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Climate Change: The Role of Technology, "Dominion," and Our Pastoral Responsibility

by Leah Wakefield

ABSTRACT:

This paper briefly examines the correlation between burning fossil fuels, the increase of carbon in the atmosphere and resulting volatile weather, including hurricanes and floods. The paper then discusses possible technological solutions, including carbon dioxide scrubbers. Finally, the paper critically examines Genesis 2:15 and 1:26 and uses Laudato Si' to reframe our understanding of "dominion" over the earth as a responsibility that calls for us to work to end climate change.

SYNOD:

This paper briefly examines the correlation between burning fossil fuels, the increase of carbon in the atmosphere and resulting volatile weather, including hurricanes and floods. The paper then discusses possible technological solutions, including carbon dioxide scrubbers. Finally, the paper critically examines Genesis 2:15 and 1:26 and uses Laudato Si' to reframe our understanding of "dominion" over the earth as a responsibility that calls for us to work to end climate change.

"The Lord God took the man and put him in the Garden of Eden to work it and take care of it." Gen 2:15

The effects of climate change are undeniable. People are being forced to relocate, extreme weather events occur more and more often, and the global temperature is rising at an-ever increasing rate. Scientists determined the earth's temperature was the highest ever recorded in 2020; the last seven years have been the hottest ever, and the previous decade has been the hottest decade on record.[1] These years have also been some of the most extreme for wildfires, adding the equivalent of several megatonnes of carbon dioxide into the atmosphere.[2] Technology has a hand in contributing to climate change; the innovation characteristic of the Industrial Revolution led to large-scale burning of fossil fuels. As the earth warms and pollution grows in the atmosphere, the number of climate refugees increases, along with increasing concern about severe storms; where technology has contributed to climate change, some technology, especially carbon removal technology, can offer hope for the future. As Catholics, we must engage with the problem of climate change in a pastoral manner; we have a responsibility to care for God's creation and to exercise dominion—as servitude, care, and love—for the earth, and Pope Francis highlights some of the ways we can do this in *Laudato Si'*.

Much of the recent focus on climate refugees has concerned the Carteret Islands. On the Carteret Islands in the south-western Pacific, residents are fleeing their home country and their ancestral lands. Sea levels have risen nearly five inches in the last 20 years, demolishing both livable land and land suitable for agriculture.[3] While five inches may not seem significant, the highest part of the island is approximately only four to five feet above sea level, and every inch matters.[4] The islanders are relying on an NGO, the Catholic Church, and their government to aid in relocation and provide food. The

1 Al Gore "Advancing Climate Solutions. Now," part of the Swain Climate Policy Series, presented by Humphrey School of Public Affairs in partnership with the Institute on the Environment. University of Minnesota: Minneapolis. 26 October 2021, virtual lecture.

2 Gore, "Advancing."

3 "The World's First Climate Change 'Refugees,'" *The New Humanitarian*, 8 June 2008. https://www.thenewhumanitarian.org/fr/node/241838.

4 Mick Pope, "The Sea Is Eating the Ground: A Theology of Sea Level Rise." *Anglican Theological Review* 2018, 100 (1): 79–92. https://search-ebscohost-com.ezproxy.csbsju.edu/login.aspx?direct=true&db=lsdar&AN=ATLAiAZI180228000129&site=ehost-live&scope=site.

Catholic Church provided land for coastal dwellers to move further inland; NGOs are working on providing food and lobbying the government.

While developing nations, such as the Carteret Islands often feel the effects of climate crises most acutely, developed nations are not immune. In the Midwest United States, the global increase in temperature has resulted in a longer growing season for many crops; while this increase is good, benefits are limited, and even negated, by extreme events, such as drought, more severe storms, floods, and more.[5] Coastal cities are experiencing their own troubles; recent storm seasons have seen a record-breaking number of hurricanes or an increasing number of extreme hurricanes. The 2020 hurricane season had 30 named storms in the Atlantic; the 2021 season has only seen 21 named storms as of November 1st—a month before the season officially ends—with one more storm forming off the coast as of November 18th, and if one more storm develops, meteorologists will have exhausted their typical naming system and will have to go to a supplemental system.[6,7] In fact, the only three seasons which left meteorologists scrambling for names were the 2005 (with Hurricane Katrina), the 2020, and 2021 seasons.[8] The United States is not alone in its struggle with severe rain storms; in Europe, France has experienced disastrous flooding. In June of 2016, excessive rains flooded the Seine more than 20 feet, forcing thousands from their homes in France and Germany.[9] The river had not flooded that excessively since 1982, 34 years prior; before then it flooded in 1910, an

5 "Climate Change Impacts in the United States: Climate Trends and Regional impacts," part of the *U.S. National Climate Assessment*, produced by the U.S. Global Change Research Program. 2014 https://www.globalchange.gov/sites/globalchange/files/NCA3-climate-trends-regional-impacts-brochure.pdf

6 Greg Allen, "2020's Monster Hurricane Season Still has Surprises," *National Public Radio*, 12 May 2021. https://www.npr.org/2021/05/12/996183191/2020s-monster-hurricane-season-still-has-surprises.

7 "2021 Hurricane Season," part of *Facts and Statistics: Hurricanes* sponsored by Insurance Information Institute. https://www.iii.org/fact-statistic/facts-statistics-hurricanes.

8 Scott Neuman, "There Have Been so many Atlantic Storms this year, Forecasters Have Run out of Names," National Public Radio, 2 November 2021, https://www.npr.org/2021/11/02/1051420610/tropical-storm-wanda-atlantic-hurricane-season-names.

9 "Paris Floods: Seine set to Peak as More Rain Forecast," *British Broadcasting Company*: News, 3 June 2016, https://www.bbc.com/news/world-europe-36441322.

additional 72 years prior.[10] The shortening interval between floods follows the trend of extreme or record-breaking events (hurricanes, described above, earth warming, etc.). Researchers questioned how likely it was that this flooding event was connected to climate change. They found that, compared to a world that assumed the climate was not changing, climate change increases the chance of such an event to 80%.[11] While generalizations cannot be drawn from the extremes of the last few years, one can see, however, the extremes, the outliers, and the record-breaking individual storms and seasons, are becoming more and more frequent.

When discussing the issues of climate change, it is critically important to discuss the role of technology—both as a catalyst for climate change and the ways in which technology can offer solutions to help combat climate change. First, one must recognize the ways in which technology has contributed to climate change. As the Industrial Revolution spread from England to continental Europe in the late 1800s, the amount of carbon dioxide in the air began to increase (cf. Figure 1).[12] The Industrial Revolution was characterized by several things: "(1) the use of new basic materials, chiefly iron and steel, (2) the use of new energy sources…, such as coal, the steam engine, electricity, petroleum, and the internal-combustion engine, (3) the invention of new machines, such as the spinning jenny and the power loom…, (4) [development of] the factory system…, (5) …developments in transportation and communication, including the steam locomotive, steamship, automobile, airplane, telegraph, and radio, and (6) the increasing application of science to industry."[13] Many of these developments involved processes that released carbon dioxide into the atmosphere at unprecedented

10 Lilia Blaise and Benoit Morenne, "In Paris, the Seine Rises to Highest Level Since 1982," The *New York Times*, 3 June 2016, https://www.nytimes.com/2016/06/04/world/europe/paris-flooding-seine-louvre.html.

11 Henry Fountain "Quick Analysis Finds Effect of Climate Change in French Floods" The *New York Times*, 10 June 2016, https://www.nytimes.com/2016/06/11/science/climate-change-french-floods.html.

12 While carbon dioxide is not the only so-called greenhouse gas that contributes to global warming, it will be the focus of this paper since it accounts for roughly 76% of human-caused emissions. Other greenhouse gases, such as methane, nitrous oxide, and fluorinated gases, are also significant in contributing to climate change and are important for understanding and fighting climate change. See https://www.nrdc.org/stories/greenhouse-effect-101#gases for more on other greenhouse gases.

13 "Industrial Revolution." *Encyclopedia Britannica*, July 21, 2021, https://www.britannica.com/event/Industrial-Revolution.

rates; the development of new machines (e.g., the power loom and steam engines) were dependent on coal or other fossil fuels. While these inventions revolutionized the manufacturing processes, they also revolutionized the way humans lived in the world: by burning fossil fuels.

Technology can also provide solutions to the problems it created. A vast array of technology that can help combat climate change exists—from coordinated initiatives to plant billions of trees, to CO2 scrubbers to fully electric cars—we need only utilize it. Technology can address climate change in several ways, including mitigating the effects of extreme weather, reducing the amount of CO2 released into the atmosphere, and removing CO2 from the atmosphere. Mitigating the effects of extreme weather caused by climate change might include making air conditioners and furnaces more readily available or investing in sea walls to protect the mainland from the rising sea levels. Reducing the amount of CO2 might include utilizing technologies that are more carbon-neutral on a small scale, such as a hybrid or fully electric car, using gas-powered lawn mowers less frequently or swapping them out for battery-powered ones[14], and large-scale carbon-neutral initiatives include capturing solar or wind energy for later use.

While many technologies exist, technologies that remove carbon from the atmosphere deserve a closer look. Two analysts from the International Energy Agency (IEA) recently published a piece about the importance of investing in measures to combat climate change. They discuss carbon capture, utilization, and storage (CCUS) technologies. They argue that thinking of CCUS as "too expensive" ignores the larger cost of doing nothing to combat climate change. In the United States "[i]n the coming decade, economic losses from extreme weather combined with the health costs of air pollution spiral upward to at least $360 billion annually."[15] The trillions of dollars that will be lost and spent in the wake of natural disasters caused by climate change could, instead, be used to invest in technologies that will help prevent the disasters from occurring. CCUS technology is the most expensive technology available; however, it is the most effective way to remove carbon from the atmosphere

14 While the electricity to charge these batteries likely comes from non-renewable sources, these products still produce less carbon dioxide since they are not burning gasoline.

15 Stephen Leahy, "Hidden Costs of Climate Change Running Hundreds of Billions a Year," *National Geographic*, 27 September 2017, https://www.nationalgeographic.com/science/article/climate-change-costs-us-economy-billions-report.

which would directly prevent climate change from progressing, and in some cases is the most appropriate way to neutralize the effects of carbon-heavy processes. For example, in cement production, "two-thirds of emissions are from chemical reactions related to heating limestone (rather than burning fossil fuels), [and] CCUS is currently the only scalable solution for reducing emissions."[16] In other circumstances, the use of CCUS technology is more cost effective: "in the iron and steel sector, production routes based on CCUS are currently the most advanced and least-cost low-carbon options. Incorporating CO2 capture raises estimated costs by less than 10%, while approaches based on electrolytic hydrogen can raise costs by 35-70%."[17] CCUS technology is less expensive than it was, and "governments and industry committed more than USD 4.5 billion" for CCUS technology.[18] This $4.5 billion investment is a fraction of the $360 billion/year expense of natural disasters. The IEA asserts "achieving net-zero [carbon] goals will be virtually impossible without CCUS."[19] This means, then, that more must be invested in this technology to neutralize our current carbon footprint, especially to buy more time to neutralize or remove the carbon already in the atmosphere.

The I.P.C.C.'s (Intergovernmental Panel on Climate Change)—a body formed by the World Meteorological Organization and the United Nations Environment Programme—most recent report reflects some of the same concerns about increasing frequency of intense storms, and expresses concerns about other climate events, including the role the increasing temperature of the earth (Figure 1).[20] The significant increase in surface temperature is concerning for several reasons, including its correlation with extreme periods of heat, flooding, and droughts.[21]

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16 Adam Baylin-Stern and Niels Berghout, "Is carbon capture too expensive?" *IEA*, 17 February 2021. https://www.iea.org/commentaries/is-carbon-capture-too-expensive.

17 Baylin, Berghout "Carbon."

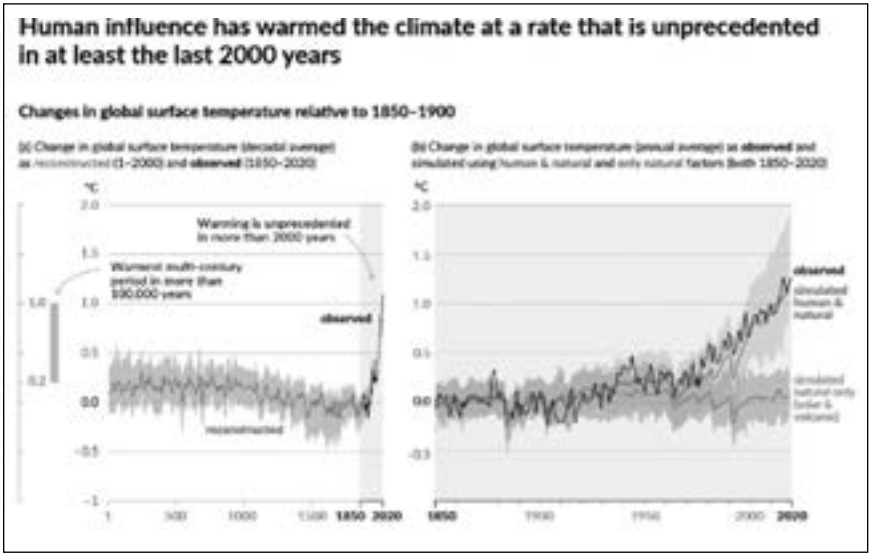
18 Byalin, Berghout "Carbon."

19 Byalin, Berghout "Carbon."

20 "Summary for Policymakers in: Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change," ed [Masson Delmotte, V., et. al.] *Intergovernmental Panel on Climate Change*, Cambridge University Press, In Press. 2021. https://www.ipcc.ch/report/ar6/wg1/#SPM.

21 IPCC "Summary" 10.

Figure 1 I.P.C.C Change in Global Surface Temperatures



The I.P.C.C. also provided five predictions for the future if this warming trend continues. Under the best-case-scenario (and one of the least likely scenarios) "carbon emissions will fall to zero during the next few decades, and new technologies will be invented to scrub tens of billions of tons of CO2 from the air" and the surface temperature will continue to rise by 1.6 degrees Celsius.[22] Under a more likely scenario, emissions will increase, the temperature will continue to rise sharply by 3.6 degrees Celsius by the end of the century.[23] Moreover, "[i]t is *virtually certain* that the land surface will continue to warm more than the ocean surface…, and [i]t is *virtually certai*n that the Arctic will continue to warm more than global surface temperatures, with *high confidence* above two times the rate of global warming."[24] The increase in water temperature, the melting of the ice caps, and resulting flooding can exacerbate the effects of warmer land temperatures.

These data sets point to one immutable fact: climate change is real, is happening quickly before our eyes, and will get worse if we do not take

22 Elizabeth Kolbert, "The U.N.'s Terrifying Climate Report" *The New Yorker*, August 23, 2021 issue. 15 August 2021.

23 I.P.C.C "Summary" 14.

24 I.P.C.C "Summary" 15, emphasis in original.

drastic action. As God's creatures, we are called to take action. Genesis 2:15 reads "God put the man in the… garden to work," with "to work" sometimes translated as "to till." Reading the man's responsibility as "to till" is significant because "[t]he Hebrew word translated 'to till' is actually a broader, more resonant word that means 'to serve' (*'bad*)."[25] Thinking, then, of "man's" (or, to be more gender inclusive: the people's) responsibility as serving the land dictates that people act in a way that is suitable, sustainable, and beneficial for both the land and humans. "The earthling has a vocation to work, a commission to till the ground in respectful, close relationship with it, to labor as an act of service to the earth itself."[26] Viewing the people's responsibility as one that fosters respect and close relationships between people and the earth, in which people serve the earth, everyone must protect the earth.

Notably, however, Gen 1:26 *seemingly* contradicts this vision of the respectful, nurturing human-earth relationship: "Then God said, 'Let us make humankind in our image, according to our likeness; and let them have dominion over the fish of the sea, and over the birds of the air, and over the cattle, and over all the wild animals of the earth, and over every creeping thing that creeps upon the earth."[27] Here, the mandate (or at least expectation) is humans will have "dominion" over other aspects of creation. In the English language, dominion implies a domination, a control, a power over someone or something else; the word "dominion" "does not convey the subtleties of the Hebrew, with its connotations of shepherding, kinship, and communal power."[28] The use of the word "dominion" seems to connote a power over creation when, in reality, it fails to convey intricacies of the Hebrew language; incorporating these connotations of "dominion" in Hebrew aligns the command of "dominion" with the command of "work." Both commands signal humans cannot treat the earth with reckless abandon, stripping the land and water of resources.

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25 Kathleen O'Connor, *Smyth and Helwys Bible Commentary: Genesis* 1-25A, (Smyth and Helwys Publishing: Macon), 2018, 51.

26 O'Connor *Commentary* 51.

27 NRSV.

28 Debra Dean Murphy, "Reading Genesis in a Dying World." *The Christian Century* 136, no. 22 (October 23, 2019): 51. https://search-ebscohost-com.ezproxy.csbsju.edu/login.aspx?direct=true&db=a6h&AN=ATLAiGU0191129001456&site=ehost-live&scope=site.

Pope Francis echoes this sentiment that humans have distorted the call to have "dominion" over the earth. In *Laudato Si'* Pope Francis discusses several aspects of climate change, ministerial responses, Biblical support for climate activism, and more, including how sin has disrupted our Biblical call to care for the earth. This "distortion" resulted in "the originally harmonious relationship between human beings and nature [becoming] conflictual."[29] Pope Francis blames this conflict and distortion on a rupture of the relationships between humans and God, humans and humans, and humans and the earth. This ruptured relationship, created by our sinfulness, has led us to an understanding of "dominion" which "has encouraged the unbridled exploitation of nature by painting [people] as domineering and destructive by nature."[30] Pope Francis reiterates the importance of an accurate interpretation of "keeping" the land: an interpretation that "means caring, protecting, overseeing, and preserving."[31] This call to oversee and preserve refers to the practicality of how we use the land. Our relationship with the land should be one of "mutual responsibility between human beings and nature. Each community can take from the bounty of the earth whatever it needs for subsistence, but it also has the duty to protect the earth and to ensure its fruitfulness for coming generations."[32] This need to preserve the earth for future generations is one area in which we fail to fulfill our responsibility. As humans drastically contribute to the warming of the earth (cf. Figure 1), the earth will become less inhabitable with each generation, if not with each decade.

Our call to care for the earth, to ensure its fruitfulness, applies not only to how individuals use the land but also to how we as individuals call for change from our community. Pope Francis offers dialogue as a response through five avenues: on the environment in the international community, for new national and local policies, transparency in decision-making, between politics and economy and human fulfilment, and religions in dialogue with science. Pope Francis advocates for dialogue on the international scale: "there has been a growing conviction that our planet is a homeland and that humanity

29 Pope Francis, *Laudato Si'* in *Catholic Social Thought: Encyclicals and Documents from Pope Leo XIII to Pope Francis* (Third Revised Edition), edited by David J. O'Brien, Thomas A. Shannon, (New York: Maryknoll), 2016. Page 612, paragraph 66.

30 *Laudato Si'* paragraph 67.

31 *Laudato Si'* paragraph 67.

32 *Laudato Si'* paragraph 67.

is one people living in a common home. An interdependent world not only makes us more conscious of the negative effects of certain lifestyles and models of production and consumption which affect us all; more importantly, it motivates us to ensure that solutions are proposed from a global perspective, and not simply to defend the interests of a few countries."[33] This interdependence and working for a common goal would lead the world to a more sustainable and ecologically just society. Working as a global society to combat climate change only makes sense; it is a global problem, created by (mostly developed) nations in the world, and it must be addressed with a global perspective.

Pope Francis goes on to emphasize that while a global perspective is imperative for combatting climate change, it must also be addressed on a local and national scale. Ecological injustices affect not only poorer countries but also the poor within the same country. Even in the United States, as many as 1 in 3 people experience the effects of climate change.[34] Currently, however, local (and even national) politics are focused on short-term problems that will allow the candidates to be re-elected or to overturn the incumbent; this "myopia of power politics delays the inclusion of a far-sighted environmental agenda within the overall agenda of governments. Thus we forget that 'time is greater than space', that we are always more effective when we generate processes rather than holding on to positions of power."[35] Pope Francis advocates for rethinking the way we approach the climate crisis: approach the conversation with a global mindset and a growth mindset that will foster innovation and change in small, national, and international communities.

Throughout these conversations, Pope Francis calls for transparency in the decision-making process, including incorporating concerns with climate change with all new proposals—from new businesses to parks. Given the broad effects of climate change, Pope Francis also calls for the conversation on climate change and ecological planning to "be linked to a study of working conditions and possible effects on people's physical and mental health, on the local economy and on public safety."[36] Given the importance of the economy

33 *Laudato Si'* paragraph 164.
34 Gore, "Advancing."
35 *Laudato Si'* paragraph 178.
36 *Laudato Si'* paragraph 183.

with issues of climate change, Pope Francis emphasizes the "need for politics and economics to enter into a frank dialogue in the service of life, especially human life."[37] No longer can one think of politics and economics as separate from human flourishing but that economic and political policies are integral to human flourishing (or failing).

Finally, Pope Francis highlights the importance of religions engaging in these conversations with science. Our religious ethics should guide our conversations on ecological justice and proposals to fight climate change, in part because "[a]ny technical solution which science claims to offer will be powerless to solve the serious problems of our world if humanity loses its compass, if we lose sight of the great motivations which make it possible for us to live in harmony, to make sacrifices and to treat others well."[38] One must note that, despite the mountain of evidence, some—especially those who practice certain religions—still deny the reality of climate change. For instance, only 71% of Catholics believe the earth is getting warmer, only 47% believe the warming trend is caused by human activity, and 48% believe the warming is a serious problem.[39] These numbers vary only slightly from the general public (68%, 45%, and 46% respectively), but in a religion where people are called to care for the earth, to value and respect the earth's resources, this similarity in numbers is interesting. There is a large divide, however, between what Catholic Democrats believe compared to Catholic Republicans: 64% of Catholic Democrats believe global warming is "a very serious problem" compared to the remarkably low 24% of Catholic Republicans who say the same.[40] This divide is important to understand for the sake of Catholic communities and for political policies.

Where Pope Francis advocates for expanded research into and use of renewable energy sources and doing more to protect our common home—as governments and individual citizens, on a local and international scale—not every Christian tradition shares this belief. A 2010 study revealed white evangelical Protestants are the least likely to believe human activity contributes to global warming when compared with Black and Hispanic

37 *Laudato Si'* paragraph 189.
38 *Laudato Si'* paragraph 200.
39 "Catholics Divided over Global Warming," *Pew Research Center*, 16 June 2015.
40 Pew, "Catholics Divided."

Protestants, and white, Black, and Hispanic Catholics and non-religious.[41] Where 50% of overall U.S. adults believe human activity contributes to global warming, only 28% of White evangelicals do; conversely, where 23% of U.S. adults believe the warming is part of a natural pattern, 33% of white evangelicals do.[42] This divide between the beliefs of U.S. adults generally and white evangelical Protestants indicates the difficulty we will face in attempting to address climate change. Granted, Protestants do not recognize the Pope's authority (and neither do some Catholics), but this speaks to the idea that a not insignificant portion of the population, about 1/3 of U.S. adults, believe climate change is not caused by human activity, does not need to be addressed, and/or that the government is doing too much to regulate environmental concerns. [43] Recognizing this segment of the population who denies the science that supports climate change and will likely resist climate activism is important in moving forward with legislation, plans, and even conversations. Pope Francis lays out several paths for moving forward (discussed above), but these all assume the vast majority of the population would be willing to have the necessary conversations, rethink climate issues on a local and global scale, and, perhaps most importantly, believe humans have a responsibility to combat our effect on the earth for the sake of everyone who inhabits it.

Climate change exists and affects inhabitants of the world differently. Rising sea levels due to melting polar ice caps force people on the Carteret Islands to flee their ancestral lands and take refuge in other countries. People along the coast of the United States continue to experience "once-in-a-lifetime" and record-breaking storms; people in the Midwest experience a longer growing season offset by disastrous weather events. The earth is warming more rapidly with human intervention than it would without, and in the years since the Industrial Revolution began, the warming trend continues to increase exponentially. The number of climate refugees continues to increase, and two out of three U.S. adults support the government doing

41 "Religion and Views on Climate and Energy Issues," *Pew Research Center*, 22 October 2015, https://www.pewresearch.org/science/2015/10/22/religion-and-views-on-climate-and-energy-issues/.

42 Pew, "Religion and Climate."

43 Alec Tyson and Brian Kennedy, "Two-Thirds of Americans think Government Should Do More on Climate." *Pew Research Center*, 23 June 2020, https://www.pewresearch.org/science/2020/06/23/two-thirds-of-americans-think-government-should-do-more-on-climate/.

more to regulate environmental issues. As Catholics, the Pope calls us to act to combat the effects of climate change out of care for our common home; yet, Catholics and non-Catholics alike weaponize the Biblical responsibility to have "dominion" over the land as an excuse to use the earth's resources with reckless abandon. In the technological age, we have the tools to utilize renewable energy and neutralize the carbon in the air, but we must act now.

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