Illnesses*, U.S. FOOD & DRUG ADMIN. (Oct. 4, 2019), <https://www.fda.gov/news-events/press-announcements/statement-consumer-warning-stop-using-thc-vaping-products-amid-ongoing-investigation-lung-illnesses>.

175. See Kolwey, *supra* note 81.