

# SACRIFICE ZONES

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*Thousands of acres of land have been lost to climate change. Additional thousands, if not millions, of acres will become uninhabitable because of floods, droughts, heatwaves, wildfires, and a host of other known and unknown climate impacts. Yet people continue to build in such areas, adding homes, businesses, infrastructure, and so on, guaranteeing that state and local governments will be perpetually engaged in emergency management and salvage operations into the indefinite future. From a climate change perspective, such construction reduces our resiliency while it increases our vulnerability to the demands of climate change. To prevent this extremely dangerous and expensive future, this Article proposes a new land use approach to regulate highly at-risk areas. Applying several existing zoning tools in new ways, such as overlay zones and floating zones, and one newer zoning tool, called environmental justice zones, this Article proposes "Sacrifice Zones." A Sacrifice Zone identifies areas where new and existing construction will exacerbate already dangerous climate conditions. Within these areas, certain regulations apply, such as a moratorium on building, the relocation of existing residents, and regenerative tools to limit dangerous and expensive development while building adaptive capacities. Designating a Sacrifice Zone can help enhance, restore, and regenerate ever-decreasing biodiversity and wildlife habitats, while moving toward a more sustainable and environmentally safe future.*

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## INTRODUCTION

Climate change is causing extensive land loss, requiring communities to adapt.<sup>1</sup> Such loss is coming in a variety of known and unknown forms. Communities, for example, are already losing land to sea level rise, floods, heat,

<sup>1</sup> See UNITED NATIONS CONVENTION TO COMBAT DESERTIFICATION, GLOBAL LAND OUTLOOK: LAND RESTORATION FOR RECOVERY AND RESILIENCE 2 (2d ed. 2022) [hereinafter U.N. GLOBAL LAND OUTLOOK] (Explaining that “on average[,] 20% of global land is degraded to some extent[,] . . . [and] land cover changes [have] suggested a net loss in natural and semi-natural areas,” which requires “collective action to meaningfully slow or reverse.”); see also *Land—The Planet’s Carbon Sink*, UNITED NATIONS, <https://www.un.org/en/climatechange/science/climate-issues/land#> [<https://perma.cc/DJ2U-9MHS>] (“[A] changing climate . . . exacerbates land degradation through drought, desertification and other extreme weather events that are increasing in frequency and intensity as the planet gets warmer. . . . The good news is that there are ways to improve land degradation.”).

and wildfires.<sup>2</sup> It is conceivable to envision a future in which even more lands become lost or unsuitable for habitation because of additional factors related to climate change, such as invasive species and inadequate water resources.<sup>3</sup>

<sup>2</sup> See NAT'L OCEANIC & ATMOSPHERIC ADMIN. OFF. OF OCEAN & COASTAL RES. MGMT, ADAPTING TO CLIMATE CHANGE: A PLANNING GUIDE FOR STATE COASTAL MANAGERS 12 (2010) ("[R]ising sea levels will inundate coastal wetlands, barrier islands, and other low-lying lands . . . [u]ltimately, . . . mean[ing] land and ecosystem loss."); see also *A Closer Look: Land Loss Along the Atlantic Coast*, ENV'T PROT. AGENCY, <https://www.epa.gov/climate-indicators/atlantic-coast> [<https://perma.cc/VRX7-N9WW>] ("Roughly 20 square miles of dry land and wetland were converted to open water along the Atlantic coast between 1996 and 2011."); Md. Sariful Islam et al., *Evaluation of Predicted Loss of Different Land Use and Land Cover (LULC) Due to Coastal Erosion in Bangladesh*, FRONTIERS ENV'T SCI., Apr. 2023, at 1, 2 ("Due to coastal erosion, people living [o]n the coast lose their valuable lands and properties[;] . . . storm, rainfall and flood, increased freshwater input to the marine systems and lengthening open water periods are influencing coastal erosion . . . in addition to the rising sea level."); Patrick Bigger & Sara Nelson, *Fixing the Forests Problem in the US*, NONPROFIT Q. (May 17, 2023), <https://nonprofitquarterly.org/fixing-the-forests-problem-in-the-us/> [<https://perma.cc/EF8L-PHGG>] (Stating that "[t]he catastrophic 2020 wildfires in California burned nearly 4.4 million acres," which "w[ill] not become more resilient on their own."); Maziar Motamedi, *Iran's Surprise 'Unprecedented Heat' Shutdown Raises Questions*, AL JAZEERA (Aug. 3, 2023), <https://www.aljazeera.com/news/2023/8/3/iran-surprise-unprecedented-heat-shutdown-raises-questions#> [<https://perma.cc/5DPU-GM47>] (noting the rising heat has caused the government offices, banks, capital markets, and other businesses to close for several days); Linda Poon, *Phoenix's Rapid Growth Magnified Its Vulnerability to Heat*, BLOOMBERG (July 28, 2023), <https://www.bloomberg.com/news/articles/2023-07-28/in-phoenix-record-heat-is-being-fueled-by-urban-spraw> [<https://perma.cc/9Q2T-9W47>] ("[T]emperatures in the city have peaked above 110F for a record-shattering 29 consecutive days—and counting. Daily lows have lingered in the 90s, settling at a record 97F on July 19 as nighttime provides little relief.").

<sup>3</sup> See UNITED NATIONS OFF. FOR THE COORDINATION OF HUMANITARIAN AFFS. ET AL., EXTREME HEAT: PREPARING FOR THE HEATWAVES OF THE FUTURE 34 (2022) ("One study of South Asia's densely populated agricultural regions found that heat and humidity could exceed human survivability thresholds by the late twenty-first century under business-as-usual scenarios, including in Indian cities such as Lucknow and Patna."); see also Radley Horton & Alex de Sherbinin, *Which Areas Will Climate Change Render Uninhabitable? Climate Models Alone Cannot Say*, COLUM. CLIMATE SCH. (June 17, 2021), <https://news.climate.columbia.edu/2021/06/17/uninhabitable-regions-climate-models/> [<https://perma.cc/P43Q-B8A>] (Explaining that "[s]cientists . . . rely on global climate models . . . to anticipate which regions of the world will face . . . droughts, and other hardships in the future . . . provid[ing] a general sense of which regions are likely to be high-risk 'hotspots,' and therefore potentially uninhabitable in the future" despite "th[is] approach [not] always [being] welcomed by communities at risk."); INT'L UNION FOR CONSERVATION OF NATURE, INVASIVE ALIEN SPECIES AND CLIMATE CHANGE 1, 2 (Feb. 2021) (Describing how "'invasive' [species] . . . negatively impact native biodiversity, as well as ecosystem services on which humans depend[,]. . . threat[en] . . . global food security and livelihoods, . . . [and] reduce the resilience of natural habitats."); Frederik Pleitgen et al., *The Middle East Is Running Out of Water, and Parts of It Are Becoming Uninhabitable*, CNN (Aug. 22, 2021, 12:08 AM), <https://www.cnn.com/2021/08/22/middleeast/middle-east-climate-water-shortage-iran-urmia-intl/index.html> [<https://perma.cc/44C2-ADFF>] ("The consequences of water becoming even scarcer are dire: Areas could become uninhabitable; tensions over how to share and manage water resources like rivers and lakes could worsen; more political violence could erupt.").

Already some places are too hot, too flooded, or too dry to sustain human life. For example, some areas are already seeing temperatures so high that even at night they do not go below 90 degrees Fahrenheit.<sup>4</sup> In summer 2023, Phoenix, Arizona, experienced almost twenty-five consecutive days with temperatures at or above 110 degrees Fahrenheit.<sup>5</sup> Potentially more disturbing, for at least fourteen days evening temperatures did not go below 90 degrees Fahrenheit—giving no relief from the extensive heat.<sup>6</sup> Similarly, Tucson, Arizona, experienced almost forty days of at or above 100 degrees Fahrenheit.<sup>7</sup>

Yet, some of these places experiencing heat, floods, droughts, or wildfires, such as Phoenix and Tucson, remain some of the fastest growing residential markets. From 2021 to 2022, “the nation’s most flood-prone counties experienced a net influx of about 400,000 people”—an over 100 percent increase from the two years prior to 2021.<sup>8</sup> Further, “US counties with the highest risk of wildfire saw 446,000 more people move in than out over the last two years (a 51% increase from 2019 and 2020). And the counties with the highest heat risk registered a net influx of 629,000, a 17% uptick.”<sup>9</sup>

Importantly, according to at least one economist, it is not that climate change is not a concern—it is that *affordability* is driving the move.<sup>10</sup>

It’s not that people don’t care about climate dangers, says Redfin Deputy Chief Economist Daryl Fairweather. It’s that concerns about affordability are primary and dominate everything else. . . . Popular destinations such as Florida, Arizona, Utah and California’s Inland Empire can have cheaper land costs for builders and, in some cases, more forgiving building codes, translating to lower new-home prices, but often the climate risks are higher than for older homes. Redfin found in a separate analysis that 55% of homes built so far this decade face wildfire risk and 45% face drought risk. By comparison, just 14% of homes built from 1900 to 1959 are at risk for fire and 37% for drought.<sup>11</sup>

<sup>4</sup> Kenton Gewecke & Morgan Winsor, *US Heat Wave Lingers in Southwest, Intensifies in Midwest*, ABC NEWS (July 24, 2023, 5:02 AM), <https://abcnews.go.com/US/us-heat-wave-latest-forecast/story?id=101598235> [<https://perma.cc/9CCT-LC5K>] (Stating that the “last 21 days on Earth have been the hottest on record.”); *see also* Alan Buis, *Too Hot to Handle: How Climate Change May Make Some Places Too Hot to Live*, NASA (Mar. 9, 2022, 11:41 AM), <https://climate.nasa.gov/explore/ask-nasa-climate/3151/too-hot-to-handle-how-climate-change-may-make-some-places-too-hot-to-live/> [<https://perma.cc/HCH4-3NGZ>] (“Extreme levels of heat stress have more than doubled over the past 40 years.”).

<sup>5</sup> Gewecke & Winsor, *supra* note 4.

<sup>6</sup> *Id.*

<sup>7</sup> *Id.*

<sup>8</sup> Leslie Kaufman, *Americans Are Moving Toward Climate Danger in Search of Cheaper Homes*, BLOOMBERG (July 24, 2023, 4:00 AM), <https://www.bloomberg.com/news/articles/2023-07-24/americans-are-moving-toward-climate-danger-in-search-of-cheaper-homes> [<https://perma.cc/Y9J7-LGS8>].

<sup>9</sup> *Id.*

<sup>10</sup> *Id.*

<sup>11</sup> *Id.*

In short, the current regulatory system applicable to development is actively engaged in putting people, many with limited financial means, into the most climate risk.

Local communities can and must adapt to these evolving conditions by employing diverse strategies aimed at mitigating environmental and social risks and minimizing potential damage. There are many steps local governments might take to adapt to changing circumstances.<sup>12</sup> As one of local governments' most important powers, amending zoning laws is one step local governments might take. However, zoning laws—and laws generally—are typically stagnant.<sup>13</sup> Laws tend to be static, going through extensive debates and enactment processes that rely on existing, and sometimes outdated, information.<sup>14</sup> Once passed, they often remain unchanged despite their age.<sup>15</sup> This stagnation is particularly concerning in the context of zoning, because it directly shapes the physical environment we inhabit. Zoning laws determine the appearance and atmosphere of cities and towns, influencing how we navigate them and who we encounter in our daily lives.<sup>16</sup> Thus, a stagnant zoning law results in a stagnant physical world.

<sup>12</sup> See U.S. AGENCY FOR INT'L DEV., CLIMATE STRATEGY 2022–2030 1, 13, 15, 17, 20, 29 (2022) (describing climate resilience strategies, including sustainable land use planning, “climate resilient” infrastructure, “[e]ducation systems with strong emergency response capacity,” early warning learning continuity, and “disaster risk insurance”); see also UNITED NATIONS WATER, THE UNITED NATIONS WORLD WATER DEVELOPMENT REPORT 2018: NATURE-BASED SOLUTIONS FOR WATER 4–6, 55, 100 (2018) [hereinafter U.N. WATER REPORT] (describing water management solutions, including green infrastructure, “[w]etland restoration and creation,” and an “[e]nabling . . . regulatory and legal environment”).

<sup>13</sup> Or as Dartmouth University Professor of Economics and Robert C. and Hilda Hardy Professor of Legal Studies, Emeritus, William A. Fischel has stated, “Zoning is designed not to change very much.” Nathaniel Meyersohn, *The Invisible Laws That Led to America's Housing Crisis*, CNN, <https://www.cnn.com/2023/08/05/business/single-family-zoning-laws/index.html> [https://perma.cc/D4TF-BVPH] (Aug. 5, 2023, 3:12 AM).

<sup>14</sup> See *The Legislative Branch*, WHITE HOUSE, <https://www.whitehouse.gov/about-the-white-house/our-government/the-legislative-branch/> [https://perma.cc/6NVE-KRXA] (describing the lengthy legislative process); see also Erin Kelly, *RURAL Act: Why Popular, Bipartisan Legislation Can Face Hurdles in Congress*, COOP. (Nov. 25, 2019), <https://www.cooperative.com/news/Pages/rural-act-why-popular-bipartisan-legislation-faces-hurdles-in-congress.aspx> [https://perma.cc/QX7F-69UP] (“It’s common for bills to be considered in several sessions of Congress before they are passed.”).

<sup>15</sup> Philip K. Howard, *Obsolete Law—The Solutions*, ATLANTIC (Mar. 30, 2012), <https://www.theatlantic.com/national/archive/2012/03/obsolete-law-0151-the-solutions/255141/> [https://perma.cc/U3P2-WJU7] (“America’s massive, convoluted, rigid legal structure makes it almost impossible for government to do this job sensibly and within budget. Laws are piled upon laws, making adaptation essentially illegal. Congress doesn’t clean out the stables in part because of a constitutional flaw—our founders didn’t anticipate that it would be much harder to repeal a law than passing it in the first place. Bureaucracies don’t clean out regulations for the additional reason that the agencies become inbred, and are run by people who do things this way because that’s how it’s always been done.”).

<sup>16</sup> See Maya Brennan, et al., *How Zoning Shapes Our Lives*, HOUS. MATTERS (June 12, 2019), <https://housingmatters.urban.org/articles/how-zoning-shapes-our-lives> [https://per

Indeed, despite the static nature of the laws and physical infrastructure we have created, the world is experiencing significant changes. Human activities, particularly the emission of greenhouse gases, have contributed to altering the climate system.<sup>17</sup> This alteration has led to observable shifts in climate patterns, such as temperature increases, changing precipitation patterns, and rising sea levels.<sup>18</sup>

In its 2023 6th *Synthesis Report*, the Intergovernmental Panel on Climate Change (“IPCC”) noted “[w]idespread and rapid changes in the atmosphere, ocean, cryosphere and biosphere.”<sup>19</sup> Specifically, the IPCC noted temperatures increasing each of the last four decades—those decades have been successively warmer than any since records began in 1850.<sup>20</sup> There has been a 0.99 degree Celsius surface temperature increase between 2001–2020 and 1850–1900,<sup>21</sup> and a 1.1 degree Celsius surface temperature increase between 2011–2020 and 1850–1900.<sup>22</sup> In addition, average precipitation over land has likely increased since 1950, and storms have shifted toward the poles.<sup>23</sup> Ice sheets and glaciers are melting, with the latter’s retreat having no comparison in the last 2000 years.<sup>24</sup> Oceans too have been warming at “unprecedented”

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ma.cc/2FD9-BE4M] (“Zoning rules dictate more than just how we can use and build on land. They also shape our communities and our lives. Land use laws determine where we can find housing, schools, and parks—and who has access to them.”).

<sup>17</sup> INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2023: SYNTHESIS REPORT 4 (2023) [hereinafter IPCC AR6 SYNTHESIS REPORT]. “It is unequivocal that human influence has warmed the atmosphere, ocean and land. Widespread and rapid changes in the atmosphere, ocean, cryosphere and biosphere have occurred.” *Id.* at 46, 47 tbl.2.1.

<sup>18</sup> *Id.* at 5; *see also* U.N. WATER REPORT, *supra* note 12, at 17 (“Climate change will affect water quality in various ways. For example, changes in spatial and temporal patterns and variability of precipitation affect surface water flows and hence dilution effects, while increases in temperature cause higher evaporation from open surfaces and soils, and increased transpiration by vegetation potentially reduce water availability.”).

<sup>19</sup> IPCC AR6 SYNTHESIS REPORT, *supra* note 17, at 5.

<sup>20</sup> *Id.* at 43 fig.2.1(c).

<sup>21</sup> *Id.* at 42.

<sup>22</sup> *Id.*

<sup>23</sup> *Id.* at 48, 50 fig.2.3(a); T. Tamarin & Y. Kaspi, *The Poleward Shift of Storm Tracks Under Global Warming: A Lagrangian Perspective*, 44 GEOPHYSICAL RSCH. LETTERS 10,666, 10,666 (2017) (“[S]torm tracks and the corresponding maximum of EKE [eddy kinetic energy] are likely to expand upward and shift poleward as a result of climate change.”).

<sup>24</sup> IPCC AR6 SYNTHESIS REPORT, *supra* note 17, at 46, 69 (“Human influence is *very likely* the main driver of the global retreat of glaciers since the 1990s and the decrease in Arctic sea ice area between 1979–1988 and 2010–2019. . . . Additional warming . . . is projected to further amplify permafrost thawing and loss of seasonal snow cover, glaciers, land ice and Arctic sea ice.”); Olga N. Solomina et al., *Glacier Fluctuations During the Past 2000 Years*, 149 QUATERNARY SCI. REVS. 61, 83 (2016) (“[T]he current globally widespread glacier retreat is unusual in the context of the past two millennia . . . .”); *Vital Signs: Ice Sheets*, NASA, <https://climate.nasa.gov/vital-signs/ice-sheets/#> [https://perma.cc/7DS7-Z2SA] (“Antarctica is losing ice mass (melting) at an average rate of about 150 billion tons per year, and Greenland is losing about 270 billion tons per year, adding to sea level rise.”).

“Sea ice in the Arctic has decreased dramatically since the late 1970s, particularly in summer and autumn. Since the satellite record began in 1978, the yearly minimum Arctic sea

rates, and their acidification has been increasing.<sup>25</sup> Globally, oceans continue to rise, increasing by 0.20 meters between 1901 and 2018.<sup>26</sup> Importantly, the IPCC's 6th *Synthesis Report* also stated that greenhouse gases are increasing, and that insufficient action has been taken since the IPCC's measurements and sounding of alarm in the 5th *Synthesis Report*, published approximately nine years earlier.<sup>27</sup>

These climate changes have cascading effects on ecosystems, leading to what is known as a trophic cascade.<sup>28</sup> Changes in the climate and other ecosystem variables can impact components of other ecosystems, including plants and animals.<sup>29</sup> Disruptions in one part of the system can cascade or have ripple effects throughout other systems, decreasing resilience and

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ice extent (which occurs in September) has decreased by about 40%." *Why Is Arctic Sea Ice Decreasing While Antarctic Sea Ice Is Not?*, ROYAL SOC'Y, <https://royalsociety.org/news-resources/projects/climate-change-evidence-causes/question-12/> [https://perma.cc/LA3R-KPJ2] (Mar. 2020).

<sup>25</sup> IPCC AR6 SYNTHESIS REPORT, *supra* note 17, at 46 ("It is *virtually certain* that the global upper ocean (0–700m) has warmed since the 1970s and *extremely likely* that human influence is the main driver. . . . It is *virtually certain* that human-caused CO<sub>2</sub> emissions are the main driver of current global acidification of the surface open ocean."). There is high confidence that oxygen levels have dropped in many upper ocean regions since the mid-20th century and it is extremely likely that human influence contributed to this drop. *Id.* at 47 tbl.2.1.

<sup>26</sup> *Id.* at 46.

<sup>27</sup> *Id.* at 42, 52 (Finding that "[g]lobal greenhouse gas emissions have continued to increase over 2010–2019," and while "[g]lobal tracked finance for mitigation and adaptation has seen an upward trend since AR5, [it] falls short of needs."). "Concentrations of CH<sub>4</sub> and N<sub>2</sub>O have increased to levels unprecedented in at least 800,000 years (*very high confidence*), and there is *high confidence* that current CO<sub>2</sub> concentrations are higher than at any time over at least the past two million years." *Id.* at 42.

<sup>28</sup> See U.N. GLOBAL LAND OUTLOOK, *supra* note 1, at 2 ("Global warming has altered geographic distributions, seasonal dynamics, and the population characteristics of many plants and animals. Keystone species that have or will become extinct increase the risk of trophic cascades in food webs, ecosystem transformation or collapse, and the permanent loss of essential goods and services." (citation omitted)). See generally Ahsen Soomro, *What is Trophic Cascade? Various Types, Effects and Examples*, ENV'T BUDDY, <https://www.environmentbuddy.com/endangered-wildlife/trophic-cascade-types-examples/> [https://perma.cc/GZK9-4ZRZ] ("A trophic cascade is a side-effect when a trophic level (species) of the ecosystem is reduced or removed. This triggers a cascade (series of events/effects on other species) that changes the balance of the entire ecosystem.").

<sup>29</sup> See IPCC AR6 SYNTHESIS REPORT, *supra* note 17, at 3 (recognizing "the interdependence of climate, ecosystems and biodiversity"); see also U.N. GLOBAL LAND OUTLOOK, *supra* note 1, at 2 ("Biodiversity underpins the delivery of ecosystem services that sustain all life on Earth. Globally, the survival of many species is threatened by human encroachment, over-exploitation, and climate change."); Soomro, *supra* note 28 (stating that "[e]cosystems are well structured and highly balanced through a number of ecological interactions").

biodiversity.<sup>30</sup> These cascading effects can result in substantial ecological transformations and challenge the sustainability of local communities.<sup>31</sup>

While zoning laws are stagnant, they do not have to be. This Article argues that “Sacrifice Zones” could be a constructive local legal approach to address climate risks and introduce flexibility into zoning laws.<sup>32</sup> The Article highlights aspects of Sacrifice Zones in terms of aiding adaptation to climate change. Sacrifice Zones serve not only as a means to adapt to climate risks but also as a platform for restoring, regenerating, and enhancing biodiversity. The aim is to provide future generations with improved or expanded ecosystem services beyond the current available offerings.

Others have detailed the connection between climate change and biodiversity.<sup>33</sup> Suffice it to say here that building back nature, habitats, and biodiversity (as opposed to continuing to reduce them) helps both mitigate greenhouse gas emissions and adapt to greenhouse gas effects.<sup>34</sup>

<sup>30</sup> See Soomro, *supra* note 28 (“The ecological species interactions keep entire ecosystems balanced. . . . [S]uppressing their numbers or changing their behavior . . . results in an ecological imbalance.”); see also Jonathan Rosenbloom, *Fifty Shades of Gray Infrastructure: Land Use and the Failure to Create Resilient Cities*, 93 WASH. L. REV. 317, 339 (2018) (Stating that the “definition of resilience has been found to vary ‘considerably across academic and practitioner fields.’” (quoting Dan Sage & Chris Zebrowski, *Resilience and Critical Infrastructure: Origins, Theories and Critiques*, in INTERNATIONAL SECURITY HANDBOOK 1, 1–2 (Palgrave MacMillan et al. eds., 2016))); *infra* Part I (describing various definitions of “resilience”). For instance, over-fishing of cod and other fish species commercially available in the North Atlantic Ocean has caused an increase in smaller fish, like the pelagic fish population, that would otherwise be eaten by cod, snow crab, shrimps and other predatory fish in the marine ecosystem. These events led to reduction in the population of herbivorous zooplankton, which is consumed by pelagic fishes, and that consequently led to an increase in the population of phytoplankton due to reduced competition. This is what we call a *cascading effect*. *Infra* Part I.

<sup>31</sup> See IPCC AR6 SYNTHESIS REPORT, *supra* note 17, at 5 and accompanying text.

<sup>32</sup> For purposes of this Article, the capitalized term “Sacrifice Zone” refers to the new concept presented here, while the lower case “sacrifice zone” refers to existing definitions described in Part III.

<sup>33</sup> See, e.g., *Climate Change and Biodiversity Loss Should Be Tackled Together*, EUR. COMM’N, <https://ec.europa.eu/research-and-innovation/en/horizon-magazine/climate-change-and-biodiversity-loss-should-be-tackled-together> [<https://perma.cc/ZN4L-JNKP>] [hereinafter *Tackled Together*] (“In a two-way process, climate change is one of the main drivers of biodiversity loss, but destruction of ecosystems undermines nature’s ability to regulate greenhouse gas (GHG) emissions and protect against extreme weather, thus accelerating climate change and increasing vulnerability to it.”); Holly Chetan-Welsh & Lisa Hendry, *How Are Climate Change and Biodiversity Loss Linked?*, NAT. HIST. MUSEUM, <https://www.nhm.ac.uk/discover/how-are-climate-change-and-biodiversity-loss-linked.html> [<https://perma.cc/3HVM-AN2G>] (“Just as climate change alters habitats and ecosystems, loss of biodiversity contributes to climate change and intensifies its effects.”); U.N. GLOBAL LAND OUTLOOK, *supra* note 1, at 8 fig.1.3 (detailing “[f]eedback loops between land degradation, climate change, and biodiversity loss”).

<sup>34</sup> *Biodiversity—Our Strongest Natural Defense Against Climate Change*, UNITED NATIONS, <https://www.un.org/en/climatechange/science/climate-issues/biodiversity> [<https://perma.cc/CE6F-H7LJ>] [hereinafter U.N. *Biodiversity*] (“When human activities produce greenhouse gases, around half of the emissions remain in the atmosphere, while the other



Human consumption today is leading to a loss of flora and fauna at a rate previously unseen.<sup>35</sup> As one article noted, “one million species are threatened with extinction and the health of the ecosystems on which we depend is deteriorating more rapidly than ever.”<sup>36</sup> This loss exacerbates climate impacts, creating dangerous conditions and unknown feedback loops.<sup>37</sup> The time for protecting or conserving lands and habitats has past.<sup>38</sup> We are now in a time of regeneration or restoration.<sup>39</sup> Restoration is about bringing back what was lost. Stopping further deterioration and bringing back even a fraction of what was lost would dramatically help stave off some of the worst effects of climate

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half is absorbed by the land and ocean. These ecosystems—and the biodiversity they contain—are natural carbon sinks, providing so-called nature-based solutions to climate change.” (internal citations omitted)); *see also* Chetan-Welsh & Hendry, *supra* note 33 (“If woodlands, peat bogs, grasslands and other natural environments in the UK were restored, . . . they could lock away more than a tenth of the country’s greenhouse gas emissions a year.”).

<sup>35</sup> *See Why Restoring Nature Is the Key to Securing Our Future and the Planet’s*, CLIENTEARTH (June 21, 2023), [https://www.clientearth.org/latest/latest-updates/news/why-restoring-nature-is-the-key-to-securing-our-future-and-the-planet-s/?utm\\_source=twitter](https://www.clientearth.org/latest/latest-updates/news/why-restoring-nature-is-the-key-to-securing-our-future-and-the-planet-s/?utm_source=twitter) [https://perma.cc/YN8F-6H2W] [hereinafter CLIENTEARTH] (“Because nature is free, we often take it for granted and overexploit it. We clear forests, overfish oceans, pollute rivers and build over wetlands without taking into account the impact this will have. By failing to take care of our natural world, we are now facing a biodiversity crisis and putting our very existence at risk . . . [and] we are losing nature at an unprecedented rate.”); *see also* U.N. *Biodiversity*, *supra* note 34 (Explaining how “[t]he main driver of biodiversity loss remains humans’ use of land” and now “nature is in crisis” as “one million species are threatened with extinction, . . . [i]rreplaceable ecosystems like parts of the Amazon rainforest are turning from carbon sinks into carbon sources due to deforestation[,] [a]nd 85 per cent of wetlands, such as salt marshes and mangrove swamps which absorb large amounts of carbon, have disappeared.” (footnotes omitted)).

<sup>36</sup> CLIENTEARTH, *supra* note 35.

<sup>37</sup> *See Tackled Together*, *supra* note 33 (Explaining how the “destruction of ecosystems undermines nature’s ability to regulate greenhouse gas (GHG) emissions and protect against extreme weather, thus accelerating climate change and increasing vulnerability to it.”); *see also* Chetan-Welsh & Hendry, *supra* note 33 (“[T]he climate crisis and biodiversity loss is creating what is called a positive feedback loop or, in this case, a vicious circle. For example, the high temperatures caused by climate change have made our forests drier and more vulnerable to wildfires. In turn, those wildfires release yet more carbon into the atmosphere, speeding up the greenhouse effect even further.”).

<sup>38</sup> *See* CLIENTEARTH, *supra* note 35 (“[T]he decline of the EU’s biodiversity is so advanced that the conservation and protection of the remaining nature will not be enough to halt biodiversity loss and tackle climate change.”).

<sup>39</sup> *See id.* (Explaining that the biodiversity loss in the E.U. is so extreme that conservation will not be enough; “What we need, is to *restore* nature.”).

change.<sup>40</sup> Sacrifice Zones aim both to achieve adaptation to protect local communities and to build resilient and sustainable communities for the future.<sup>41</sup>

Part I of the Article describes the mismatch between a rapidly changing climate and a stagnant and, at times, regressive zoning law. Zoning was not designed to address climate change; nor is it prepared for the type of massive land conversion that climate change is bringing. As such, there is a significant asymmetry between how the law regulates land use through zoning laws and how land is needed to serve the public welfare. This Part of the Article also highlights how zoning has historically played a role in shaping lands that have been disregarded, overlooked, or lost. It acknowledges that human manipulation of land, enforced by or encouraged through zoning, has often been driven by discriminatory motives.<sup>42</sup>

While intentional discriminatory land manipulation has been a troubling aspect of zoning practices, climate change now presents an unprecedented situation in which there will be an unintended and permanent conversion of

<sup>40</sup> See *10 Years to Boost Ecosystem Restoration for People and Planet*, UNITED NATIONS ENV'T PROGRAMME WORLD CONSERVATION MONITORING CTR. (Apr. 2020), <https://www.unep-wcmc.org/en/news/10-years-to-boost-ecosystem-restoration-for-people-and-planet> [https://perma.cc/T9A3-79PW] (“Around 25 per cent of the world’s land is degraded. We collectively need to restore 350 million hectares of degraded landscapes to meet the global target . . . [But] [r]estoring and rehabilitating 12 million hectares [about 3 percent of the global target and less than 1 percent of the world’s total degraded land] of degraded land per year could help close the emissions gap by up to 25 per cent by 2030. Some analysts conclude that the restoration of converted and degraded wetlands alone can offer 14 per cent of the mitigation potential needed to limit global warming to 2 degrees Celsius.”); see also Masumi Hisano et al., *Biodiversity as a Solution to Mitigate Climate Change Impacts on the Functioning of Forest Ecosystems*, 93 BIOLOGICAL REV. 439, 440 (2018) (Finding that “increased biodiversity can mitigate the negative impacts of climate change on ecosystem functioning.”).

<sup>41</sup> *Supra* Abstract. This Article is focused on proposing a tool for protecting communities and growing biodiversity. Whether the tool—Sacrifice Zones—is appropriate for a specific community remains a critical question. Some components of this question include an exploration of the unique characteristics, priorities, and challenges faced by each community. It is essential for communities to assess their vulnerabilities, engage in long-term planning, and collaborate with multiple stakeholders to ensure effective and sustainable adaptation actions. Further, doing so must be done in an equitable manner ensuring that those already disadvantaged by prior land use decisions and climate change are not made worse off by Sacrifice Zones.

<sup>42</sup> Sarah J. Adams-Schoen, *The White Supremacist Structure of American Zoning Law*, 88 BROOK. L. REV. 1225, 1269–70, 1255 & n.214 (2023) (Detailing discriminatory zoning practices, including placing “multifamily housing, where many low-income and minority people live . . . near the industrial and commercial uses to create a buffer that protects high-income, white, single-family neighborhoods;” concentrating “locally undesirable land uses—such as noxious industrial polluters and solid or hazardous waste landfills . . . in areas inhabited by People of Color;” and “forcibly dispossess[ing] and displac[ing] People of Color,” through “annexations, urban renewal projects, . . . underinvestment in public infrastructure and public services,” and “slum clearance[s].” (quoting SHERYLL CASHIN, *WHITE SPACE, BLACK HOOD: OPPORTUNITY HOARDING AND SEGREGATION IN THE AGE OF INEQUALITY* 113, 118–26 (2022))).

vast tracts of land into unusable areas.<sup>43</sup> In Part II of the Article, the concepts of overlay, floating, and environmental justice zones are introduced as flexible tools that modernize zoning and help adapt to unintended changes. Overlay zones are employed to update zoning laws in response to unforeseen developments in the world.<sup>44</sup> For instance, pedestrian zones, airport zones, or green zones can be implemented as overlay zones, which involve imposing a new set of regulations over a specific geographic area.<sup>45</sup> This allows local governments to tailor regulations to meet the specific needs of particular areas.<sup>46</sup>

A “floating zone” refers to a zoning district that is established within the law but has not yet been assigned to a specific location.<sup>47</sup> A floating zone includes the new or additional legal requirements that are applicable in the specific geographic area where it is located.<sup>48</sup> Essentially, the floating zone “floats” above the locality until it is situated in specified areas that meet the criteria outlined within the floating zone provisions.<sup>49</sup>

An environmental justice zone, also known as an environmental justice area or community, refers to a geographic area or community that experiences

<sup>43</sup> Jeremy Williams, *The Uninhabitable (Parts of the) Earth*, EARTHBOUND REP. (Mar. 23, 2021), <https://earthbound.report/2021/03/23/the-uninhabitable-parts-of-the-earth/> [<https://perma.cc/R5GS-A8TM>] (“The climate crisis won’t render the entire planet uninhabitable, [but] parts of it will be.”). “[C]limate change has been overwhelmingly caused by the global north, which is predominantly white. The regions where people will be displaced are among those least responsible for global emissions, and it will be mainly people of colour who will suffer.” *Id.*

<sup>44</sup> Elizabeth A. Garvin, *Making Use of Overlay Zones*, 43 PLAN. COMM’RS J. 1, 1 (2001) (“[T]raditional zoning through residential, commercial, and industrial districts is not sophisticated enough to address complicated growth and development issues. To fill this void, local governments are creating zoning approaches . . . aimed at more specialized targets[,] . . . [o]ne of these tools is the overlay zone.”).

<sup>45</sup> *Id.* (“The overlay zone is . . . a special zone placed over an existing zoning district, over part of a district, or over a combination of districts. . . . [I]t includes a set of regulations that is applied to property within the overlay zone *in addition to* the requirements of the underlying or base zoning district.”); see also Kurt Schindler & Mary Reilly, *Overlay Zoning Districts Can Be a Valuable Tool*, MICH. STATE UNIV., [https://www.canr.msu.edu/news/overlay\\_zoning\\_districts\\_can\\_be\\_a\\_valuable\\_tool](https://www.canr.msu.edu/news/overlay_zoning_districts_can_be_a_valuable_tool) [<https://perma.cc/D97J-BRXW>] (Sept. 15, 2023) (“The overlay district tool can be used for several different things. It can be an overlay around an airport[,] . . . municipal wellhead protection zones[,] . . . sides of a river or lake[,] vegetation buffer areas[,] greater setbacks[,] . . . DNR Critical Dune additional regulations[,] beach protection[,] along a scenic road or highway[,] . . . historic districts[,] . . . commercial corridor[,] . . . and more.”).

<sup>46</sup> Garvin, *supra* note 44 (Describing how overlay zones give “local governments . . . increased flexibility . . . to solve problems identified in their community.”).

<sup>47</sup> *Property Topics and Concepts*, AM. PLAN. ASS’N, <https://www.planning.org/divisions/planningandlaw/propertytopics.htm#Floating> [<https://perma.cc/LX5P-ZH28>] (Describing how “the floating zone is . . . written as an amendment in the zoning ordinance[,] . . . ‘floats’ until a development application is approved, . . . [then] the zone is . . . added to the official zoning map.”).

<sup>48</sup> *Id.* (“A floating zone . . . delineates conditions which must be met before that zoning district can be approved for an existing piece of land.”).

<sup>49</sup> *Id.*

a disproportionate burden of environmental pollution, hazards, or risks compared to other areas. These zones are typically populated by marginalized and disadvantaged communities, including low-income individuals, people of color, and indigenous peoples, who are impacted by poor environmental conditions (such as poor air and water quality) and/or lower-than-average key life determinants (such as asthma rates). Once identified, additional regulations apply to these zones. In an ideal world, these regulations afford benefits to those in the environmental justice zone to remedy the hazards.

In Part III of the Article, the concept of “sacrifice zones” is introduced, starting with an explanation of the traditional use of the term. In literature, the term “sacrifice zone” has been employed in different ways, and two common uses are described. First, sacrifice zones are often defined as geographical areas that have been compromised or lost because of the establishment of polluting industrial activities.<sup>50</sup> These areas have been subjected to environmental degradation and adverse health effects as a result of industrial pollution.<sup>51</sup> Second, sacrifice zones can refer to residential areas and the people residing in close proximity to regions with a high concentration of polluting industrial facilities.<sup>52</sup> These residential areas bear the burden of living in the vicinity of such polluting industries. Both of these traditional uses of the term “sacrifice zone” depict adverse conditions and highlight the negative consequences that arise from the presence of polluting industries.

Part III then presents a new perspective on “sacrifice zones” as a proactive legal mechanism to address climate adaptation at the local level. These proposed Sacrifice Zones serve as a novel form of overlay, floating, and environmental justice zones that are specifically designed to aid communities in swiftly responding to climate change impacts. They act as a tool for both preparing for future changes and addressing existing ones. Unlike the traditional understanding of “sacrifice zones,” this concept goes beyond merely acknowledging geographical areas that have been devastated or lost because of climate change. Instead, it views these areas as opportunities for positive transformation. Rather than associating sacrifice with irreversible loss, the term “Sacrifice Zones” in this context refers to a means of not only protecting against the effects of climate change and safeguarding other areas but also revitalizing

<sup>50</sup> *Sacrifice Zones 101*, CLIMATE REALITY PROJECT, <https://www.climaterealityproject.org/sacrifice-zones> [<https://perma.cc/3KR4-R4X3>] (Defining sacrifice zones as “areas with high levels of pollution and environmental hazards, thanks to . . . polluting industrial facilities.”).

<sup>51</sup> *Id.* (Explaining that “residents [in sacrifice zones] are subjected to heightened levels of pollution and hazardous materials . . . [and] are far more likely to develop conditions such as asthma, respiratory disease, and cancer as a result of their environment.”).

<sup>52</sup> *Id.* (Defining sacrifice zones as “areas with high levels of pollution and environmental hazards, thanks to nearby toxic or polluting industrial facilities.”); *What are Sacrifice Zones?*, CTR. FOR HEALTH, ENV'T & JUST., <https://chej.org/issues/sacrifice-zones> [<https://perma.cc/2GYU-AD8N>] (“Sacrifice zones are commonly characterized as communities in proximity to pollution produced by intensive and concentrated industry.”).

and restoring critical biodiversity and habitats that were previously compromised. As such, Sacrifice Zones aim to rejuvenate or regenerate areas that were once sacrificed, allowing them to be reborn and thrive in the face of climate change challenges.

Part IV of the Article focuses on two crucial aspects of a Sacrifice Zone: the criteria necessary for its establishment and the applicable requirements once it is designated. The first aspect highlights the importance of clear and careful criteria for situating a Sacrifice Zone. It emphasizes the need for equity in selecting these criteria to ensure that communities of color and economically distressed communities, which already bear the burdens of climate change,<sup>53</sup> are not disproportionately affected. The aim is to establish a set of criteria that is fair and alleviates the burden already borne by these marginalized communities.

Once a Sacrifice Zone is designated, local governments can undertake various climate-critical actions. These steps may include prohibiting any development in the zone, withdrawing human habitation from the zone, and implementing measures to enhance ecosystems, thereby mitigating climate impacts and reducing greenhouse gas emissions. This Part of the Article recognizes the significant benefits to humans, wildlife, and the environment when humans withdraw from a specific area. It draws attention to instances in which human withdrawal has occurred because of manufactured disasters, such as the evacuation of 100,000 people following the Chernobyl nuclear reactor fire and explosion. Sacrifice Zones seek to achieve the advantages associated with withdrawal while aiming to alleviate some of the associated suffering.

#### I. ASYMMETRY: CHANGING CLIMATE AND STATIC ZONING

The rapid changes in our climate are starkly misaligned with the stagnant and sometimes regressive nature of zoning laws. These laws were not

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<sup>53</sup> U.S. ENV'T PROT. AGENCY, CLIMATE CHANGE AND SOCIAL VULNERABILITY IN THE UNITED STATES: A FOCUS ON SIX IMPACTS 6 (2021) ("Black and African American individuals are 40% more likely than non-Black and non-African American individuals to currently live in areas with the highest projected increases in mortality rates due to climate-driven changes in extreme temperatures. . . . Hispanic and Latino individuals are 43% more likely than non-Hispanic and non-Latino individuals to currently live in areas with the highest projected labor hour losses in weather-exposed industries due to climate-driven increases in high-temperature days. . . . American Indian and Alaska Native individuals are 48% more likely than non-American Indian and non-Alaska Native individuals to currently live in areas where the highest percentage of land is projected to be inundated due to sea level rise. . . . Asian individuals are 23% more likely than non-Asian individuals to currently live in coastal areas with the highest projected increases in traffic delays from climate-driven changes in high-tide flooding. Those with low income or no high school diploma are approximately 25% more likely than non-low income individuals and those with a high school diploma to currently live in areas with the highest projected losses of labor hours due to increases in high-temperature days with 2°C of global warming.").

originally intended to tackle climate change, nor are they equipped to handle the extensive transformation of land that climate change is affecting. Consequently, there exists a noticeable disparity between the way zoning laws govern land use and the land requirements necessary for the well-being of the public. This Part describes that disparity.

The relevance of the stagnation of zoning can be examined and understood through the lens of “engineering resilience.” Engineering resilience focuses on maintaining stability in close proximity to an equilibrium state.<sup>54</sup> It emphasizes the ability to withstand or repel disturbances, such as rising sea levels or the heat island effect resulting from climate system changes, and the speed at which the system can return to its previous equilibrium state.<sup>55</sup> The concept of engineering resilience assumes that we possess knowledge of an ecosystem’s equilibrium state and can predict its behavior, enabling us to manipulate nature to maintain the desired systems and services.<sup>56</sup>

This approach is based on two underlying assumptions, as highlighted by Professor Robin Craig. First, it assumes that nature is “knowable, predictable, and largely controllable.”<sup>57</sup> Second, it presumes that we can prevent

<sup>54</sup> C. S. Holling, *Engineering Resilience Versus Ecological Resilience*, in *ENGINEERING WITHIN ECOLOGICAL CONSTRAINTS* 31, 33 (Peter C. Schulze ed., 1996); see also Janine S. Hiller & Jordan M. Blanke, *Smart Cities, Big Data, and the Resilience of Privacy*, 68 *HASTINGS L.J.* 309, 340 (2017); Timothy Malloy, *Re-Imagining Risk: The Role of Resilience and Prevention*, 22 *NEV. L.J.* 145, 182 (2021).

<sup>55</sup> See Holling, *supra* note 54, at 33 (Explaining that by “concentrat[ing] on stability near an equilibrium steady state, . . . resistance to disturbance and speed of return to the equilibrium are used to measure the property.”); see also Hiller & Blanke, *supra* note 54, at 340 (Explaining that “[f]ollowing a disturbance, a resilient system w[ill] return to the equilibrium point relatively quickly, and it is implied that the system w[ill] not vary greatly from the equilibrium point” by using the example of a building undergoing a natural disaster. (citation omitted)); J. B. Ruhl, *General Design Principles for Resilience and Adaptive Capacity in Legal Systems – With Applications to Climate Change Adaptation*, 89 *N.C. L. REV.* 1373, 1377 (2011) (“The engineering resilience strategy is to devote all system resources to staying near the equilibrium, the goal being to snap back.”).

<sup>56</sup> See Robin Kundis Craig, *Putting Resilience Theory into Practice: The Example of Fisheries Management*, 31 *NAT. RES. & ENV’T* 1, 1 (2017) (“[A]n expectation that natural systems will exhibit engineering resilience assumes a rather steady-state view of nature—i.e., that there is an equilibrium balance of nature to which natural systems will return[,] . . . [which] is knowable, predictable, and largely controllable . . . [and] that humans are always pretty much in control of ecosystems[,] . . . can keep important systems from changing in the first place and . . . can restore any system that we’ve already changed to its previous state.”); see also Robin Kundis Craig, *Resilience Theory and Wicked Problems*, 73 *VAND. L. REV.* 1733, 1758 (2020) (“Engineering resilience also embodies an expectation that natural systems have a preferred equilibrium to which they will return after a shock or disturbance, and hence that preservation and restoration are and will always remain rational legal and policy goals.”); Ruhl, *supra* note 55, at 1377 (“The engineering resilience strategy is to devote all system resources to staying near the equilibrium, the goal being to snap back.”); Holling, *supra* note 54, at 34 (“There is an implicit assumption of global stability, that is, that only one equilibrium steady state exists, or, if other operating states exist, they should be avoided by applying safeguards.”).

<sup>57</sup> Craig, *Fisheries Management*, *supra* note 56, at 1.

significant changes from occurring in vital systems “in the first place.”<sup>58</sup> For instance, by analyzing past rainfall patterns, we can estimate future rainfall amounts and construct dams accordingly—that is, to ensure their safe and effective operation.

Ecosystems and—particularly relevant here—the climate system have been subjected to extensive exploitation and have reached a point of alteration that may exceed previously planned engineered resilience.<sup>59</sup> These alterations are leading to unpredictable changes occurring at unprecedented rates and putting extreme pressure on infrastructure designed on engineered resilience principles.<sup>60</sup> An illustrative example of this unpredictability is the 2017 incident when heavy inflows—one of the highest in the last thirty years and surpassing the annual average in fifty days—resulted in the overflow of the Oroville Dam in Oregon and the failure of its designated overflow area.<sup>61</sup> The dam had been constructed based on predetermined specifications concerning the volume of water, and that those specifications would remain stagnant over time.<sup>62</sup> However, the world has transformed in a manner that renders those specifications obsolete, if not misleading and dangerous.

The Oroville Dam example and engineering resilience described above superimpose a stagnant built environment on a changing climate. That same juxtaposition can be applied to stagnant laws, specifically zoning laws, and a changing climate. Canadian ecologist C. S. Holling stated, “[i]n a system anticipating transformation, in a flip from one state to another, laws are truly of limited help, because the transformed system has unknown key variables and

<sup>58</sup> *Id.*

<sup>59</sup> See IPCC AR6 SYNTHESIS REPORT, *supra* note 17, at 6 (Stating that “[h]uman activities, principally through emissions of greenhouse gases, have unequivocally caused global warming, with global surface temperature reaching 1.1°C above 1850-1900 in 2011-2020. Global greenhouse gas emissions have continued to increase over 2010-2019, with unequal historical and ongoing contributions arising from unsustainable energy use, land use and land-use change, lifestyles and patterns of consumption and production across regions, between and within countries, and between individuals.”).

<sup>60</sup> See *id.* at 11 (“Widespread and rapid changes in the atmosphere, ocean, cryosphere and biosphere have occurred. The scale of recent changes across the climate system as a whole and the present state of many aspects of the climate system are unprecedented over many centuries to many thousands of years.”).

<sup>61</sup> Brian Henn et al., *Extreme Runoff Generation from Atmospheric River Driven Snowmelt During the 2017 Oroville Dam Spillways Incident*, GEOPHYSICAL RSCH. LETTERS, June 2020, at 8–9; *Cal OES Revisits the Oroville Dam Spillway Incident and Its Impacts Five Years Later*, CAL OES NEWS, <https://news.caloes.ca.gov/cal-oes-revisits-the-oroville-dam-spillway-incident-and-its-impacts-five-years-later/> [<https://perma.cc/9AV7-QEGX>]; see also *Atmospheric Rivers and the Lake Oroville Dam Stress*, GLOB. HYDROMETEOROLOGY RES. CTR., <https://ghrc.nsstc.nasa.gov/home/content/atmospheric-rivers-and-lake-oroville-dam-stress> [<https://perma.cc/7KG4-PS8L>]; Irfan A. Alvi, *Case Study: Oroville Dam (California, 2017)*, DAM FAILURES, <https://damfailures.org/case-study/oroville-dam-california-2017/> [<https://perma.cc/2UQT-VYCP>].

<sup>62</sup> See Alvi, *supra* note 61.

processes and unknown risks and opportunities emerge.”<sup>63</sup> Holling was noting that laws can exacerbate engineering resilience vulnerabilities because they, much like physical structures attempting to control nature, are static in time and space and are not designed to accommodate the inherent uncertainty of the natural world.

This point is particularly relevant for zoning law because zoning law fixes not only the law, but also the built environment. Many laws are fixed and rarely revisited or modified.<sup>64</sup> As currently drafted, zoning law is stagnant. Such stagnation leads to and is reflected in a static built environment. As Holling suggested, this rigidity can lead to vulnerabilities because the phenomena we seek to regulate are constantly changing. As the climate changes, the existing zoning laws may no longer be effective or appropriate for addressing emerging challenges and risks. This mismatch between static laws and a dynamic climate can exacerbate vulnerabilities and limit the ability of legal frameworks to adequately respond to the evolving needs of society and the environment.

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In some cases, zoning laws can worsen the negative impacts of climate change.<sup>65</sup> In the United States, land use regulation is generally the province

<sup>63</sup> C. S. Holling, *Response to “Panarchy and the Law”*, 17 *ECOLOGY & SOC’Y* 37, 37 (2012).

<sup>64</sup> See *supra* note 13 and accompanying text.

<sup>65</sup> See *State Preemption of Local Zoning Laws as Intersectional Climate Policy*, 135 *HARV. L. REV.* 1592, 1598–99 (2022) (“Policies that foster sprawl, loosely defined as development characterized by low population density, are particularly harmful. Sprawling land patterns increase the distance that people must travel from place to place, like from home to work. These distances increase total vehicle miles traveled (VMT), a key determinant of GHG emissions from transportation. Dispersed housing also requires the construction of more municipal infrastructure, like streets and sewers, and encourages the construction of larger houses with correspondingly larger energy demands. These homes, which are typically detached, lack the energy efficiencies associated with shared walls and increased insulation. . . . Furthermore, sprawling housing patterns reduce the benefits of constructing low-carbon public transport.” (footnotes omitted)); see also Lauren Sommer, *Why Sprawl Could Be the Next Big Climate Change Battle*, NPR (Aug. 6, 2020, 9:00 AM ET), <https://www.npr.org/2020/08/06/812199726/why-sprawl-could-be-the-next-big-climate-change-battle> [<https://perma.cc/7T3W-LLAG>] (“Around the country, cities and states are grappling with how zoning rules have . . . exacerbated climate change. . . . As sprawl became the default, it increased the reliance on cars. Today, super-commuters who live hours from their jobs are driving up carbon emissions. Experts say tackling climate change will mean reshaping neighborhoods with a new focus on public transit, biking and walkability.”).



of local governments,<sup>66</sup> such as cities, towns, and counties, which collectively make up approximately 39,000 general-purpose local governments.<sup>67</sup>

In the early twentieth century, local governments began implementing comprehensive zoning laws as a means of regulating land use.<sup>68</sup> Prior to zoning, land use disputes were primarily addressed through nuisance law, meaning that legal action had to be taken after the damage had already occurred.<sup>69</sup> This process was often costly and time-consuming, requiring lawsuits to resolve disputes.<sup>70</sup>

In response to the limitations and inefficiencies of nuisance law, local governments in the late nineteenth and early twentieth centuries started implementing specific, one-off restrictions on land use.<sup>71</sup> These restrictions were aimed at preventing certain types of activities from occurring in particular areas. For instance, the City of Los Angeles enacted regulations prohibiting

<sup>66</sup> See Daniel Finnegan, *How Eliminating Single-Family Zoning Can Help in the Fight Against Climate Change*, NYSBA (Feb. 8, 2023), <https://nysba.org/how-eliminating-single-family-zoning-can-help-in-the-fight-against-climate-change/> [<https://perma.cc/CF3H-2F7B>] (explaining the “establish[ment] [of] land-use decision-making at the local level”); see also Gabi Velasco & Oriya Cohen, *Three Ways Zoning Can Advance Housing and Climate Justice*, HOUS. MATTERS (Mar. 2, 2022), <https://housingmatters.urban.org/articles/three-ways-zoning-can-advance-housing-and-climate-justice#> [<https://perma.cc/7NJ9-BC2E>] (Stating that zoning “is the local regulatory tool that helps dictate where housing, schools, and parks are located; who can access them; and how they’re built.”).

<sup>67</sup> See Michael Maciag, *U.S. Local Governments Map*, GOVERNING (May 29, 2019), <https://www.governing.com/archive/local-governments-most-concentrated-map.html> [<https://perma.cc/6HL4-5V5P>]. To differentiate the almost 39,000 general purposes governments from the national and state governments, I will refer to them as “local governments.”

<sup>68</sup> Christopher Serkin, *A Case for Zoning*, 96 NOTRE DAME L. REV. 749, 752 (2020) (“[M]unicipalities’ use of zoning has evolved significantly from its origins in the 1920s when it was focused on keeping industry and intensive land uses out of residential neighborhoods.”). See generally Amanda Erickson, *The Birth of Zoning Codes, a History*, BLOOMBERG (June 19, 2012, 8:02 AM), <https://www.bloomberg.com/news/articles/2012-06-19/the-birth-of-zoning-codes-a-history> [<https://perma.cc/U4ZJ-EZ56>].

<sup>69</sup> Erickson, *supra* note 68 (“Before zoning, cities mostly regulated what could be built through nuisance laws. If someone didn’t like how their neighbor was using their property, they could haul them to trial and let a judge decide what to do about it.”).

<sup>70</sup> See *id.*; see also Susanne A. Heckler, *A Right to Farm in the City: Providing a Legal Framework for Legitimizing Urban Farming in American Cities*, 47 VAL. U.L. REV. 217, 229 (2012) (“Municipalities introduced zoning laws to resolve land use conflicts in advance and reduce the number of nuisance lawsuits.”).

<sup>71</sup> Heckler, *supra* note 70, at 227–29 (“Nuisance laws, however, were unable to manage and mitigate land use conflicts effectively. Consequently, zoning laws were created . . . for the division of different land uses into physically distinct zones, segregating incompatible land uses.”); Erickson, *supra* note 68 (“[I]n 20th century New York, the [nuisance] process had already become cumbersome. . . . There were early efforts to temper New York’s building streak. A landmark 1885 law restricted tenement buildings to one-and-a-half times the street width . . . .”); Adams-Schoen, *supra* note 42, at 1234 (“Some of the earliest local zoning laws in the United States were single purpose ordinances adopted to geographically separate white homes and businesses from those owned or occupied by People of Color.”).

brick kilns in areas transitioning into residential neighborhoods,<sup>72</sup> while Little Rock, Arkansas, banned livery stables from locations near downtown.<sup>73</sup>

It is important to note that the birth and history of zoning in the United States is also rooted in discriminatory practices.<sup>74</sup> In 1910, Baltimore introduced the first comprehensive zoning regulation at the citywide level.<sup>75</sup> This regulation included provisions prohibiting Black homeowners from purchasing homes in blocks where most property owners were white.<sup>76</sup> Such discriminatory regulations were challenged in the 1917 Supreme Court case *Buchanan v. Warley*, resulting in a ruling that deemed such racial zoning practices unconstitutional.<sup>77</sup>

A year earlier, in 1916, New York enacted the first comprehensive zoning law based on what would later be known as the “Euclidean zoning” model.<sup>78</sup> This law covered the entire city and addressed a wide range of issues, primarily focusing on regulating land uses by geographically separating different types of use, as well as controlling building heights and area or bulk.<sup>79</sup>

The significance of this zoning model was further solidified in 1926 with the landmark Supreme Court case *Village of Euclid v. Ambler Realty Co.*, the zoning model’s namesake.<sup>80</sup> In this case, the United States Supreme Court ruled that local governments had the authority to enact zoning laws without

<sup>72</sup> *Hadacheck v. Sebastian*, 239 U.S. 394, 404 (1915). In 1904, Los Angeles also passed a zoning ordinance prohibiting industrial uses in residential districts. *New Code*, L.A. CITY PLAN., <https://planning.lacity.org/zoning/new-code> [<https://perma.cc/E4W4-3TA9>]. Los Angeles passed its first comprehensive zoning ordinance in 1921. *Id.*

<sup>73</sup> *Reinman v. City of Little Rock*, 237 U.S. 171, 176–78 (1915).

<sup>74</sup> Velasco & Cohen, *supra* note 66 (“[Z]oning codes played a central role in producing the place-based inequality characteristic of many American cities. Racist and classist zoning decisions locked in patterns of segregation and neighborhood disinvestment that created inequitable access to economic opportunity and disproportionate exposure to environmental hazards for households with low incomes and households of color.”); Sommer, *supra* note 65 (Discussing that “cities and states are grappling with how zoning rules have deeply codified racial inequity.”).

<sup>75</sup> Serkin, *supra* note 68, at 754; Adams-Schoen, *supra* note 42, at 1234 & n.63.

<sup>76</sup> *Buchanan v. Warley*, 245 U.S. 60, 70 (1917); Serkin, *supra* note 68, at 754–55; Adams-Schoen, *supra* note 42, at 1246.

<sup>77</sup> *Buchanan*, 245 U.S. at 70, 82; *see also* Adams-Schoen, *supra* note 42, at 1250–53.

<sup>78</sup> Adams-Schoen, *supra* note 42, at 1277 (“Euclid’s zoning ordinance is often described as having been closely modeled on New York City’s 1916 Zoning Resolution.”); *see also* Jason M. Barr, *Revisiting 1916 (Part I): The History of New York City’s First Zoning Resolution*, BLDG. THE SKYLINE (Mar. 27, 2019), <https://buildingtheskyline.org/revisiting-1916-i/> [<https://perma.cc/4GED-DAPG>] (describing the 1916 zoning law of New York City); Eric R. Claeys, *Euclid Lives? The Uneasy Legacy of Progressivism in Zoning*, 73 *FORDHAM L. REV.* 731, 739–41 (2004) (“Euclidean zoning institutes a centralized, command-and-control style of land-use regulation. It operates on the principle, ‘a place for everything, and everything in its place.’ The zoning process enables local majorities to set the ‘governance’ standards—the goals that use districts will promote. . . . Above all else, Euclidean zoning centralizes community land use.”).

<sup>79</sup> Barr, *supra* note 78.

<sup>80</sup> *Village of Euclid v. Ambler Realty Co.*, 272 U.S. 365, 387, 390 (1926).

infringing upon constitutional rights.<sup>81</sup> The decision affirmed the constitutionality of zoning regulations and recognized the legitimacy of local governments' power to regulate land use through zoning.<sup>82</sup> The *Euclid* decision established a legal precedent that allowed local governments across the United States to enact and enforce zoning laws.<sup>83</sup> This ruling laid the foundation for comprehensive zoning practices still in place today and based on the regulation of use, height, and area or bulk.<sup>84</sup>

After *Euclid*, Euclidean Zoning in the United States spread like wildfire. Throughout the 1950s through the 1980s, local governments across the country enacted comprehensive Euclidean zoning codes.<sup>85</sup> Such zoning codes aimed to proactively regulate land use by designating specific zones for diverse types of development, such as residential, commercial, and industrial areas.<sup>86</sup> Typically, the stated intention was to prevent conflicts and promote orderly and planned development.<sup>87</sup>

It is crucial to acknowledge that zoning has been implemented in a manner that, although seemingly neutral on the surface, has disproportionately

<sup>81</sup> *Id.* at 395–97.

<sup>82</sup> *See id.* at 397 (Finding that “the [zoning] ordinance in its general scope and dominant features, so far as its provisions are here involved, is a valid exercise of authority.”); *see also* Adams-Schoen, *supra* note 42, at 1229 (Describing *Euclid* as “the seminal case in which the US Supreme Court approved of comprehensive zoning with separate, exclusively single- and two-family residential districts as a legitimate police power function.”); Claeys, *supra* note 78, at 731 (stating that *Euclid* “gave zoning a generous endorsement”); *State Preemption of Local Zoning Laws as Intersectional Climate Policy*, *supra* note 65, at 1594 (Explaining that *Euclid* “recognized as legitimate a locality’s state-delegated right to exclude undesirable uses from certain areas.”).

<sup>83</sup> *See* Finnegan, *supra* note 66 (Stating that “[i]n *Euclid*, the U.S. Supreme Court ruled that local governments can utilize their ‘police power’ to implement zoning ordinances.”); *see also* Adams-Schoen, *supra* note 42, at 1275–76 (“In validating *Euclid*’s zoning ordinance as a legitimate exercise of the police power, the Court applied a standard of review that has come to be recognized as allowing local governments nearly unfettered discretion to regulate the uses of property within their boundaries.”).

<sup>84</sup> *See* Adams-Schoen, *supra* note 42, at 1277 (Stating that “*Euclid*’s ordinance regulated land uses, structure heights, and structure bulk . . . with use, height, and area districts.”); *see also* Barr, *supra* note 78 (describing New York City’s “specific set of rules that regulated the use, height, and bulk of every property in the metropolis.”).

<sup>85</sup> Finnegan, *supra* note 66 (“Within five years of *Euclid*, 35 states had delegated zoning to local governments, and by 1979, all 50 states had done so.”).

<sup>86</sup> *See* Claeys, *supra* note 78, at 741 (“Once Euclidean zoning had taken over, each zoned lot came with a security—a legal guarantee that neighbors would use their lots consistently with tastes, standards and economic goals set by the control group in the local community.”); *see also* Serkin, *supra* note 68, at 763 (Stating that the 1950s looked like “[t]he Euclidean dream of separate residential, commercial, and industrial uses, each in their own spheres.”).

<sup>87</sup> *See* Claeys, *supra* note 78, at 739 (Describing how Euclidean zoning “work[ed] to encourage uniformity and majority rule over the disorder created by diverse individual choices.”).

impacted certain racial and socioeconomic groups.<sup>88</sup> This discrimination has resulted in the perpetuation of racial and socioeconomic disparities. In the context of climate adaptation, zoning has been employed or applied—often as part of discriminatory practices—in ways that have deliberately disregarded or marginalized certain lands.<sup>89</sup>

For instance, local governments have historically used zoning to disproportionately locate hazardous and toxic facilities in communities of color.<sup>90</sup> They have also implemented zoning measures that use multi-family housing to separate industrial areas from predominantly single-family residential neighborhoods, creating a buffer between these industries and more affluent communities.<sup>91</sup> Additionally, under the guise of economic development or

<sup>88</sup> See Jonathan Rosenbloom, *Reducing Racial Bias Embedded in Land Use Codes*, 26 CITY L. 56, 56 (2020); see also UNITED CHURCH OF CHRIST COMM’N FOR RACIAL JUST., TOXIC WASTES AND RACE IN THE UNITED STATES: A NATIONAL REPORT ON THE RACIAL AND SOCIO-ECONOMIC CHARACTERISTICS OF COMMUNITIES WITH HAZARDOUS WASTE SITES 15–17 (1987) [hereinafter TOXIC WASTES AND RACE REPORT]; BRUCE MITCHELL & JUAN FRANCO, NAT’L CMTY. REINVESTMENT COAL., HOLC “REDLINING” MAPS: THE PERSISTENT STRUCTURE OF SEGREGATION AND ECONOMIC INEQUALITY 18 (2018); Jacobi Collins, *#Redlined: A St. Louis Story: Exposing Deeply Rooted Systems of Redlining That Have Disproportionately Affected Black and Brown People Dating Back to the 1920’s*, STORY MAPS (May 28, 2021), <https://storymaps.arcgis.com/stories/366759e8b76c46efbf6ff9e8fff3ac0b> [https://perma.cc/K3NE-KBBX]; N. CAMBRIA ET AL., SEGREGATION IN ST. LOUIS: DISMANTLING THE DIVIDE, 26–28, 31–32, 34, 36–37, 39, 42–47, 58–62 (2018); Buchanan v. Warley, 245 U.S. 60, 70–71 (1917) (Describing the ordinance that essentially “made unlawful for any colored person to move into and occupy as a residence . . . any house upon any block upon which a greater number of houses are occupied . . . by white people.”); Vill. of Arlington Heights v. Metro. Hous. Dev. Corp., 429 U.S. 252, 257–58 (1977) (Describing the zoning materials that were “designed to assure that a subsidized development [wa]s racially integrated.”); Christopher Silver, *The Racial Origins of Zoning in American Cities*, in URBAN PLANNING AND THE AFRICAN AMERICAN COMMUNITY: IN THE SHADOWS 23, 28–29 (June Manning Thomas & Marsha Ritzdorf eds., 1997); CAL. TASK FORCE TO STUDY & DEV. REPARATION PROPOSALS FOR AFR. AMS., FINAL REPORT 197–226 (2023) [hereinafter CAL. TASK FORCE FINAL REPORT]; COMM’N TO EXAMINE RACIAL INEQUITY IN VA. L., IDENTIFYING AND ADDRESSING THE VESTIGES OF INEQUITY AND INEQUALITY IN VIRGINIA’S LAWS 15–23 (2020).

<sup>89</sup> See *State Preemption of Local Zoning Laws as Intersectional Climate Policy*, *supra* note 65, at 1596, 1598–99 (Describing how “restrictive zoning has resulted in de facto housing segregation.”); see also Eliza Hall, Note, *Divide and Sprawl, Decline and Fall: A Comparative Critique of Euclidean Zoning*, 68 U. PITTSBURGH L. REV. 915, 932, 944 (2007) (detailing the discriminatory legacy of *Euclid*).

<sup>90</sup> TOXIC WASTES AND RACE REPORT, *supra* note 88, at 15 (“The results of the study suggest that the disproportionate numbers of racial and ethnic persons residing in communities with commercial hazardous waste facilities is not a random occurrence, but rather a consistent pattern.”); Adams-Schoen, *supra* note 42, at 1269–70 (Explaining that there is “a significant body of research demonstrating that locally undesirable land uses—such as noxious industrial polluters and solid or hazardous waste landfills—are disproportionately concentrated in areas inhabited by People of Color.”).

<sup>91</sup> Adams-Schoen, *supra* note 42, at 1268–69 (“[E]arly adopters of zoning in the United States protected single-family zones from undesirable land uses . . . by creating geographic buffers between the favored zones and areas containing industrial and other undesirable land uses.”); Craig Anthony Arnold, *Planning Milagros: Environmental Justice and Land Use Regulation*, 76 DENV. L. REV. 1, 119 (1998) [hereinafter *Planning Milagros*] (“Buffer

“slum clearance,” zoning has been used to encircle, demolish, or sever communities, causing further harm and disruption.<sup>92</sup>

Currently, numerous zoning codes that were established decades ago are still in effect across the country.<sup>93</sup> While some amendments may have been made over time, the core Euclidean aspects of many zoning codes remain unchanged.<sup>94</sup> As expected, considering the age of many zoning codes, the *direct and intentional* regulation of climate change adaptation is often lacking or limited. Many of these codes either lack specific regulations addressing climate change adaptation or regulate other aspects, such as economic development, which can have unintended and regressive effects on implementing effective and safe adaptation strategies.

The absence of explicit zoning provisions for climate change adaptation within zoning codes can hinder the ability of local governments to proactively address the impacts of climate change. By not including specific regulations or guidelines, zoning codes may inadvertently perpetuate outdated practices that do not account for the changing environmental conditions and associated risks.<sup>95</sup> Furthermore, when zoning codes prioritize economic

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zones are perhaps one of the major reasons why low-income and minority neighborhoods have so much industrial and commercial zoning: the multi-family housing, where many low-income and minority people live, is purposefully placed near the industrial and commercial uses to create a buffer that protects high-income, white, single-family neighborhoods. Zoning practices place large numbers of poor and minority people near intensive uses because traditional zoning and planning theory values most the single-family residence, instead of the integrity and quality of all residential areas.”).

<sup>92</sup> CAL. TASK FORCE FINAL REPORT, *supra* note 88, at 207.

<sup>93</sup> URB. LAND INST., *RESHAPING THE CITY: ZONING FOR A MORE EQUITABLE, RESILIENT, AND SUSTAINABLE FUTURE 6* (2023) [hereinafter *RESHAPING THE CITY*]; *see also* Karla Georges, *What to Expect in State Legislatures on Zoning Reform in 2023*, AM. PLAN. ASS’N (Jan. 20, 2023), <https://www.planning.org/blog/9263443/what-to-expect-in-state-legislatures-on-zoning-reform-in-2023/> [<https://perma.cc/KB3S-TBJZ>] (“Zoning reform has taken shape in state legislatures in the form of efforts aimed at overhauling outdated local codes and encouraging greater housing options.”); David A. Goldberg, *Coding for the Future: Casting Off Outdated Regulations, Cities Reinvent Zoning for a Changing Marketplace*, NAT’L ASS’N REALTORS (Nov. 20, 2014), <https://www.nar.realtor/articles/coding-for-the-future-casting-off-outdated-regulations-cities-reinvent-zoning-for-a-changing> [<https://perma.cc/23A5-H9P9>] (“[M]any cities have discovered that their graying zoning codes are an impediment to capitalizing on this urban energy. For the first time in decades, they are adopting new methods of shaping development that encourage mixing, rather than separating, uses and that sacrifice less urban space to the automobile.”).

<sup>94</sup> *See* Hall, *supra* note 89, at 916–17 (“‘Euclidean systems of separation—conventional zoning—have been implemented ubiquitously’ in the United States: ‘[a]bout ninety-seven percent of incorporated communities zone.’” (first quoting Andres Duany & Emily Talen, *Making the Good Easy: The Smart Code Alternative*, 29 FORDHAM URB. L.J. 1445, 1451 (2002); then quoting Andrew G. Dietderich, *An Egalitarian’s Market: The Economics of Inclusionary Zoning Reclaimed*, 24 FORDHAM URB. L.J. 23, 29 (1996))).

<sup>95</sup> *See* Sydney O’Connell, *Zoning Impacts Climate, Health, and Social Justice*, CMTY. CLIMATE COLLABORATIVE (July 11, 2023), <https://theclimatecollaborative.org/blog/2023/5/31/zoning-rewrite-can-impact-climate> [<https://perma.cc/FB4Y-QCBE>] (Explaining how “[l]ow-density restrictions exacerbate many social justice, climate, and health issues.” For

development over climate change adaptation, they can lead to adverse consequences.<sup>96</sup> This approach may prioritize short-term economic gains at the expense of long-term sustainability and resilience, leaving communities at risk.

There has been growing recognition that traditional zoning codes may not be sufficiently equipped to address climate concerns, particularly as communities experience climate impacts more directly and acutely, and as the understanding of climate change impacts and the need for equitable responses has evolved.<sup>97</sup> For example, some, albeit limited, efforts are being made in various areas to update and revise zoning codes to better incorporate climate change adaptation strategies.<sup>98</sup> These efforts aim to align zoning regulations with the evolving understanding of climate change and the need for sustainable and resilient communities. However, the process of revising zoning codes can be complex and time-consuming.<sup>99</sup>

Circling back to the concept of engineering resilience, it is essential to recognize its limitations as we set about the process of updating zoning codes

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example, it “pushes low-income residents away from accessible public transportation . . . forc[ing] [them] to spend more time commuting to work, . . . contribut[ing] . . . to global warming due to the higher levels of individual transportation emissions and wear on roads.”).

<sup>96</sup> See *id.*

<sup>97</sup> See *State Preemption of Local Zoning Laws as Intersectional Climate Policy*, *supra* note 65, at 1600–01 (“[C]limate policy advocates generally recommend state zoning laws as ‘one strategy among many,’ policies that . . . are still ‘crucial’ to the sustainability transition.” (first quoting Alice Kaswan, *Climate Change, Consumption, and Cities*, 36 FORDHAM URB. L.J. 253, 263 (2009); then quoting Alex Baca & Hannah Lebovits, *No, Zoning Reform Isn’t Magic. But It’s Crucial.*, BLOOMBERG: CITYLAB (Feb. 5, 2019, 1:50 PM), <https://www.bloomberg.com/news/articles/2019-02-05/why-that-new-zoning-study-shouldn-t-deter-yimby> [https://perma.cc/2YCC-7MS5]); see also Adie Tomer et al., *We Can’t Beat the Climate Crisis Without Rethinking Land Use*, BROOKINGS INST. (May 12, 2021), <https://www.brookings.edu/articles/we-cant-beat-the-climate-crisis-without-rethinking-land-use/> [https://perma.cc/R52Y-7MR7] (“Simply put, the United States cannot reach its [greenhouse gas] reduction targets if our urban areas continue to grow as they have in the past.”).

<sup>98</sup> See Velasco & Cohen, *supra* note 66 (Discussing municipalities that have instituted green zones, resilience overlays, and other zoning reforms “to equitably transition to environmentally sustainable cities.”); see also Brandon Hanson, *Green Zones*, SUSTAINABLE DEV. CODE, <https://sustainablecitycode.org/brief/creating-green-zones/> [https://perma.cc/SX4N-AGA9] (Discussing municipalities that have instituted green zones, which are “stationary or floating districts created by a local government to promote sustainable practices, to help reduce environmental impacts, and to help revitalize an area.”); Tyler Adams, *Mixed-Use Zoning*, SUSTAINABLE DEV. CODE, <https://sustainablecitycode.org/brief/mixed-use-zoning/> [https://perma.cc/4NY5-CU2Z] (Discussing municipalities that have instituted mixed-use zones, which “permit[] a complementary mix of residential, commercial, and/or industrial uses in a single district.”).

<sup>99</sup> See Tomer et al., *supra* note 97 (Discussing how zoning reform “won’t be an easy task. Fundamentally changing where and what we build requires new ways of planning and investing in our communities. Since the federal government doesn’t directly control local land use, changing where we live and how we get around will require buy-in from states and local governments that manage zoning and other regulations, real estate developers who lead construction, and the finance industry that underwrites it all.”).

to address climate adaptation.<sup>100</sup> Professor Tracy-Lynn Humby raises a related yet distinct point:

One of the key insights of resilience theory is that . . . [r]esource management strategies that attempt to optimize only particular elements of an ecosystem . . . frequently weaken the entire system. Such interventions are blind to the fact that while resource management practices keep one component of an ecosystem constant, the other elements continue to change at other spatial and temporal scales. This tends to tip the social-ecological system more precariously toward a regime shift.<sup>101</sup>

Professor Humby is noting that adopting a stationary view of natural systems can create a narrow and limited perspective that disregards the dynamic nature of ecosystems. This narrow focus can lead to complacency and a false sense of stability, which can undermine the resilience of the system. By prioritizing equilibrium at a steady state rather than acknowledging and adapting to changes in ecosystems, one risks overlooking the need for proactive measures to address emerging challenges. This shift in priorities can divert attention away from understanding and responding to the actual changes occurring within ecosystems, including those driven by climate change.<sup>102</sup>

Adapting to those changes is what can save a system, making it more resilient and sustainable, and failure to adapt can often drive the system to collapse.<sup>103</sup> Sacrifice Zones seek to incorporate “adaptive governance” and “ecological resilience” principles into decision-making processes. The adaptive governance approach recognizes that our understanding of complex issues, such as climate change, is constantly evolving. For purposes of this Article, the concept of adaptive governance is rooted in a strong emphasis on experimentation and continuous learning. Adaptive governance recognizes the need to respond to changes and transform social-ecological systems into more resilient and improved states as they evolve.<sup>104</sup>

<sup>100</sup> See Ruhl, *supra* note 55, at 1394 (Defining stationarity as “the idea that natural systems fluctuate within an unchanging envelope of variability.” (quoting P.C.D. Milly et al., *Stationarity Is Dead: Whither Water Management?*, 319 SCI. 573, 573 (2008))).

<sup>101</sup> Tracy-Lynn Humby, *Law and Resilience: Mapping the Literature*, 4 SEATTLE J. ENV'T L. 85, 92 (2014).

<sup>102</sup> See Hiller & Blanke, *supra* note 54, at 341–42 (Explaining that, by focusing on maintaining equilibrium, there is an “[i]nflexibility and failure to adapt” that makes “[e]ngineering resilience and the laws and regulations that adopt this approach . . . too limited for the dynamic and rapidly changing environment of big data and smart cities.”).

<sup>103</sup> See Lisen Schultz et al., *Adaptive Governance, Ecosystem Management, and Natural Capital*, 112 PROC. NAT'L ACAD. SCI. 7369, 7372 (2015) (“[C]ases of adaptive governance . . . built system-wide knowledge and awareness of ecological dynamics, providing an improved foundation for actors to respond in an informed manner . . . [and] enabled coordination, negotiation, and collaboration across whole landscapes and seascapes, across sectors, and across institutional levels, allowing issues to be addressed in a holistic manner at the appropriate scale.”).

<sup>104</sup> Carl Folke et al., *Adaptive Governance of Social-Ecological Systems*, 30 ANN. REV. ENV'T RES. 441, 443 (2005); see also Brian C. Chaffin et al., *A Decade of Adaptive Governance Scholarship: Synthesis and Future Directions*, 19 ECOLOGY & SOC'Y 1, 8–9 (2014). The

Carl Folke, et al., highlight four key aspects that are crucial to understanding adaptive governance:

- [(1)] [Developing a deep] understanding of resource and ecosystem dynamics[:] . . . [successfully enhancing] resilience . . . [through] ecological knowledge [requires us to detect and respond to environmental feedback] and [understand] . . . ecosystem processes[:] . . .
- [(2)] [Integrating] ecological knowledge into adaptive management practices[:] [Effective] management [involves] continuous testing, monitoring, and reevaluation . . . acknowledging the inherent [complexity and] uncertainty . . . [of these] systems[:] . . .
- [(3)] Support[ing] flexible institutions and multilevel governance systems[:] . . . [Effective governance often requires] . . . sharing . . . power and responsibility . . . among [various stakeholders, including] user groups[,]. . . government agencies, and nongovernmental organizations[: and] . . .
- [(4)] [Addressing] external perturbations, uncertainty, and surprise[s][:] . . . [A] well-functioning multilevel governance system . . . [must build] capacity [to deal] with [unforeseen] changes . . . .<sup>105</sup>

In communities across the country, social-ecological systems are formed by the convergence of land use laws, infrastructure, and ecosystem services associated with public services. Given the susceptibility of these systems and services to unknown changes and disturbances, adaptive governance plays a vital role in enhancing community resilience. This process may involve

- Inclusive planning for future infrastructure and service needs;
- Evaluation of existing resources and relevant laws pertaining to infrastructure and services;
- Regular collection of information on infrastructure system performance and its response to changes, often including critical metric assessment;
- Monitoring and assessing this information to determine whether infrastructure is adapting or becoming more vulnerable; and

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term “adaptive governance” is often thought to be coined in the *Science* article: Thomas Dietz et al., *The Struggle to Govern the Commons*, 302 SCI. 1907, 1908 (2003). For a listing of several definitions and a discussion of related concepts, such as adaptive management and adaptive planning, see Craig Anthony Arnold, *Environmental Law, Episode IV: A New Hope? Can Environmental Law Adapt for Resilient Communities and Ecosystems?*, 21 J. ENV'T & SUSTAINABILITY L. 1, 24–40 (2015) [hereinafter *Environmental Law, Episode IV*].

<sup>105</sup> Folke et al., *supra* note 104, at 463–64; see also *Environmental Law, Episode IV, supra* note 104, at 28 (“For adaptation to be successful, institutions clearly need to endure and be persistent throughout the process of adjustment and change. But at the same time, they need themselves to cope with changing conditions. . . . [T]he strong normative message from resilience research is that shared rights and responsibilities for resource management (often known as comanagement) and decentralization are best suited to promoting resilience.” (alteration in original) (quoting Donald R. Nelson et al., *Adaptation to Environmental Change: Contributions of a Resilience Framework*, 32 ANN. REV. ENV'T & RES. 395, 409 (2007))).



- Modifying land use laws and policies based on information and assessments to ensure that future infrastructure development continues to enhance resilience in the face of uncertainty.

Adaptive governance contributes to building community resilience by providing local officials with a continuous stream of relevant information about evolving systems and a structured approach for adaptation. This approach helps navigate the intricacies inherent in social-ecological systems, focusing on understanding their dynamics rather than maintaining fixed states. It also equips communities to address uncertainty and unexpected disturbances effectively.

Professor and land use expert Tony Arnold has coined the incorporation of adaptive tools into environmental law as the “fourth generation,” which emphasizes adaptive environmental governance and the resilience of interconnected ecosystems and human communities.<sup>106</sup> While land use laws have not undergone the same generational iterations as environmental laws, they face similar challenges posed by dynamic, complex environmental and societal issues. Zoning codes, often projecting years into the future, are based on assumptions about stable conditions, inaccurate linear change models, and misplaced faith in human and ecosystem management capabilities.

Adaptive governance is especially relevant to zoning laws due to the close physical link between zoning and ecosystems. Zoning often aims to control ecosystems, such as in water provision and stormwater management. These ecosystems, however, are subject to unpredictable alterations. Therefore, integrating adaptive governance into land use laws becomes critical because as ecosystems change, infrastructure is impacted.

Furthermore, adaptive governance is beneficial because local governments often struggle to comprehensively grasp, model, and plan for ecosystem changes. Land use laws typically lack provisions for monitoring or updating infrastructure. Incorporating adaptive governance into land use laws bridges this gap in policymaking by establishing a process that focuses on a continuous flow of information and integrates it into decision-making.<sup>107</sup>

A related concept is “ecological resilience,” which focuses on maintaining the system’s functionality and accommodating changes in system inputs.<sup>108</sup> It is not overly concerned with maintaining a steady state; nor does it depend on whether the system is at or near an equilibrium state. Rather, ecological resilience recognizes that ecosystems are constantly moving and

<sup>106</sup> *Environmental Law, Episode IV*, *supra* note 104, at 3 (quoting Craig Anthony Arnold, *Fourth-Generation Environmental Law: Integrationist and Multimodal*, 35 WM. & MARY ENV’T L. & POL’Y REV. 771, 775 (2011)).

<sup>107</sup> See Schultz et al., *supra* note 103, at 7369 (“Adaptive governance . . . involv[es] both state and nonstate actors, often at multiple levels, with the aim to adaptively negotiate and coordinate management of social-ecological systems and ecosystem services across landscapes and seascapes.”).

<sup>108</sup> See Holling, *supra* note 54, at 33.

accommodates those changes. Ecologist Brian Walker and author David Salt state it this way:

At the heart of resilience thinking is a very simple notion—things change—and to ignore or resist this change is to increase our vulnerability and forego emerging opportunities. . . . Sometimes changes are slow . . . sometimes they are fast . . . Humans are usually good at noticing and responding to rapid change. Unfortunately, we are not so good at responding to things that change slowly.<sup>109</sup>

Slow changes include climate change, species extinction, ocean acidification, deforestation, and many others relevant to zoning and development.

This is a very different way to think about law and policy. Instead of designing a one-time policy based on a one-time analysis, we—local governments, communities, and the public—design laws to work with nature and its inevitable changes.<sup>110</sup> Ecological resilience and an adaptive approach provide a process that recognizes the complexities of social-ecological systems by integrating a system to measure and track internal and external changes.<sup>111</sup> It is focused on the constant flow of information and a constant learning process to reevaluate.<sup>112</sup>

In closing this Part, it is crucial to recognize that ecosystems are inherently dynamic and constantly evolving. This is in stark contrast to zoning codes, and the associated built environment, which are static. Embracing the potential for change allows us to foster ecological resilience by actively adapting and responding to the changing conditions. Rather than striving for a static steady state, our focus should be on understanding and managing the transitions and transformations that are occurring within ecosystems.

<sup>109</sup> BRIAN WALKER & DAVID SALT, *RESILIENCE THINKING* 9–10 (2006); *see also* WILLIAM E. REES, *THINKING “RESILIENCE”* 5 (Richard Heinberg & Daniel Lerch eds., 2010) (Resilience thinking “[r]ecognizes that the sustainability of the human enterprise on a crowded and resource-stressed planet depends on our ability to conserve the resilience of socioecological systems. In this context, resilience defines the capacity of the system to assimilate disturbances without crossing a threshold into an alternative and possibly less ‘friendly’ stable state. A desirable socioecological system characterized by high resilience is able to resist external disturbance and continue to provide biophysical goods and services essential for a satisfactory quality of life.”).

<sup>110</sup> *See* Holling, *supra* note 54, at 33–34 (“[T]he near-equilibrium definition of engineering resilience . . . draw[s] predominantly from . . . deductive mathematical theory . . . where simplified, untouched ecological systems are imagined, or from traditions of engineering, where the motive is to design systems with a single operating objective . . .”).

<sup>111</sup> *See* Schultz et al., *supra* note 103, at 7369 (“The [adaptive governance] collaboration involves building knowledge and understanding of ecosystem dynamics and services, feeding such knowledge into adaptive management practices, supporting flexible institutions and multilevel governance systems, and dealing with external perturbations, uncertainty, and surprise.”).

<sup>112</sup> *See id.* (“Adaptive governance expands the measures available and provides the coordination and the context for choosing between tools, monitoring their effect, and adjusting them as the social-ecological system evolves.”).

## II. EXISTING ZONING TOOLS FOR FLEXIBILITY

Since zoning regulations were first established, various tools have been employed to introduce flexibility into what is often a rigid code. This Part examines some of these tools, focusing on aspects that are particularly relevant to climate adaptation.

Two of the earliest tools used to incorporate flexibility into zoning are conditional use permits (“CUPs”) and variances. Despite their continued use, popularity, and integral role in zoning codes, their application to climate adaptation has been limited. Further, use of CUPs in the climate context poses considerable challenges.

CUPs are a zoning mechanism that acknowledges certain uses that may be allowed in specific areas under particular circumstances.<sup>113</sup> When the circumstances or conditions specified by the zoning regulations are fulfilled, landowners can apply to the city or relevant authority to demonstrate compliance with those conditions.<sup>114</sup> If the application is approved, the conditional use is granted permission to proceed.<sup>115</sup> Typically, a zoning code will list and describe all of the zoning districts and their respective by-right uses and conditional uses. For example, the various zoning districts are listed in Section 18.02 of Reno, Nevada’s zoning code. For each district, the code then lists the permitted uses by-right and those permitted upon conditional use permit. For Greenfield Single-Family (“GFSF”) District, for example, the code states that

Permitted land uses shall be:

- [a] Single Family, detached; and
- [b] Accessory Dwelling Unit.

Permitted land uses with the approval of a conditional use permit:

- [a] Child Care Center, as accessory use only;
- [b] Churches/House of Worship;
- [c] Utility Box/Well House, Back-up Generator, Pumping Station or Booster Station;
- [d] Utility Installation other than listed; and

<sup>113</sup> *Zoning and Conditional Use Permits*, INST. FOR LOC. GOV’T, <https://www.ca-ilg.org/hn-online-guide/zoning-and-conditional-use-permits> [https://perma.cc/XX24-6A4B]; e.g., MANHATTAN, MONT., CODE tit. 10, ch. 11, § 1 (2023) [hereinafter MANHATTAN ORDINANCE].

<sup>114</sup> See, e.g., BELLPORT, N.Y., CODE OF ORDINANCES ch. 21, §§ 127, 128 (2022) [hereinafter BELLPORT ORDINANCE]; Jacob Green, Comment, *When Conditions Go Bad: An Examination of the Problems Inherent in the Conditional Use Permitting System*, 2014 BYU L. REV. 1185, 1191–93 (2014) (explaining the process of obtaining a conditional use permit using an example from the case *In re Conditional Use Permit Denied to Meier*, 613 N.W.2d 523 (S.D. 2000)).

<sup>115</sup> See, e.g., BELLPORT ORDINANCE § 127 (Stating that “no land, building or structure shall be used and no building or structure shall be erected or altered to be used for any purpose for which a conditional use permit is required . . . unless such conditional use permit is issued.”); MANHATTAN ORDINANCE § 1 (Stating that “[n]o structure or land may be used for any purpose in any district where such use is not a permitted use, unless such use is listed as a conditional use . . . and approval for that use is obtained.”).

[e] Communication Facility, Equipment Only.<sup>116</sup>

The code then sets forth the process and documentation necessary to obtain the CUP.<sup>117</sup>

CUPs have existed since the early days of zoning. In fact, as early as five years before the US Supreme Court's landmark decision upholding zoning in *Euclid*, Los Angeles, California implemented its first comprehensive citywide zoning ordinance in 1921.<sup>118</sup> This ordinance was one of the earliest to incorporate CUPs.

The introduction of CUPs in Los Angeles reflected a shift towards a more nuanced approach to land use regulation. The underlying idea was to recognize that certain uses could be deemed acceptable or unacceptable in specific circumstances or with the implementation of specific mitigations as conditions change.<sup>119</sup> This approach granted the city greater flexibility in adapting to the diverse and evolving needs and development patterns. The adoption of CUPs by Los Angeles and other cities set a precedent for the widespread use of CUPs to incorporate some flexibility into zoning.

Variances too have been around since the inception of zoning. A variance allows landowners to seek deviations or adjustments from the existing zoning requirements for specific properties, usually based on the special circumstances of that property.<sup>120</sup> By requesting a variance, landowners seek exceptions or modifications to certain zoning regulations that cause a "hardship."<sup>121</sup>

<sup>116</sup> RENO, NEV., ANNEXATION & LAND DEV. CODE ch. 18.02 § 603(b)(2)(b) (2022).

<sup>117</sup> See, e.g., *id.* ch. 18.08 §§ 604, 605.

<sup>118</sup> See Andrew H. Whittemore, *Zoning Los Angeles: A Brief History of Four Regimes*, 27 PLAN. PERSPS. 393, 394 (2012) (discussing the Los Angeles Ordinance of 1921); see also *New Code*, L.A. CITY PLAN., <https://planning.lacity.gov/zoning/new-code#> [<https://perma.cc/FG84-DX39>] (explaining the California zoning timeline).

<sup>119</sup> See Green, *supra* note 114, at 1187–88 (“A conditional use permit allows that city to provide the necessary property uses and control the negative impact of that use.”); see also *Am. Warrior, Inc. v. Bd. of Cnty. Comm’rs*, 525 P.3d 789, 793 (Kan. Ct. App. 2023) (“A special—or conditional—use permit allows for land to be put to an otherwise prohibited use. And in granting the permit, county officials can impose special conditions and safeguards on the use in the name of the public interest.”).

<sup>120</sup> See MICHAEL ALLAN WOLF, POWELL ON REAL PROPERTY § 79C.14 (2023) [hereinafter POWELL ON REAL PROPERTY] (“A variance allows a property owner to depart from the literal requirements of a zoning ordinance and to use the property in a manner otherwise prohibited by the ordinance.”); see also David W. Owens, *The Zoning Variance: Reappraisal and Recommendations for Reform of a Much-Maligned Tool*, 29 COLUM. J. ENV’T L. 279, 280 n.1 (2004) (Defining a variance as “a legal exemption from the zoning regulations that apply to their neighbors.”).

<sup>121</sup> See JAMES A. COON, N.Y. DIV. OF LOC. GOV’T SERVS., GUIDELINES FOR APPLICANTS TO THE ZONING BOARD OF APPEALS 4 (2023) [hereinafter N.Y. ZONING BOARD GUIDANCE] (“If requesting . . . permission to establish a use of property not otherwise permitted in the zoning district, the applicant must prove ‘unnecessary hardship.’”); see also Owens, *supra* note 120, at 280, 285 (“Upon a showing of unnecessary hardship, general rules are suspended for the benefit of individual owners and special privileges established.” (quoting *People ex rel. Fordham Manor Reformed Church v. Walsh*, 155 N.E. 575, 578 (N.Y. 1927))).

The variance process acknowledges that strict adherence to zoning requirements may not always be feasible or fair in certain cases, and it provides an avenue for property owners to present their unique circumstances to the appropriate zoning authority.

An early example of a city adopting the variance process is New York City's 1916 comprehensive zoning.<sup>122</sup> New York City's 1916 zoning included provisions for variances, allowing property owners to seek exceptions to specific zoning regulations if they could demonstrate "practical difficulties or unnecessary hardships."<sup>123</sup> The introduction of variances in New York City's zoning regulations recognized the need for flexibility in certain cases. This approach set a precedent for other jurisdictions and became influential in the development of zoning laws and practices across the US.<sup>124</sup>

Both CUPs and variances raise challenges when applied to climate adaptation. While these tools offer some flexibility to accommodate changes, they are not specifically designed to address the large-scale and rapidly changing impacts associated with climate change. They are focused on individual lots and challenges that affect that specific lot only.

Further, variances typically require the property owner to demonstrate unique circumstances,<sup>125</sup> which may be unlikely in the context of climate adaptation. Climate change-related impacts such as flooding, extreme heat, and droughts are likely to affect multiple property owners and large areas,<sup>126</sup> making it difficult to establish the uniqueness required for individual variance applications. Additionally, the granting of one variance does not automatically guarantee approval for others.<sup>127</sup> Each variance request is evaluated on

<sup>122</sup> See N.Y.C., N.Y., Bd. of Estimate & Apportionment, Bldg. Zone Resol. (July 25, 1916).

<sup>123</sup> *Id.* § 20.

<sup>124</sup> See Owens, *supra* note 120, at 284 ("[V]ariance power was included in the standard State Zoning Enabling Act promulgated by the U.S. Department of Commerce in 1922, which largely followed the New York City model. Most states incorporated similar language into their statutes." (footnote omitted)).

<sup>125</sup> *E.g.*, N.Y. ZONING BOARD GUIDANCE, *supra* note 121, at 4 ("To prove [unnecessary hardship], State law requires the applicant to show *all* of the following: (1) that the property is incapable of earning a reasonable return on initial investment if used for any of the allowed uses in the district (actual 'dollars and cents' proof must be submitted); (2) that the property is being affected by unique, or at least highly uncommon circumstances; (3) that the variance, if granted, will not alter the essential character of the neighborhood; and (4) that the hardship is not self-created."); Owens, *supra* note 120, at 287 ("While the precise [zoning variance] tests vary from state to state, the common tenor set very early was that the 'power of variation is to be sparingly exercised and only in rare instances and under exceptional circumstances peculiar in their nature, and with due regard to the main purpose of a zoning ordinance to preserve the property rights of others.'" (footnote omitted) (quoting *Hammond v. Bd. of Appeal*, 154 N.E. 82, 83 (Mass. 1926))).

<sup>126</sup> See *supra* notes 1–3 and accompanying text.

<sup>127</sup> *Berk v. McMahon*, 814 N.Y.S.2d 753, 754 (N.Y. App. Div. 2006) ("[T]he fact that the petitioners were denied a variance whereas one prior applicant had been granted a concededly similar variance . . . does not, in itself, establish that the Board's determination was arbitrary or motivated by a discriminatory intent." (citing *Cowan v. Kern*, 363 N.E.2d

its own merits, which can lead to a prolonged process and increased costs for adaptation measures.<sup>128</sup>

Indeed, using CUPs and variances for climate adaptation on an individual landowner basis can be expensive and impractical. The need for each landowner to seek a CUP or variance for their property would result in a resource-intensive process; it would require reviewing individual filings and associated documentation, as well as conducting public hearings, for each parcel of land.<sup>129</sup> This approach could result in a piecemeal and inconsistent development pattern, lacking a cohesive and strategic approach to climate adaptation. Such haphazard decision making may undermine the effectiveness of climate adaptation measures and put lives at risk.

Relatedly, climate adaptation requires broader, systemic approaches that go beyond individual property-level solutions that are applicable to CUPs and variances. Climate adaptation necessitates comprehensive zoning that considers larger geographic scales to address the wide-ranging impacts of climate change more effectively and efficiently.<sup>130</sup>

305, 307 (N.Y. 1997))). While the granting of a variance does not automatically result in the approval of a similar variance request, it can often be persuasive. *See* *Risen v. Phila. Zoning Bd. of Adjustment*, No. 01885, 2013 Phila. Ct. Com. Pl. LEXIS 95, at \*15 (Pa. C.P. Apr. 10, 2013) (“Landowner is in a unique position because it owns the only remaining lot in a series of lots that have been granted similar variances.”); *see also* *Midgard Self Storage Alpharetta GA, LLC v. Alpharetta City Council*, No. 2020CV340240, 2021 Ga. Super. LEXIS 2055, at \*15 (Ga. Super. Ct. July 20, 2021) (“The record supports the possible grant of the requested variances under the applicable ordinance, and the Council’s denial, especially given its prior approval of similar applications, was not supported by any evidence and was therefore arbitrary and capricious.”).

<sup>128</sup> *See* *RESHAPING THE CITY*, *supra* note 93, at 13–14 (“Nonconforming projects that seek variances will be subject to discretionary review . . . potentially adding time or cost to development projects.”).

<sup>129</sup> *See* *Green*, *supra* note 114, at 1192 (Explaining the “detailed and specific” requirements that must met to be granted a conditional use permit in South Dakota, including: “(1) a written application indicating the section of the zoning ordinance under which the conditional use is sought and the grounds for which it is requested; (2) notice of public hearing and the holding of a hearing; (3) the zoning board to make particular findings of fact that it has authority to grant the conditional use permit and that ‘the granting of the conditional use will not adversely affect the public interest;’ (4) additional findings that the conditional use meets certain general conditions relating to traffic, parking, proper disposal of refuse, etc.; and (5) a finding that the proposed use meets the specific criteria set forth in the zoning ordinance relating to that particular conditional use.”); *see also* *POWELL ON REAL PROPERTY*, *supra* note 120, § 79C.14 (“A variance is an extraordinary exception to a zoning ordinance that should be granted sparingly. The reasons to justify approval must be substantial, serious, and compelling.” (footnote omitted)).

<sup>130</sup> *See* *State Preemption of Local Zoning Laws as Intersectional Climate Policy*, *supra* note 65, at 1615 (“[I]nterventions that make dense zoning possible are necessary to reduce the copious emissions that sprawl engenders. . . . States should continue to prohibit municipalities from allowing single-family zoning, . . . subsidiz[e] the development of affordable housing, . . . use tax incentives to encourage developers to build dense housing located close to transit[,] . . . require housing to contain a certain minimum number of units[,] . . . [and] employ[] zoning policy not only to mitigate climate change, but also to make cities and towns more resilient to climate change’s inevitable impacts. . . . Only with

Notwithstanding the foregoing, one relevant aspect of CUPs is the notion that the zoning code can anticipate and allow for certain uses based on specific conditions being met.<sup>131</sup> This concept of incorporating conditional allowances or requirements in zoning regulations can have value in the context of climate adaptation. For instance, if a local government identifies critical characteristics or conditions resulting from climate change, the CUP process could modify the base zoning regulations accordingly. By implementing conditional provisions tied to specific climate-related criteria, zoning regulations can be adapted to address evolving circumstances.

This approach allows for a more dynamic zoning framework where land uses can shift or be modified based on changing conditions associated with the impacts of climate change. It provides a mechanism to align land use regulations with the specific characteristics or requirements identified as significant for climate adaptation. Further details on this type of zoning, where uses are adjusted based on changing conditions, are provided in Section IV.A below as integrated into Sacrifice Zones.

More recently, overlay, floating, and environmental justice zones were created to help local governments adapt to changing conditions. These zones add more flexibility and adaptability to larger areas.<sup>132</sup> This Part highlights legal provisions and aspects of each respective zone that are particularly helpful in adapting to climate change.

#### A. Overlay Zones

An “overlay zone” adds an additional or distinct set of regulations to a specific area where it applies.<sup>133</sup> Each geographical area is subject to a base set

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a comprehensive effort, worthy of the problems that we face today, will states do what is necessary to address housing affordability, segregation, and climate change.”).

<sup>131</sup> See GOVERNOR’S OFF. OF PLAN. & RSCH. CAL., THE PLANNER’S TRAINING SERIES: THE CONDITIONAL USE PERMIT 1 (1997) (“A conditional use permit can provide flexibility within a zoning ordinance. . . . Each city or county may include in their zoning ordinance a wide variety of uses which they will permit with a conditional use permit.”); see also Green, *supra* note 114, at 1192 (Explaining that “[a] detailed and specific statutory scheme is how a conditional use permitting statute should look and function. The statutory scheme provides a clear process for the applicant to follow. Additionally, the statute provides clear standards the zoning board should apply.”).

<sup>132</sup> *Property Topics and Concepts*, *supra* note 47 (Discussing overlay zones and floating zones as “[f]lexible [z]oning [t]echniques” that “can help communities meet stated goals or address specific inequities” and assist “communities that wish to achieve specific goals outlined in a comprehensive plan or other public documents,” respectively.); see also ENV’T JUST. INTERAGENCY WORKING GRP., NEW YORK CITY’S ENVIRONMENTAL JUSTICE FOR ALL REPORT SCOPE OF WORK 12 (2021) (Explaining how environmental justice areas involves “[a]nalyz[ing] data related to environmental justice concerns to assess the distribution of environmental benefits and burdens, and identify[ing] areas which may be experiencing multiple, compounding EJ [environmental justice] concerns.”).

<sup>133</sup> *Property Topics and Concepts*, *supra* note 47 (“An overlay zone is a zoning district which is applied over one or more previously established zoning districts, establishing

of zoning regulations related to single-family residences, industrial businesses, and so forth. Traditionally, this base set regulates the available uses in the area and limits the height and bulk (or area)—Euclidean zoning.<sup>134</sup> An overlay zone builds off the existing base zoning in that it sets forth a layer—or overlay—of zoning regulations.<sup>135</sup> The purpose of an overlay zone is to allow the local government to address a specific issue or issues in a particular area without having to disturb the underlining base zoning.<sup>136</sup>

While the concept of an overlay zone has been around since the early twentieth century, the term “overlay zone” did not materialize until later.<sup>137</sup> Charleston, South Carolina enacted one early example of an overlay zone.<sup>138</sup> In 1931, Charleston implemented one of the first “Historic District Overlay Zones” to protect and preserve the historic character of certain neighborhoods in the city.<sup>139</sup> The overlay zone imposed additional regulations and design guidelines to ensure that new construction and renovations within the designated historic districts were compatible with the existing architectural

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additional or stricter standards and criteria for covered properties in addition to those of the underlying zoning district.”).

<sup>134</sup> See *supra* note 86 and accompanying text.

<sup>135</sup> KENNETH A. MANASTER & DANIEL P. SELMI, CALIFORNIA ENVIRONMENTAL LAW AND LAND USE PRACTICE § 60.12[3] (2024) [hereinafter CALIFORNIA ENVIRONMENTAL LAW AND LAND USE PRACTICE]; *Property Topics and Concepts*, *supra* note 47.

<sup>136</sup> Robert J. Blackwell, *Overlay Zoning, Performance Standards, and Environmental Protection After Nollan*, 16 B.C. ENV'T AFFS. L. REV. 615, 659 (1989) (“Overlay zoning . . . allows municipalities . . . to specifically tailor a land use without disturbing the underlying zoning.”); see also *Property Topics and Concepts*, *supra* note 47 (“Overlay zones . . . tailor regulations to specific properties and districts to meet specific community goals, they can be more politically feasible to implement and can help communities meet stated goals or address specific inequities.”).

<sup>137</sup> Steven H. Magee, *Protecting Land Around Airports; Avoiding Regulatory Taking Claims by Comprehensive Planning and Zoning*, 62 J. AIR L. & COM. 243, 269 & n.167 (1996) (Explaining that “[o]verlay zones have existed since the first zoning ordinance was adopted in the City of New York” in 1916, “although the term was not used as such.”); see also *Auckland v. Bd. of Cnty. Comm’rs*, 536 P.2d 444, 445 (Or. Ct. App. 1975) (representing the earliest case regarding overlay zones in 1975, in which a community service overlay was denied in 1973).

<sup>138</sup> MASS. HIST. COMM’N, ESTABLISHING LOCAL HISTORIC DISTRICTS 7 (2021) [hereinafter ESTABLISHING LOCAL HISTORIC DISTRICTS]; *The Old and Historic Charleston District*, N.Y. PRES. ARCHIVE PROJECT, <https://www.nypap.org/preservation-history/the-old-and-historic-charleston-district/> [<https://perma.cc/Z225-W7EW>]; *Historic Overlay*, PRELIMINARY ZONING ANALYSIS, <https://preliminaryzoninganalysis.com/blog/historic-overlay/> [<https://perma.cc/CAQ4-6S89>].

<sup>139</sup> ESTABLISHING LOCAL HISTORIC DISTRICTS, *supra* note 138, at 7.



style and character of the area.<sup>140</sup> This type of historic district overlay zone became popular and spread to other cities across the country.<sup>141</sup>

In addition to historic district overlay zones, overlay zones have been used to achieve a variety of objectives, including protection of environmentally sensitive areas,<sup>142</sup> affordable housing,<sup>143</sup> pedestrian areas,<sup>144</sup> transit-

<sup>140</sup> See *id.* at 3 (“The overarching benefit of a local historic district is the protection of significant buildings from demolition and inappropriate alteration.”); see also *Historic Overlay Districts*, FAIRFAX CNTY. DEP’T OF PLAN. & DEV., <https://www.fairfax-county.gov/planning-development/historic-overlay-districts#> [<https://perma.cc/SPE4-FE-XY>] (Explaining how Virginia’s “Historic Overlay Districts . . . provide regulations over and above the regular zoning protection to better protect those unique areas, sites, and buildings that are of special architectural, historic, or archaeological value to local residents and visitors.”).

<sup>141</sup> ESTABLISHING LOCAL HISTORIC DISTRICTS, *supra* note 138, at 7; *The Old and Historic Charleston District*, *supra* note 138.

<sup>142</sup> Magee, *supra* note 137, at 269 (1996) (explaining that environmental overlay zones can be used to protect environmentally sensitive areas, such as wetlands or critical wildlife habitats); *Property Topics and Concepts*, *supra* note 47 (“Communities often use overlay zones to protect special features such as . . . wetlands, steep slopes, and waterfronts.”). A variety of strategies may be used in these districts including setbacks from critical waterways and requiring minimum plantings. Joel Russell, *Overlay Zoning to Protect Surface Waters*, 54 PLAN. COMM’RS J., 1, 1 (2004) (“An essential first step in developing an overlay zone is to map the zone’s boundaries. In the case of stream corridors or lakeshores, these boundaries are typically determined by drawing a boundary line a specified horizontal distance from the bank or shore of the stream or lake (usually between 100 and 200 feet).”); N.Y.C., N.Y., City Plan. Comm’n, Planting Requirement § 23–451 (Apr. 14, 2010) (Stating that “[i]n the districts indicated, a minimum percentage of the area of the *front yard* shall be planted.”).

<sup>143</sup> *Property Topics and Concepts*, *supra* note 47. An affordable housing overlay zone seeks to encourage the development of affordable housing by offering incentives, such as density bonuses or tax benefits for the construction of affordable housing or requiring minimum amount of affordable housing for any permitting. NAT’L ASS’N OF HOME BUILDERS, RESEARCH ON STATE AND LOCAL MEANS OF INCREASING AFFORDABLE HOUSING 46, 49, 66 (2008).

<sup>144</sup> ILL. PREVENTION RSCH. CTR., PEDESTRIAN-ORIENTED ZONING IN ACTION: A COMMUNITY SNAPSHOT (2019). Pedestrian overlay zones seek to reorder vehicular primacy in planning; they prioritize pedestrian-focused infrastructure, including requiring wider sidewalks, green infrastructure, and safe street crossing. See *id.* (“[A]n overlay zoning designation . . . supports compact, mixed-use developments that enhance the pedestrian environment. The zoning district fosters bike and pedestrian connectivity through the construction of bike lanes and sidewalk networks, and encourages pedestrian amenities such as bike parking and access to open space.”); see also Brett DuBois, *Create Pedestrian Focused Overlay Zones*, SUSTAINABLE DEV. CODE, <https://sustainablecitycode.org/brief/create-pedestrian-focused-overlay-zones/> [<https://perma.cc/VY9F-N5CV>].

oriented development districts,<sup>145</sup> and cultural heritage sites.<sup>146</sup> They are also used to regulate Planned Unit Developments.<sup>147</sup>

By establishing a new set of applicable criteria for a specific area, overlay zones can also be a valuable tool to regulate areas needing to adapt to climate change. Overlay zones prove particularly useful for climate adaptation because they provide the ability to add or supplement criteria to the existing base zoning regulations. By incorporating additional provisions, overlay zones can address specific climate-related concerns and drive the purpose and objectives of the overlay zone. They can impose restrictions on development, establish construction and design standards, and require specific vegetation standards. They achieve these goals by either incentivizing or mandating landowners to take various actions.

When an overlay zone is implemented, landowners within the defined geographical area must comply with both the base zone regulations and any additional provisions outlined in the overlay zone. This dual compliance ensures that the new criteria, which can be tailored to address climate adaptation needs, shape the development and land use practices within the area. Integrating climate-focused criteria into overlay zones can effectively help communities promote sustainable and resilient development patterns. The overlay zoning, for instance, can include requirements for stormwater management, green infrastructure, tree canopy cover, preservation of natural resources, or other measures that enhance climate resilience.<sup>148</sup>

<sup>145</sup> Patricia E. Salkin & Amy Lavine, *Land Use Law and Active Living: Opportunities for States to Assume a Leadership Role in Promoting and Incentivizing Local Options*, 5 RUTGERS J.L. & PUB. POL'Y 317, 344 (2008). Transit-oriented development ("TOD") overlay zones incentivize or require certain types of construction around transportation corridors. *Id.* They often aim to promote mixed-use, high-density development that is easily accessible to public transportation, reducing reliance on private vehicles. *Id.*; Kyler Massner, *Transit-Oriented Development*, SUSTAINABLE DEV. CODE, <https://sustainablecitycode.org/brief/transit-oriented-development-8/> [<https://perma.cc/23L6-QWZV>].

<sup>146</sup> Victoria A. Smalls, *Uphold the Integrity of the Cultural Protection Overlay on St. Helena Island*, ISLAND PACKET (Dec. 28, 2022, 1:13 PM), <https://www.coastalconservation-league.org/wp-content/uploads/2023/02/St.-Helena-SCs-Gullah-culture-at-risk-if-golf-course-allowed--Hilton-Head-Island-Packet.pdf> [<https://perma.cc/79VQ-TQRX>]; see also VICT. DEP'T ENV'T, LAND, WATER & PLAN., *APPLYING THE HERITAGE OVERLAY: PLANNING PRACTICE NOTE 1*, at 1 (2018).

<sup>147</sup> Magee, *supra* note 137, at 268, 270. "A Planned Unit Development (PUD) is a specific type of plan or development commonly associated with master planned communities and sprawl. The specific definitions of a PUD vary by jurisdiction, but the term generally refers to a flexible approach to the planning of a variety of housing types and land uses on a relatively large portion of land." *What is a Planned Unit Development*, PLANETIZEN, <https://www.planetizen.com/definition/planned-unit-development> [<https://perma.cc/47VQ-WAYZ>].

<sup>148</sup> See *infra* Section IV.B (discussing criteria that could be used as part of Sacrifice Zones).

### B. Floating Zones

A “floating zone” refers to a zoning district that is created in the written code, but not yet applied to a specific geographical area.<sup>149</sup> Before being sited on the ground, floating zones establish the legal conditions that warrant their implementation and outline the new set of regulations that will be enforced in the specific geographic area once the zone is situated.<sup>150</sup> In essence, a floating zone remains in a suspended state until specific conditions outlined in the floating zone regulations are fulfilled, at which point the floating zone is grounded and implemented in a designated area.

Floating zones were introduced in the mid-twentieth century.<sup>151</sup> One of the early adopters of the floating zone concept was the Village of Tarrytown, New York.<sup>152</sup> Its 1947 floating zone created the following:

“A new district or class of zone . . . [to] be called ‘Residence B-B’, in which, besides one- and two-family dwellings, buildings for multiple occupancy of fifteen or fewer families were permitted. The boundaries of the new type district were not delineated in the ordinance but were to be “*fixed by amendment of the official village building zone map, at such times in the future as such district or class of zone is applied, to properties in this village.*” . . . In addition, the ordinance erected exacting standards [that were to be applied in the floating zone].<sup>153</sup>

In upholding the village’s floating zone, the high court of New York found that the village had the authority to enact floating zones.<sup>154</sup> New York’s enabling zoning legislation, the court ruled, gave the village the authority to zone to promote the general welfare. Further, the court ruled that floating zones were consistent with New York’s general enabling statute.<sup>155</sup>

<sup>149</sup> J. THEODORE FINK & EMILY SVENSON, CREATING CONSERVATION OVERLAY ZONING: A GUIDE FOR COMMUNITIES IN THE HUDSON RIVER ESTUARY WATERSHED 8 (2022) (“The municipality adopts the text for the floating zone district, but it is not mapped onto a particular location until a formal application for a zoning amendment is made . . . .”); *Property Topics and Concepts*, *supra* note 47.

<sup>150</sup> CALIFORNIA ENVIRONMENTAL LAW AND LAND USE PRACTICE *supra* note 135, § 60.12[2] (“[A] floating zone is a prefabricated zone change, a fully described zone existing only in the text of the zoning ordinance until the local government imposes the floating zone on a specific parcel or area . . . .”); *Planning Milagros*, *supra* note 91, at 120 (“The zoning authority identifies a need for a particular type of use but may not be able to identify where in the locality that use should be placed or zoned. . . . [T]he authority creates a district without any specific location(s) on the map, but with a set of standards for determining appropriate locations. The zone ‘floats’ until a landowner seeks to have it applied to his or her property via a rezoning of the property.”).

<sup>151</sup> See *Rodgers v. Vill. of Tarrytown*, 96 N.E.2d 731, 732–33 (N.Y. 1951) (representing one of the earliest cases regarding floating zones passed in the late 1940s).

<sup>152</sup> See *id.* (describing Tarrytown’s challenged ordinances).

<sup>153</sup> *Id.* at 732 (first alteration in original) (emphasis added).

<sup>154</sup> *Id.* at 733–36.

<sup>155</sup> *Id.* at 731, 733–34 (“[P]ersons who own property in a particular zone or use district enjoy no eternally vested right to that classification if public interest demands otherwise . . . .”).

As illustrated in Tarrytown's ordinance, unlike traditional zoning districts that have fixed and predetermined locations, a floating zone does not specify its siting.<sup>156</sup> This concept arises from the understanding that land uses and development patterns change over time. Traditional zoning tends to be inflexible and unresponsive to emerging needs or changing circumstances; in contrast, a floating zone allows local governments to maintain some adaptability when circumstances change.<sup>157</sup>

Like overlay zones, floating zones also allow the local government to integrate criteria or conditions that meet the locality's needs. Those needs come in two forms: first, the pre-conditions that must be met before the floating zone is sited in a certain area; and second, the new requirements that are applicable to the area once the floating zone is grounded.<sup>158</sup>

Floating zones present various potential benefits for addressing climate adaptation. They provide flexibility to accommodate changes that were not anticipated by traditional zoning practices. Moreover, they enable the adaptive reuse of existing lands, structures, or brownfield sites by permitting new uses that contribute to revitalization efforts. Additionally, floating zones allow local governments to incorporate environmental and societal considerations that are not only tailored to specific locations but also absent from traditional zoning regulations.

### C. *Environmental Justice Zones*

The Environmental Protection Agency ("EPA") defines environmental justice as "the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation and enforcement of environmental laws, regulations and policies."<sup>159</sup> Numerous national-, state-, and county-level data demonstrate that communities of color face a disproportionate burden of environmental hazards compared to their white counterparts.<sup>160</sup> This disparity

<sup>156</sup> *Planning Milagros*, *supra* note 91, at 120.

<sup>157</sup> *Id.* ("Rather than be limited by the rigidity of traditional Euclidean zoning, . . . [floating zones] give[] the local authority flexibility in responding to local land use needs.").

<sup>158</sup> See Farrell Fritz, *It's a Bird, It's a Plane, It's a Floating Zone*, LONG ISLAND LAND USE & ZONING (June 26, 2017), <https://www.lilanduseandzoning.com/2017/06/26/its-a-bird-its-a-plane-its-a-floating-zone/> [<https://perma.cc/Z5GQ-5PU4>].

<sup>159</sup> *Learn About Environmental Justice*, EPA, <https://www.epa.gov/environmentaljustice/learn-about-environmental-justice> [<https://perma.cc/HX42-UXF7>] (Aug. 16, 2023).

<sup>160</sup> *E.g.*, Christopher W. Tessum et al., *PM<sub>2.5</sub> Polluters Disproportionately and Systemically Affect People of Color in the United States*, 7 SCI. ADVANCES eabf4491 at 3 (2021) (Finding "that most emission source types . . . disproportionately affect racial-ethnic minorities. This phenomenon is systemic, holding for nearly all major sectors, as well as across states and urban and rural areas, income levels, and exposure levels."); see also, *e.g.*, ANDREA FLYNN ET AL., ROOSEVELT INST., *REWRITE THE RACIAL RULES: BUILDING AN INCLUSIVE AMERICAN ECONOMY* 58 (2016) ("[In] segregated [B]lack neighborhoods[,] . . . environmental exposure to toxins and air pollutants are five to 20 times higher than in white

arises from systemic racial biases ingrained in “ostensibl[y] race-neutral[]” policies.<sup>161</sup> Despite efforts to establish equitable neighborhoods, such as the enactment of the Fair Housing Act, shortcomings persist in fostering integration.<sup>162</sup>

The environmental justice movement, pioneered by Professor Robert Bullard, has highlighted the stark inequalities faced by communities of color in terms of environmental degradation.<sup>163</sup> The concept of environmental justice emerged in response to the recognition that certain communities—particularly those with less socioeconomic power and political influence—bear a greater share of the negative environmental impacts associated with industrial activities, waste disposal sites, power plants, and other sources of pollution.<sup>164</sup> Bullard’s pioneering work in Houston, Texas, illuminated the

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neighborhoods with comparable incomes thanks to the ‘deliberate placement’ of toxic waste sites and polluting factories. The lack of green space and public recreation areas in [B]lack neighborhoods further reduces quality of life and health.” (footnote omitted)); INTERDISC. ENV’T CLINIC, WASH. UNIV. SCH. OF L. ST. LOUIS, ENVIRONMENTAL RACISM IN ST. LOUIS 1 (2019) (“Black St. Louisans are exposed to considerably greater environmental risks than white residents, contributing to stark racial disparities regarding health, economic, and quality of life burdens . . .”).

<sup>161</sup> See FLYNN ET AL., *supra* note 160, at 5, 6, 58 (Discussing that “even when policymakers intend on race-neutral results, policies are refracted through historical institutions, current rules, and societal norms, resulting in disparate impacts on [B]lack . . . Americans” and that “[i]ndividuals who reside in segregated neighborhoods[,] . . . are also much more likely to be exposed to conditions that lead to negative health outcomes.”).

<sup>162</sup> *Id.* at 29 (“The 1968 Fair Housing Act and 1977 Community Reinvestment Act targeted racially discriminatory practices in the housing and lending industries. . . . However, non-rules—a lack of regulations—have enabled new forms of redlining widely practiced by private banking institutions.”); Michelle Adams, *The Unfulfilled Promise of the Fair Housing Act*, NEW YORKER (Apr. 11, 2018), <https://www.newyorker.com/news/news-desk/the-unfulfilled-promise-of-the-fair-housing-act> [<https://perma.cc/NG4J-VLCN>] (“[T]he Fair Housing Act has never fully delivered on its promise to promote and further integration.”); see also Raj Chetty et al., *The Effects of Exposure to Better Neighborhoods on Children: New Evidence from the Moving to Opportunity Experiment*, 106 AM. ECON. REV. 855, 899 (2016) (Finding “that children who move[] to lower-poverty areas when they [a]re young (below age 13) are more likely to attend college[,] . . . have substantially higher incomes as adults[,] . . . [and] also live in better neighborhoods themselves as adults.”).

<sup>163</sup> See Renee Skelton & Vernice Miller, *The Environmental Justice Movement*, NAT. RES. DEF. COUNCIL (Aug. 22, 2023), <https://www.nrdc.org/stories/environmental-justice-movement> [<https://perma.cc/VG8P-8TKW>]; see also *Environmental Justice Timeline*, EPA, <https://www.epa.gov/environmentaljustice/environmental-justice-timeline> [<https://perma.cc/MCG9-T2R9>] (June 27, 2023) (Describing how “Dr. Robert Bullard . . . conducted . . . the first comprehensive [study] . . . of environmental racism in the United States[,]” published “the first book focused primarily on documenting environmental injustice in the United States” and formed “[t]he Environmental Justice Resource Center . . . at Clark Atlanta University.”).

<sup>164</sup> See Nika Beauchamp, *The Environmental Justice Movement*, DEF. OUR HEALTH (Jan. 12, 2018), <https://defendourhealth.org/blog/the-environmental-justice-movement/> [<https://perma.cc/C4MV-J85Q>] (“[T]he environmental justice movement addresses a statistical fact: people who live, work and play in America’s most polluted environments are commonly people of color and the poor. Environmental justice advocates have shown that this

presence of municipal waste disposal sites predominantly in these communities.<sup>165</sup> The 1991 People of Color Environmental Leadership Summit underscored this issue by outlining seventeen principles of environmental justice.<sup>166</sup> Subsequent studies by Bullard et al. in 2007 revealed persistent overexposure of people of color to hazardous environments.<sup>167</sup>

Zoning and land use policies hold significant potential to address local environmental injustices.<sup>168</sup> Municipalities can employ various tools, like comprehensive planning, environmental impact analyses, and local boards to promote environmental justice.<sup>169</sup> One such recent development is to implement a new zoning district called an environmental justice zone. An environmental justice zone, also known as an environmental justice area or community, refers to a geographic area or community that experiences a disproportionate burden of environmental pollution, hazards, or risks compared to other areas.<sup>170</sup> These zones are typically populated by marginalized

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is no accident. Communities of color, which are often poor, are routinely targeted to host facilities that have negative environmental impacts—say, a landfill, dirty industrial plant or truck depot. The statistics provide clear evidence of what the movement rightly calls ‘environmental racism.’ Communities of color have been battling this injustice for decades.”); *see also Environmental Justice Timeline*, *supra* note 163 (“The environmental justice movement was started by individuals, primarily people of color, who sought to address the inequity of environmental protection in their communities.”).

<sup>165</sup> *Environmental Justice Timeline*, *supra* note 163. *See generally* Robert D. Bullard, *Solid Waste Sites and the Black Houston Community*, 53 SOCIO. INQUIRY 273 (1983) [hereinafter *Solid Waste Sites*].

<sup>166</sup> Environmental Justice Act of 2019, S. 2236, 116th Cong. §§ 3(4)(C) (“[T]he 17 Principles of Environmental Justice written and adopted at the First National People of Color Environmental Leadership Summit held on October 24 through 27, 1991, in Washington, DC, are upheld.”); Dana Alston, *Transforming a Movement*, 2 RACE, POVERTY & ENV’T 1, 29 (1991).

<sup>167</sup> ROBERT D BULLARD ET AL., TOXIC WASTES AND RACE AT TWENTY: 1987—2007 49, 52, 53 (2007) [hereinafter TOXIC WASTES].

<sup>168</sup> *See* ANA ISABEL BAPTISTA, NEW SCH. TISHMAN ENV’T & DESIGN CTR, LOCAL POLICIES FOR ENVIRONMENTAL JUSTICE: A NATIONAL SCAN 6 (2019) (“While local zoning codes and land use policies historically have been tools for segregating people and concentrating pollution in low-income communities and communities of color, community-based advocacy can transform these same tools into means for addressing cumulative burdens borne by environmental justice communities.”).

<sup>169</sup> *See id.* at 14 (Describing environmental justice policies, including those that: “relied principally on the initiation of an environmental review for new or expanding development proposals as a vehicle to assess the potential cumulative or disparate burdens of the proposal[,] . . . were narrowly focused on a particular fix like outright prohibitions or bans of targeted industries or land uses[,] . . . [and] general EJ policies to lay out commitments to broad EJ goals.”).

<sup>170</sup> *See What Does an Environmental Justice Community Even Mean?*, FORESIGHT DESIGN INITIATIVE (July 19, 2017), <https://www.foresightdesign.org/blog/2017/7/19/xcd8aq95i73fy933hw4ppjappv346t> [https://perma.cc/2K48-4MKJ] (“Communities most impacted by environmental harms and risks are typically referred to as ‘environmental justice (EJ) communities . . . .’”); *see also* BAPTISTA, *supra* note 168, at 8 (“[E]nvironmental justice communities combat . . . dust, odor, noise and light pollution, illegal dumping, and toxic runoff into neighborhoods and nearby waterbodies.”).

and disadvantaged communities, including low-income individuals, people of color, and indigenous peoples, that are impacted by poor environmental conditions (such as poor air and water quality) or lower than average key life determinants (such as asthma rates), or both.<sup>171</sup>

Environmental justice zones are identified through various methods, including environmental impact assessments, community-driven research, and analysis of demographic data.<sup>172</sup> Government agencies, non-governmental organizations, and grassroots movements work to raise awareness about environmental justice issues and advocate for equitable distribution of environmental benefits and burdens.<sup>173</sup> The goal is to address and rectify the disproportionate environmental hazards faced by these communities—ensuring fair treatment, meaningful involvement, and equal protection under

<sup>171</sup> *What Does an Environmental Justice Community Even Mean?*, *supra* note 170 (Describing environmental justice communities as those where “[m]inority, low-income, tribal, or indigenous populations or geographic locations in the United States that potentially experience disproportionate environmental harms and risks. This disproportionality can be a result of greater vulnerability to environmental hazards, lack of opportunity for public participation, or other factors. . . . The term describes situations where multiple factors, including both environmental and socioeconomic stressors, may act cumulatively to affect health and the environment and contribute to persistent environmental health disparities.”); BAPTISTA, *supra* note 168, at 17, 27 (discussing “low-income communities and communities of color [that] face higher cancer risks from hazardous air pollutants than more well-off areas” as well as “asthma rates [that] are disproportionately high”); *see also* ENV’T JUST. INTERAGENCY WORKING GRP., *supra* note 132, at 6–7, 9 (Defining an environmental justice area as “[a] low-income community located in the city or a minority community located in the city;” the final report’s “top priorities . . . include . . . [environmental justice area’s] direct and indirect linkages to environmental and health outcomes[] [and] . . . disparate health or environmental outcomes based on race or income.”).

<sup>172</sup> *See What Does an Environmental Justice Community Even Mean?*, *supra* note 170 (Stating that the “factors that go into identifying EJ communities, include[e] . . . (1) disproportionate exposure to environmental hazards and (2) increased vulnerability to said hazards.”); *see also* *Defining Environmental Justice Communities: Using CalEnviroScreen in State Policy*, CAL. ENV’T JUST. ALL., <https://caleja.org/2016/09/defining-environmental-justice-communities-using-calenviroscreen-in-state-policy/#> [<https://perma.cc/6X6L-JV74>] (Discussing the CalEnviroScreen, “a place-based cumulative impact screening methodology . . . [that] provides one clear, accessible, and science-based way to identify and define communities that are disproportionately burdened by multiple sources of pollution and social vulnerabilities . . . [by] look[ing] at 19 indicators to provide a statewide ranking of all 8,000 census tracts in California.”). *See generally* DAVID KONISKY ET AL., *MAPPING FOR ENVIRONMENTAL JUSTICE: AN ANALYSIS OF STATE LEVEL TOOLS* (2021).

<sup>173</sup> Beauchamp, *supra* note 164 (Highlighting that grassroots environmental justice advocates and communities have shown that “[c]ommunities of color, which are often poor, are routinely targeted to host facilities that have negative environmental impacts—say, a landfill, dirty industrial plant or truck depot.”). These advocates and communities have become “strong and enduring forces for environmental protection and social change in their communities.” Skelton & Miller, *supra* note 163; *see also* TOXIC WASTES, *supra* note 167, at 1; BAPTISTA, *supra* note 168, at 6.

environmental laws and regulations—and to prevent further environmental burdens.<sup>174</sup>

An example of an environmental justice zone is Baltimore's 2018 Crude Oil Terminal Prohibition, which employs zoning codes to thwart the expansion of crude oil terminals.<sup>175</sup> This move was prompted by the surge in crude oil shipments via rail, which raised concerns about public safety and environmental risks.<sup>176</sup> By using its zoning authority, Baltimore and other cities (including Portland, Oregon) have pioneered measures to safeguard their citizens from hazardous fossil fuel infrastructure.<sup>177</sup>

The Los Angeles Clean Up Green Up Ordinance, inspired by the Green Zones concept developed by environmental justice organizations, is another example of local action to combat cumulative health impacts from incompatible land uses.<sup>178</sup> This approach designates highly impacted areas as green zones and then focuses resources, regulatory attention, and green business development in the green zone.<sup>179</sup> Los Angeles implemented the Clean Up Green Up Ordinance, benefiting neighborhoods burdened by environmental hazards.<sup>180</sup>

<sup>174</sup> See TOXIC WASTES, *supra* note 167, at 152 (“The [environmental justice] movement set out clear goals of eliminating unequal enforcement of environmental, civil rights and public health laws.”); see also Skelton & Miller, *supra* note 163 (“Environmental justice [communities] . . . [continue to be] an important part of the struggle to improve and maintain a clean and healthful environment, especially for [those] . . . who have [traditionally] . . . live[d], work[ed], and play[ed] closest to sources of pollution.”).

<sup>175</sup> BALT., MD., ZONING CODE, §§ 1-209, 1-304 (2023).

<sup>176</sup> *Baltimore Bans Crude Oil Export Terminals*, CHESAPEAKE CURRENTS (Summer 2018).

<sup>177</sup> See *id.* at 2 (calling “[t]he Crude Oil Terminal Prohibition . . . a victory for public safety, clean water and air, and climate change”); see also Natasha Geiling, *Baltimore Votes to Ban Crude Oil Export Terminals*, THINKPROGRESS, <https://archive.thinkprogress.org/baltimore-votes-to-ban-crude-oil-export-terminals-c922541de292/> [<https://perma.cc/Y7V2-NN4J>] (Mar. 29, 2018, 12:17 PM) (Noting that Portland has banned “new or expanded ‘bulk fossil fuel terminal[s].’”); Richard Nunno, *Oil ‘Bomb Trains’ Secretly Moving to West Coast*, ENV’T & ENERGY STUDY INST. (Aug. 22, 2019), <https://www.eesi.org/articles/view/oil-bomb-trains-secretly-moving-to-west-coast> [<https://perma.cc/59B7-MYN8>] (noting the dangers associated with fossil fuel infrastructure, including explosions, water pollution, and air pollution from derailment as well as “loss of consciousness and respiratory failure” when benzene and hydrogen sulfide are inhaled).

<sup>178</sup> BAPTISTA, *supra* note 168, at 24; L.A., CAL., MUN. CODE § 13.18 (2016).

<sup>179</sup> BAPTISTA, *supra* note 168, at 24 (Explaining that the “approach works by identifying highly impacted communities as green zones, directing benefits and programs into the areas, and giving these green zones first priority in terms of resources, regulatory attention, and green business development.”); see also L.A., CAL., MUN. CODE § 13.18 (2016).

<sup>180</sup> See BAPTISTA, *supra* note 168, at 24 (“The purpose of Green Zones is to improve environmental and economic conditions in environmental justice communities . . . .”); see also L.A., CAL., MUN. CODE § 13.18(A) (2016) (“The purpose of the CUGU [Clean Up Green Up] District is to reduce cumulative health impacts resulting from land uses including, but not limited to, concentrated industrial land use, on-road vehicle travel, and heavily freight-dominated transportation corridors, which are incompatible with the sensitive uses to which they are in close proximity, such as homes, schools and other sensitive uses.”).



A notable strategy emerging from environmental justice activism is the creation of supplemental use districts with tailored community standards to mitigate hazardous land uses while fostering economic growth and community revitalization.<sup>181</sup> Minneapolis, Minnesota's adoption of similar green zone plans reflects this trend.<sup>182</sup> Such approaches, whether through zoning overlays or supplemental use districts, offer avenues to proactively address health hazards and encourage sustainable development, effectively shifting the focus from perpetuating harm to preventing it.

### III. BRINGING SYMMETRY: SACRIFICE ZONES

Part I described the mismatch between a stationary zoning law that manifests into the permanent, physical landscape of each city we experience today and a rapidly changing environment and climate. Part II described several existing zoning tools that were designed to insert some flexibility into the zoning process and zoning code to help accommodate change. Building upon the previous sections, Part III takes overlay zones, floating zones, and environmental justice zones and offers an approach that would maximize their potential to proactively address the impacts of climate change. In doing so, Part III introduces a novel hybrid zoning approach called a Sacrifice Zone, which aims to optimize responses to changing climate conditions.

Sacrifice Zones present an opportunity to proactively plan for a future of significant climate change while simultaneously addressing historical injustices and discriminatory practices through purposeful, fair, and sustainable long-term land use planning. By considering the impacts of climate change and adopting inclusive and sustainable zoning practices, Sacrifice Zones may promote climate adaptation, environmental justice, resilience, and fairness in land use decision-making.

Section III.A begins with a review of the traditional, albeit recent, use of "sacrifice zone" in both the literature and in popular articles. As discussed below, the review illustrates how the term "sacrifice zone" has been used in a pejorative way that designates a geographical area lost or sacrificed based on environmental degradation, discrimination, and segregation. Section III.B provides an alternative definition for "Sacrifice Zone." A Sacrifice Zone is proposed as a zoning district that proactively addresses climate adaptation and mitigation, as well as discrimination.

<sup>181</sup> Carla J. Kimbrough, *Los Angeles' "Clean Up, Green Up" Ordinance: A Victory in the Environmental Justice Fight*, 106 NAT'L CIVIC REV. 3, 5 (2017).

<sup>182</sup> See *id.* at 7 ("CUGU seems to be catching on in other places, . . . in Minneapolis, people are looking at the ordinance as well . . ."); see also Minneapolis, Minn., City Council Resol. No. 2017R-188: Establishing Green Zones in the City of Minneapolis (2017) (adopting "Green Zones in the City of Minneapolis to achieve racial equity, prevent gentrification, support economic development, and strengthen the health of communities that face the cumulative impacts of environmental pollution as well as social, political, and economic vulnerability").

### A. *Traditional Use of “Sacrifice Zone”*

Since its introduction in the mid-twentieth century,<sup>183</sup> the term “sacrifice zones” has evolved. It encompasses not only the loss of land but also how that loss negatively impacts both the land itself and the people connected to it.<sup>184</sup> The evolved concept recognizes the detrimental effects impacting both the natural environment and the adjacent communities. It also recognizes that laws and policies prioritize certain interests at the expense of others.

Scholars have traced the origins of “sacrifice zones” to the 1970s.<sup>185</sup> Originally, it was used to describe land that was overused by farmers holding livestock.<sup>186</sup> These areas

Lack[ed] vegetation, [and] during rainy periods . . . turned to mud; during droughts to dust. Yet because successful livestock operations required green pastures, the sacrifice area concept developed to index different practices for different plots of land: some pastureland should be permanently destroyed to allow other pastureland to remain verdant over the long term.<sup>187</sup>

Stemming from its application to livestock, sacrifice zones then began to reference areas impacted by the energy sector, in particular oil exploration. As energy markets tightened in the 1970s, exploration and production of oil in the United States increased in priority.<sup>188</sup> This created a conflict between existing land use—particularly agricultural uses and energy exploration and extraction.<sup>189</sup> In part, this conflict led Colorado’s governor in a *New York*

<sup>183</sup> See *supra* note 50 and accompanying text.

<sup>184</sup> See *supra* note 17 and accompanying text.

<sup>185</sup> See Ryan Juskus, *Sacrifice Zones: A Genealogy and Analysis of an Environmental Justice Concept*, 15 ENV’T HUMANITIES 1, 5 (2023) (“By the early 1970s land managers and animal agriculturalists in the United States and the United Kingdom referred to places destroyed by livestock as ‘sacrifice areas.’”).

<sup>186</sup> See *id.* (“[O]bserving that the vegetation around water sources was often destroyed by heavy grazing, trampling, or dusting over, bureaucratic land managers in the American West called these places ‘sacrifice areas’ in a 1970 report.”).

<sup>187</sup> *Id.*

<sup>188</sup> See MEG JACOBS, PANIC AT THE PUMP: THE ENERGY CRISIS AND THE TRANSFORMATION OF AMERICAN POLITICS IN THE 1970s 3, 4, 7, 8 (2016) (“Arab producers of the Organization of Petroleum Exporting Countries (OPEC) put in place an embargo on oil exports to the United States in October 1973 and threatened to cut back overall production 25 percent. . . . By 1973, Americans relied on oil for almost half of all their energy needs, and each day imports made up an expanding portion of the country’s supply. . . . Three weeks into the Arab embargo, . . . to confront the energy crisis head-on[,] . . . [President] Nixon . . . [announced] ‘Project Independence.’ The goal, Nixon declared, was for the country to achieve energy self-sufficiency by 1980[,] . . . [and he] called for greater production of domestic energy . . .”).

<sup>189</sup> See Juskus, *supra* note 185, at 6 (Describing how “‘Project Independence’ . . . entailed expanding nuclear plants and coal strip mines into western areas largely inhabited by ranchers, agriculturalists, and Native Americans. Coal and nuclear companies took their industrial technologies to states like Colorado, Montana, and Wyoming.”); see also JACOBS, *supra* note 188, at 8 (Stating that “Nixon[] called for greater production of domestic energy and the scaling back of environmental and economic regulations, many of which he had

*Times* op-ed to plead with the country to “not sacrifice . . . [Colorado and its land], our water, and our agricultural economy for your energy consumption during a time of crisis.”<sup>190</sup> Further, he noted, “[t]he West, understandably, doesn’t want to become a ‘national sacrifice area.’”<sup>191</sup>

During its application to the energy sector, the concept of sacrifice zones shifted to not only encompass sacrificing the land, but also it included the people in the surrounding areas. Building off this new meaning, “American Indian Movement leader Russell Means theoretically enriched the concept by linking it to the sacrifice of entire peoples.”<sup>192</sup> Means identified ways in which Native American lands were exploited for natural resources, often resulting in negative conditions for those living there, including increased pollution.<sup>193</sup> Harming entire Native American societies, Means noted, “is considered by industry, and by the white society which created this industry, to be an ‘acceptable’ price to pay for energy resource development.”<sup>194</sup>

From this context spawned the most recent development in the concept of sacrifice zones, which is closely aligned with the environmental justice movement.<sup>195</sup> As noted above in Section II.C, the environmental justice

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put in place himself . . . [Y]oung conservatives, free from New Deal influences, argued that it was these very [environmental] regulations that thwarted American production of energy and made the country vulnerable. Without them, said their champion Milton Friedman, there would be no crisis”).

<sup>190</sup> Juskus, *supra* note 185, at 8.

<sup>191</sup> *Id.*

<sup>192</sup> *Id.* at 9.

<sup>193</sup> RUSSELL MEANS & MARVIN J. WOLF, *WHERE WHITE MEN FEAR TO TREAD: THE AUTOBIOGRAPHY OF RUSSELL MEANS* 402 (1995) (“Half of all U.S. uranium reserves and a third of the West’s coal, are under reservation land . . . Pine Ridge, with enormous uranium deposits, had been designated as part of a ‘National Sacrifice Area.’ In other words, white men decided they needed cheap energy and nuclear bombs more than we Indians needed our homes. The most efficient way to extract and process ore is to dump the radioactive waste near the mine, making the region uninhabitable forever. Those who sought the uranium also wanted to pump out the water beneath our territory, thus ensuring that *no* living thing could survive on our land.”); *see also* Juskus, *supra* note 185, at 10 (“[Means] pointed to the USSR, China, and Vietnam, where Marxists justified sacrificing Indigenous peoples in the name of industrialization. Industrial societies’ need for abundant energy sources would render places like his Pine Ridge ‘uninhabitable forever. This is considered by industry, and the white society which created this industry, to be an “acceptable” price to pay for energy resource development.’ However, he continued, ‘we are resisting being turned into a national sacrifice area. We’re resisting being turned into a national sacrifice people. The costs of this industrial process are not acceptable to us. It is genocide to dig the uranium here and to drain the water-table.’ In short, he said, capitalism is not ‘really responsible for the situation in which we have been declared a national sacrifice. No, it is the European tradition; European culture itself is responsible. Marxism is just the latest continuation of this tradition’ that ‘declare[s] us an acceptable “cost.”’ (alteration in original) (quoting RUSSELL MEANS, *THE SAME OLD SONG* 5–6)).

<sup>194</sup> MEANS & WOLF, *supra* note 193, at 549; Juskus, *supra* note 185, at 10.

<sup>195</sup> Jasmine Anderson, *An End to Sacrifice Zoning in Chicago*, 28 LOY. PUB. INT. L. REP. 10, 11 (2022) (“The term sacrifice zones has been adopted within the environmental justice movement to refer to areas of dense industrial concentration. The practice essentially

movement highlights the unjust distribution of environmental hazards and pollution.<sup>196</sup> The term “sacrifice zones” refers to an area or community, or both, that is not only polluted but also polluted based on explicit and implicit discriminatory policies.<sup>197</sup> The community, often a community of color or low-income, is where industries or infrastructure projects are located and result in environmental degradation, health risks, and socio-economic challenges.<sup>198</sup> These areas are considered sacrificed for the perceived “greater good”—typically economic development or resource extraction—without consideration of the local population’s well-being.<sup>199</sup>

This concept of sacrifice zone was adapted by Robert Bullard, “which he eventually referred to as ‘environmental sacrifice zones,’ to describe environmental disparities in places, like Warren County [North Carolina], that disproportionately bear the burdens of pollution, chemical exposure, and toxic waste.”<sup>200</sup> In *Sacrifice Zones: A Genealogy and Analysis of an Environmental*

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sacrifices the health, quality of life, and property of those in the vicinity of industrial facilities in the name of retaining the industry’s economic benefit for the larger community.”); Juskus, *supra* note 185, at 10 (“The concept’s next major development phase occurred in the 1990s with the rise of the EJ movement . . .”).

<sup>196</sup> See *supra* note 163 and accompanying text.

<sup>197</sup> See Anderson, *supra* note 195, at 11–12 (“Environmental justice groups have justly identified the racist underpinnings of sacrifice zones and continue to dedicate significant efforts to eradicating them through legislative and legal means.”); see also Juskus, *supra* note 185, at 11 (“[S]cholars and activists used [sacrifice zones] . . . to name any geographical area that bore a disproportionate amount of industrial pollution, toxic chemical exposure, or other environmental harms associated with industry or national security.”).

<sup>198</sup> See Anderson, *supra* note 195, at 11 (“[S]acrifice zones . . . refer to areas of dense industrial concentration. . . . As noted by Peter C. Little, the term has been ‘revived and recycled as a trope used to describe disadvantaged communities and landscapes disproportionately contaminated and neglected in the name of capital accumulation.’ These disadvantaged communities, where residents are predominantly low-income and people of color . . .”; see also Juskus, *supra* note 185, at 11 (“Steve Lerner . . . argued, [sacrifice zones] are ‘semi-industrial areas—largely populated by African Americans, Latinos, Native Americans, and low-income whites—where a dangerous and sometimes lethal brand of racial and economic discrimination persists.’ He argued that . . . ‘low-income and minority populations . . . are required to make disproportionate health and economic sacrifices that more affluent people can avoid.’ And this ‘pattern of unequal exposures constitutes a form of environmental racism that is being played out on a large scale across the nation.’” (quoting STEVE LERNER, *SACRIFICE ZONES* 2–3 (2010))).

<sup>199</sup> See Anderson, *supra* note 195, at 11 (“The practice [of sacrifice zones] essentially sacrifices the health, quality of life, and property of those in the vicinity of industrial facilities in the name of retaining the industry’s economic benefit for the larger community.”).

<sup>200</sup> Juskus, *supra* note 185, at 11; see also *Let’s Talk About Sacrifice Zones*, CLIMATE REALITY PROJECT (May 13, 2021), <https://www.climaterealityproject.org/blog/lets-talk-about-sacrifice-zones> [<https://perma.cc/B37Y-HUZA>] (Describing geographical examples located in the United States of Cancer Alley, Louisiana and Flint, Michigan, “No surprise, systemic racism plays a huge role in the geography of sacrifice zones. Research shows polluting plants are more likely to be built in areas where people of color live. The result, new studies show, is that industries responsible for 75 percent of air pollution hurt communities of color more. Tellingly, this statistic doesn’t change even across rural and urban areas or across income levels, meaning that in the US, Black and Latino Americans on average

*Justice Concept*, Ryan Juskus notes that “sacrifice zones” have become places that greatly affect certain demographics of people over others.<sup>201</sup> Originally, the lands were sacrificed for the “greater good,” which meant the development of food and energy.<sup>202</sup> Today, the concept of sacrifice zones refers not only to the lands but also to the people that are sacrificed.<sup>203</sup>

The *Climate Reality Project* adopts a similar definition, noting sacrifice zones are “populated areas with high levels of pollution and environmental hazards, thanks to nearby toxic or polluting industrial facilities. These areas are called ‘sacrifice zones’ because the health and safety of people in these communities is being effectively sacrificed for the economic gains and prosperity of others.”<sup>204</sup> Similarly, in the *UN Special Rapporteur on Human Rights and Environment*, the authors outline fifty of the most polluted places on Earth and the drastic effects such pollution has on the people of those areas.<sup>205</sup> These effects include a wide variety of harmful and serious health issues,

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breathe in significantly more pollution than Whites.”); U.N. SPECIAL RAPPORTEUR ON HUMAN RIGHTS AND THE ENVIRONMENT ANNEX 1, at 18 (2022) [hereinafter U.N. REPORT ANNEX]. Outside of the United States examples include: Niger Delta, Nigeria; Kibera, Nairobi; Minata, Japan; Kabwe, Zambia; and Lahore, Pakistan. See DAVID R. BOYD, U.N. SPECIAL RAPPORTEUR ON HUMAN RIGHTS & ENV’T 6–8 [hereinafter U.N. REPORT] (Noting that “[t]he people of the Niger Delta . . . have lived with oil pollution and gas flaring for decades, resulting in extensive physical and mental health problems caused by contaminated air, water and food,” that “[i]n Kabwe, . . . 95 per cent of children suffer from elevated blood lead levels caused by lead mining and smelting.”); see also U.N. REPORT ANNEX at 10 (Noting that “[i]n 2016, a severe smog episode occurred in Lahore, with nitrogen oxide levels 17 times higher than usual, causing a range of adverse health effects.”); AMNESTY INT’L, KENYA: THE UNSEEN MAJORITY 20 (2009) (“[O]ne of the greatest problems in the informal [Nairobi] settlements is the lack of water and sanitation services and garbage disposal facilities, which forces the residents to use the Nairobi Rivers as a dumping site.”); Christine L. Marran, *Contamination: From Minamata to Fukushima*, ASIA-PAC. J., May 9, 2011, at 1, 1 (“Chisso Corporation’s dumping of methyl-mercury in nearby waters [in Minamata] caused Minamata disease, as the painful ailment came to be known after it was first recognized in 1956.”).

<sup>201</sup> See Juskus, *supra* note 185, at 11 (Explaining that “the problem was systemic: toxic dumps and other ‘locally unwanted land uses’ were routinely sited in economically poor communities and communities of color”).

<sup>202</sup> See *supra* notes 186–187 and accompanying text.

<sup>203</sup> See Juskus, *supra* note 185, at 9; see also Anderson, *supra* note 195, at 11.

<sup>204</sup> *Sacrifice Zones 101*, *supra* note 50.

<sup>205</sup> See generally U.N. REPORT, *supra* note 200.

many of which lead to a premature death.<sup>206</sup> As described in the report, sacrifice zones refer to the people as much as the land.<sup>207</sup>

In sum, the term “sacrifice zone” has evolved over time: in current literature it describes polluted areas that are sacrificed *and* where the people living nearby are considered the sacrifice. These areas are often severely contaminated, and the term highlights the significant health impacts experienced by the residents, who are typically people of color or members of lower socioeconomic groups. This shift in definition may stem from the realization that certain groups, disproportionately affected by pollution, are being sacrificed for the benefit of society. The individuals in these sacrifice zones face severe health risks, including premature death.<sup>208</sup> This understanding has led both the public and scholars to recognize that the most significant sacrifice is the people themselves.<sup>209</sup> This use of “sacrifice zones,” which encapsulates both the loss of land and the sacrifice of the people, is integrated into the concept of “Sacrifice Zones” as described here. It represents a new zoning district and a proactive response to climate adaptation.

### *B. Sacrifice Zones as a Zoning Tool*

As conceived here, the concept of Sacrifice Zones incorporates the descriptions above and ventures into the realm of solutions. In this context, a Sacrifice Zone is a zoning district that applies to areas that are sacrificed to climate change, but in a way that benefits the land, biodiversity, and people living there or nearby.

Sacrifice Zones offer communities a means to address climate change by combining elements from overlay, floating, and environmental justice zones, along with other techniques. The concept of Sacrifice Zones is presented as a strategy to enhance community resilience and sustainability by facilitating

<sup>206</sup> DAVID R. BOYD & STEPHANIE KEENE, U.N. HUMAN RIGHTS, ESSENTIAL ELEMENTS OF EFFECTIVE AND EQUITABLE HUMAN RIGHTS AND ENVIRONMENTAL DUE DILIGENCE LEGISLATION, POLICY BRIEF NO. 3, at 3 (2022) (“Some of the most extreme overlapping environmental and human rights harms take place in ‘sacrifice zones’ where residents suffer devastating physical and mental health consequences and other human rights abuses as a result of living in pollution hotspots, heavily contaminated areas and places that have become (or are becoming) uninhabitable because of extreme weather events or slow-onset disasters spurred by the climate crisis.”).

<sup>207</sup> *See id.* at 3.

<sup>208</sup> *Id.*; *see also Sacrifice Zones 101*, *supra* note 50 (“[I]ndividuals who live constantly exposed to high levels of pollution often end up facing worse health outcomes and long-term ailments. Especially if they’re children, with Black children particularly vulnerable. Air pollution is linked to conditions such as asthma and respiratory illness. And groundwater contamination can result in diseases including cancer and organ damage.”).

<sup>209</sup> *See Juskus*, *supra* note 185, at 14 (“[T]he sacrifice zone concept signifies more than empirical description. Scholars, activists, and journalists appear to prefer the concept of a sacrifice zone to other descriptive concepts because others fail to accurately name the phenomenon’s existential significance to those who live and assemble in the places it describes.”).

the restoration of depleted ecosystems and the regeneration of habitats within a defined geographic area. Functioning akin to a floating zone, a Sacrifice Zone represents a specialized zoning district that gets grounded on a specific geographic area only once ecosystem and anthropogenic characteristics that would warrant the siting of a Sacrifice Zone are met. Such characteristics, like floating zones, are pre-determined and detailed further in Section IV.A. A Sacrifice Zone resembles an overlay zone by superseding the base zoning and introducing new standards when specific conditions are met. These conditions align with those typically found in environmental justice zones and are detailed in Section IV.B. Thus, Sacrifice Zones have two core components: (1) specific ecosystem and anthropogenic characteristics that warrant the siting of a Sacrifice Zone; and (2) criteria that are applicable to the area once a Sacrifice Zone is sited.

In Section IV.A below, the determination of whether a Sacrifice Zone should be grounded is elaborated, considering both ecosystem and anthropogenic factors influenced by climate change, such as flooding frequency, heat waves or urban heat island effects, drought conditions, wildfires, and equity considerations. Further described in Section IV.B, once a Sacrifice Zone is designated, compliance with specific criteria applicable to landowners within the district becomes obligatory. These criteria are designed to enhance adaptive capacities by focusing on the regeneration and restoration of natural habitats.<sup>210</sup> They encompass changes that could include building moratoria, relocation, enhanced building standards, ecosystem restoration, and infrastructure development or retraction.<sup>211</sup> By adhering to these criteria, Sacrifice Zones facilitate community adaptation to climate change and enable zoning to function as a regulatory tool that effectively addresses the unique challenges arising from shifting environmental conditions.

Sacrifice Zones have four primary objectives:

1. *Sacrifice Zones Aim to Resolve the Disparity Identified in Part I by Providing a Mechanism that Grants Local Governments the Flexibility to Respond Effectively to Evolving Circumstances.*

By allowing for real-time adjustments, Sacrifice Zones enable communities and local governments to engage in debates, draft regulations, and implement provisions before the actual need for the zone arises.

In the face of climate change-induced transformations, Sacrifice Zones offer communities and local governments a timely avenue to swiftly enact new zoning regulations. They serve as a catalyst for implementing adaptive strategies aimed at reducing vulnerabilities to climate-related risks, including

<sup>210</sup> See discussion *infra* Section IV.B.

<sup>211</sup> See discussion *infra* Section IV.B.

sea-level rise, extreme weather events, and intensified heatwaves,<sup>212</sup> *before* local governments and communities experience such vulnerabilities. By acting as a framework to incorporate climate adaptation into land use, Sacrifice Zones encourage proactive measures to enhance community resilience and reduce potential impacts on both human and natural systems.

The development of a new zoning code is often approached by prioritizing the enactment of language (the written code) before creating the zoning map, which is deemed to be the most politically contentious aspect.<sup>213</sup> In a similar manner, the process outlined for creating a Sacrifice Zone mirrors this approach. It commences with the formulation of language that defines the components and criteria associated with a Sacrifice Zone. Only when the actual conditions materialize does the Sacrifice Zone become designated within a specific geographic area. This aspect is significant as it underscores the tangible and physical nature of Sacrifice Zones. The relevance and enforceability of Sacrifice Zones only comes into effect when these geographic regions have experienced significant climate-related impacts.

Zoning amendments often require a lengthy land use process before implementation.<sup>214</sup> Sacrifice Zones frontload this process, making sure the process occurs in a methodical way prior to an emergency. They take the urgency out of trying to enact new zoning during a time of crisis. This approach involves articulating the relevant provisions for a Sacrifice Zone upfront and subsequently situating them within a specific geographic area when the appropriate conditions arise. By adopting this method, the process and political discourse are initiated proactively—before an emergency unfolds. When the

<sup>212</sup> See IPCC AR6 SYNTHESIS REPORT, *supra* note 17, at 6, 11, 12.

<sup>213</sup> See generally *City Releases Draft of Zoning Code Changes*, CITY OF POUGHKEEPSIE (Dec. 8, 2022), <https://www.cityofpoughkeepsie.com/CivicAlerts.aspx?AID=192> [<https://perma.cc/V3RT-X2JT>] (Discussing how, for the first time in forty years, Poughkeepsie is amending its zoning code and “intend[ing] the release of th[e] initial draft code . . . to help facilitate community conversation regarding zoning.”); Noah Kazis, *New York’s Ideas for Zoning Reform Offer Many Paths to Tackling the Housing Crisis*, BROOKINGS INST. (Jan. 31, 2022), <https://www.brookings.edu/articles/new-yorks-ideas-for-zoning-reform-offer-many-paths-to-tackling-the-housing-crisis/> [<https://perma.cc/5PK6-8NEC>] (Describing how “the best [zoning reform] bill is the one that passes—which itself is not a simple task.”); UNION, N.Y., ZONING CODE § 300-62.9 (2022) (featuring “[a] formal protest petition [to] oppos[e] a Zoning map amendment”).

<sup>214</sup> See CITIZENS BUDGET COMM’N, IMPROVING NEW YORK CITY’S LAND USE DECISION-MAKING PROCESS 10 (2022) (Describing how in New York City, “[i]mplementing needed zoning changes . . . has become increasingly difficult. Too often, the land use decision-making process through which the City reviews and approves changes has been an impediment to progress, restricting the City’s ability to spur job growth, develop housing, and become more resilient and sustainable. . . . A dysfunctional review process also makes it more difficult to pass the broad, publicly led rezonings that are needed to increase as-of-right residential capacity at the scale needed to address the City’s housing needs.”); see also *City Releases Draft of Zoning Code Changes*, *supra* note 213 (explaining the long process that preceded the *first draft* of a Poughkeepsie zoning amendment).



need arises, the local government can swiftly adapt by grounding the Sacrifice Zone in the specific area.

Relatedly, once conditions are met to site a Sacrifice Zone, such zone should exist in perpetuity and be subject to a minimum period during which it cannot be lifted or changed except in a way to further adapt to the climate changing conditions. Frontloading the code work avoids some of the protectionism that can accompany the siting of certain districts. Requiring a Sacrifice Zone to remain in place for a designated minimum period, such as three, five, seven, or ten years, helps the jurisdiction mitigate public backlash and the immediate political pressure to revoke the floating zone upon its implementation. This approach minimizes the urgency to remove Sacrifice Zones as soon as they come into effect, especially when they directly impact the community. It is important to remember that the siting of any Sacrifice Zone would occur only after repeated climate events, including the most recent event that triggers the siting of the zone.

2. *Sacrifice Zones Offer the Advantage of Leveraging the Groundwork Laid by Previous Local Governments Regarding Flexible Zoning Measures.*

An important aspect of drafting and implementing Sacrifice Zones is ensuring they comply with existing local authority. Floating zones and overlay zones have consistently been upheld under various local powers, whether in Home Rule or Dillon Rule states,<sup>215</sup> and they have withstood legal challenges, including those based on preemption.<sup>216</sup> By using these established legal

<sup>215</sup> See Jonathan Rosenbloom & Keith H. Hirokawa, *Foundations of Insider Environmental Law*, 49 EVN'T L. 631, 644–45 (2019) (describing Dillon's Rule).

<sup>216</sup> *E.g.*, *Franchise Devs., Inc. v. City of Cincinnati*, 505 N.E.2d 966, 971 (Ohio 1987) (upholding an “overlay zoning scheme . . . [as] a proper exercise of the city’s zoning authority”); *City of Iowa City v. Hagen Elecs., Inc.*, 545 N.W.2d 530, 536 (Iowa 1996) (Finding that “[t]he city clearly had a rational basis for adopting and enforcing the airport [overlay] zoning ordinance.”); *Zartman v. Reisem*, 399 N.Y.S.2d 506, 508, 510 (App. Div. 1977) (upholding a preservation overlay ordinance); *Rodgers v. Vill. of Tarrytown*, 96 N.E.2d 731, 732–33 (N.Y. 1951) (Holding that the floating zoning ordinance “not only accorded with sound zoning principles, not only complied with every requirement of law, but was accomplished in a proper, careful and reasonable manner.”); *Huff v. Bd. of Zoning Appeals of Balt. Cnty.*, 133 A.2d 83, 84, 92 (Md. 1957) (Finding that a floating ordinance was enacted “entirely free from a valid claim that it was arbitrary, capricious or unreasonable.”); *Donahue v. Zoning Bd. of Adjustment*, 194 A.2d 610, 610–12 (Pa. 1963) (Holding that the floating zone ordinance was “enacted in accordance with [the] comprehensive plan.”); see also Blackwell, *supra* note 136, at 630 (Stating that “overlay regulations generally prevail because they are usually more restrictive.”); Magee, *supra* note 137, at 271 (Explaining that overlay zones, “like any other zoning regulations, must be rationally related to the health, safety, and welfare of the community to be sustained legally.”); *Zoning—The Floating Zone: A Potential Instrument of Versatile Zoning*, 16 CATH. U.L. REV. 85, 88 (1966) (“[T]he validity of a floating zone will depend, *inter alia*, upon whether that particular land classification of that specific property conforms to a master plan . . .”). But see *Jachimek v. Superior Ct. of Ariz.*, 819 P.2d 487, 488–89 (Ariz. 1991) (invalidating an overlay zoning

mechanisms, such as overlay and floating zones, and the precedent upholding them, local governments can enact Sacrifice Zones with confidence in their authority to do so.

While Sacrifice Zones rely on and supplement existing tools, they redirect the focus of these previously validated tools toward climate adaptation, with secondary consideration given to climate mitigation. A key goal of this project is to ensure that local governments can adapt swiftly to climate change without becoming entangled in extensive and costly litigation. This goal does not imply that legal challenges are always unwarranted but rather acknowledges the reality that imposing a Sacrifice Zone at the moment of sacrifice—that is, the moment the land is lost to climate changing conditions—may result in litigation further delaying the change in status and exacerbating harms.

*3. Sacrifice Zones Encompass More than Just Mitigating Land Loss and Building Adaptive Capacity; They Also Aim to Create a Better Future.*

Historically, humans have exploited non-human living beings with disregard and recklessness, leading to an uncertain and risky future.<sup>217</sup> The concept of Sacrifice Zones emphasizes the need to restore and regenerate nature, habitats, and biodiversity to secure a more fruitful planet and a better future for generations.

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ordinance for violating the “statutory uniformity requirement” and “the policy of equal treatment”); *Eves v. Zoning Bd. of Lower Gwynedd Twp.*, 164 A.2d 7, 10–11 (Pa. 1960) (Invalidating a floating zone ordinance on the grounds that it “vari[ed] with the[] legislative directives . . . in two objectionable ways: (1) The ordinances were not enacted ‘in accordance with a comprehensive plan[;]’ and (2) they devolve upon the township supervisors duties quite beyond those duties outlined for them in the enabling legislation.”). In Home Rule states, “localities [have] the broadest powers of self-government or autonomy possible so that localities may adopt initiatives without looking to state law for specific authorization,” and in Dillon Rule States “local governments . . . ha[ve] limited authority to make laws and c[an] only exercise those powers specifically granted by state law.” PUB. HEALTH L. CTR., MITCHELL HAMLINE L. SCH., DILLON’S RULE, HOME RULE, AND PREEMPTION 4, 5 (2020). Ohio and Iowa are Home Rule states while Pennsylvania, New York and Maryland are considered Dillon Rule or combination states. JON D. RUSSEL & AARON BOSTROM, AM. CITY CNTY. EXCH., FEDERALISM, DILLON RULE AND HOME RULE 6 (2016) (Explaining that the Home Rule applies to “[a]ny municipality” in Ohio and Iowa.); TRAVIS MOORE, NEB. LEGIS. RSCH. OFF., DILLON RULE AND HOME RULE: PRINCIPLES OF LOCAL GOVERNANCE 2 (2020) (illustrating a map of Dillon and Dillon-Home combination states, which include New York, Pennsylvania and Maryland).

<sup>217</sup> See INTERGOVERNMENTAL SCI.-POL’Y PLATFORM ON BIODIVERSITY & ECOSYSTEM SERVS., THE GLOBAL ASSESSMENT REPORT ON BIODIVERSITY AND ECOSYSTEM SERVICES: SUMMARY FOR POLICYMAKERS 12 (2019) (“For terrestrial and freshwater ecosystems, land-use change has had the largest relative negative impact on nature since 1970, followed by the direct exploitation, in particular overexploitation, of animals, plants and other organisms, mainly via harvesting, logging, hunting and fishing. In marine ecosystems, direct exploitation of organisms (mainly fishing) has had the largest relative impact [on nature], followed by land-/sea-use change.”).

By developing large-scale nature restorations, Sacrifice Zones not only provide protection from the impacts of climate change but also contribute to improving biodiversity and function as greenhouse gas sinks to mitigate carbon emissions.<sup>218</sup> Moreover, the restoration of these lost ecosystems offers a wide range of crucial services that are rapidly diminishing across the United States, including water purification, air purification, flood protection, water retention, soil protection, and prevention of wildfires.<sup>219</sup> Such ecosystem restoration is pivotal in enhancing the resilience of the United States to climate change impacts.<sup>220</sup> The regeneration envisioned with Sacrifice Zones recognizes the interconnectedness of nature and human societies, emphasizing the importance of preserving and restoring ecosystems not only for environmental reasons but also for the well-being and prosperity of local communities.

4. *Sacrifice Zones Can Help Local Governments and Communities Move Toward More Sustainable, Equitable, and Environmentally Safe Planning and Zoning.*

Zoning happens. Some type of zoning covers most of the developed land in the United States.<sup>221</sup> Often, as mentioned above, as novel issues arise, existing zoning codes unintentionally regulate these issues.<sup>222</sup> And, as is often the case, they end up doing so in a haphazard way that exacerbates the challenges.<sup>223</sup>

<sup>218</sup> See IPCC AR6 SYNTHESIS REPORT, *supra* note 17, at 21, 55, 105 (Describing how nature restorations can “reduce a range of climate change risks,” “enhance biodiversity and ecosystem functions,” and “mitigate climate change through carbon uptake and storage.”).

<sup>219</sup> See *id.* at 105, 106 (Describing how restoration of certain natural systems can “reduc[e] risk from extreme events such as heatwaves, heavy precipitation and droughts,” “reduce emissions and/or increase carbon uptake and storage” and “protect against coastal erosion and flooding.”); see also Susan C. Cook-Patton et al., *Protect, Manage and Then Restore Lands for Climate Mitigation*, 11 NATURE CLIMATE CHANGE 1027, 1031 (2021) (Explaining that nature restoration “can capture carbon, improve air and water quality, . . . reduce urban heat effects,” “provide habitat for biodiversity, . . . improve[] flow regulation of water,” and “protect coastal communities from storm surge and erosion.” (footnotes omitted)).

<sup>220</sup> See CLIENTEARTH, *supra* note 35 (Explaining that improving ecosystems has additional “benefits for human health and well-being and socio-economic benefits including sustainable jobs and ecotourism opportunities.”); see also *Ecosystem Restoration*, U.S. DEP’T OF INTERIOR, <https://www.doi.gov/priorities/investing-americas-infrastructure/ecosystem-restoration> [<https://perma.cc/QXN5-6XUD>] (Explaining how the “Bipartisan Infrastructure Law . . . for Ecosystem Restoration and Resilience . . . will support the work of the Department and our conservation partners as we tackle the climate crisis while advancing environmental justice and boosting local economies.”).

<sup>221</sup> Michael Lens, *Low-Density Zoning, Health, and Health Equity*, HEALTH AFFS., (Sept. 30, 2021), <https://www.healthaffairs.org/doi/10.1377/hpb20210907.22134/> [<https://perma.cc/T5R6-LM8B>] (“In the US, . . . virtually all municipal space is governed by zoning codes.”).

<sup>222</sup> See *supra* note 42 and accompanying text. See generally Part I.

<sup>223</sup> See *supra* notes 42 and accompanying text. See generally Part I.

For example, a developer or landowner may have the legal right to pave over an area that is vulnerable to flooding or that is situated in a locality susceptible to the heat island effect.<sup>224</sup> The original zoning code may not have accounted for the impacts of climate change, such as sea-level rise, increased precipitation, or rising temperatures, which can render the area increasingly unsuitable for habitation. However, paving over such an area can worsen flooding and heat island effect because of the increased percentage of impervious surfaces.<sup>225</sup> Sacrifice Zones offer a potential solution by intentionally regulating land use in a manner that addresses the evolving ecosystems and climate conditions. By designating the area as a Sacrifice Zone, specific provisions can be implemented to mitigate the negative impacts of development and ensure that adaptive strategies are implemented to address changing environmental circumstances.

As discussed in more detail below, the Sacrifice Zone, for example, may require the implementation of green infrastructure measures to manage stormwater, limit the extent of impervious surfaces, and promote permeable surfaces to reduce flooding risks.<sup>226</sup> Additionally, regulations may include provisions for heat island mitigation, such as mandating the incorporation of green spaces and tree planting—or they may prohibit construction

<sup>224</sup> See, e.g., MASON, OHIO, ZONING CODE § 1175.07(b) (2005) (requiring paved parking lots). “[H]eat islands are pockets of a city that absorb and retain heat more than surrounding areas due to dense concentrations of pavement, buildings and other urban features and limited natural land cover to reduce temperatures.” Aydali Campa, *New York, LA, Chicago and Houston, the Nation’s Four Largest Cities, Are Among Those Hardest Hit by Heat Islands*, INSIDE CLIMATE NEWS (July 27, 2023), <https://insideclimatenews.org/news/27072023/new-york-los-angeles-chicago-houston-heat-islands/> [https://perma.cc/5HYZ-DQ-S8]. The four largest cities in the U.S.—Chicago, Houston, L.A., and N.Y.—are among those suffering the most from “heat islands.” *Id.* “A new study of heat exposure disparities also puts Chicago among the cities with the largest share of people living in heat islands that are as much as 12 degrees hotter than the cities’ baseline temperatures.” *Id.*

<sup>225</sup> Lance Frazer, *Paving Paradise: The Peril of Impervious Surfaces*, 113 ENV’T HEALTH PERSPS. 457, 458, 459 (2005) (Explaining how “impervious surfaces can quickly trigger devastating floods” and can contribute to “the ‘heat island’ impact” as “[i]mpervious surfaces, particularly roads and parking lots, are generally dark, and thus heat-absorbing, so they heat the rainwater as it hits . . . adding heated water to a stream or river.”); Lakis Polycarpou, *No More Pavement! The Problem of Impervious Surfaces*, COLUM. CLIMATE SCH. (July 13, 2010), <https://news.climate.columbia.edu/2010/07/13/no-more-pavement-the-problem-of-impervious-surfaces/> [https://perma.cc/M8UY-K7CD] (“[C]ities are largely paved-over or built on, so there is no vegetation or moisture to absorb heat and cool the landscape; asphalt, concrete and rooftops simply absorb the sun’s energy during the day and re-release it at night.”); see also Erica Gies, *Expanding Paved Areas Has an Outsize Effect on Urban Flooding*, SCI. AM. (May 15, 2020), <https://www.scientificamerican.com/article/expanding-paved-areas-has-an-outsize-effect-on-urban-flooding1/> [https://perma.cc/9S84-97VY] (“[O]n average across the U.S., every time a city expands roads, sidewalks or parking lots by one percentage point, the annual flood magnitude in nearby waterways increases by 3.3 percent.”).

<sup>226</sup> See *infra* notes 252–53 and accompanying text.

altogether.<sup>227</sup> By incorporating climate change considerations into the regulatory framework of Sacrifice Zones, local governments can ensure that development or de-development activities align with adaptive strategies and contribute to the resilience of communities and ecosystems.

Further, we often perform post-hoc disaster recovery in ways that harm the most needy and vulnerable, as 2005's Hurricane Katrina aptly demonstrated.<sup>228</sup> Sacrifice Zones are a way to plan for a changing climate before catastrophic events occur. They allow for not just economic savings but also a more informed and level-headed approach to moving forward in a sustainable manner.

#### IV. THE DETAILS

Part III described the foundation for establishing a Sacrifice Zone. This Part elaborates on that by setting forth the details of the two principal parts of a Sacrifice Zone: (A) the criteria necessary to establish a Sacrifice Zone; and (B) the additional regulations that apply to the area designated as a Sacrifice Zone.

##### A. *Criteria to Situate a Sacrifice Zone*

Identifying Sacrifice Zones involves thoroughly assessing key factors that make a location suitable because of its significant climate risks. Like overlay and floating zones, establishing clear and carefully defined criteria for siting a Sacrifice Zone is critical. This process entails, among other things, identifying the specific characteristics that make a location suitable for designation as a Sacrifice Zone because of its vulnerability to climate change.

The process to identify criteria to site a Sacrifice Zone must extend beyond conventional planning processes.<sup>229</sup> To ensure a comprehensive approach, it is imperative to not only include stakeholders in the decision-making process but also in the selection of the criteria for the siting and establishing a Sacrifice Zones. Additionally, considerations of equity and

<sup>227</sup> See *infra* notes 233–36, 249, 253–55 and accompanying text.

<sup>228</sup> See Chris Edwards, *Hurricane Katrina: Remembering the Federal Failures*, CATO INST., (Aug. 27, 2015, 2:56 PM), <https://www.cato.org/blog/hurricane-katrina-remembering-federal-failures> [<https://perma.cc/5ND4-GNXV>]; see also Robert R.M. Verchick, *Disaster Justice: The Geography of Human Capability*, 23 DUKE ENV'T L. & POL'Y F. 23, 23–24, 43–46, 64–65 (2012); RICHARD THOMPSON FORD, *PLAYING THE RACE CARD: HOW BLUFFING ABOUT BIAS MAKES RACE RELATIONS WORSE* 39, 41, 46 (1st ed., 2008). See generally ROBERT R.M. VERCHICK, *FACING CATASTROPHE: ENVIRONMENTAL ACTION FOR A POST-KATRINA WORLD* (2010).

<sup>229</sup> Given some states' environmental review requirements, it may be necessary to get pre-approval of a Sacrifice Zone or, in what would be responsible state planning, have the state exempt Sacrifice Zones from environmental review.

inclusion must be given to the allocation of decision-making authority.<sup>230</sup> By integrating these aspects into the assessment and siting criteria, a more robust and fairer implementation of Sacrifice Zones can be achieved.

Using the best scientific methods possible, local governments could establish baselines and metrics to indicate when an area has reached extreme conditions to warrant the siting of a Sacrifice Zone. Such baselines and metrics would depend on the area and the climate impacts that the community is facing. Criteria could be based on the frequency and intensity of floods, wildfires, droughts, or temperatures. For example, some areas are already seeing temperatures so hot that even at night they do not go below 90 degrees Fahrenheit.<sup>231</sup> Some of these areas will be exceedingly dangerous—if not simply unlivable—without extreme costs, some of which will be borne by society.<sup>232</sup>

Similarly, other areas may monitor wildfires through the number of acres burned, the intensity of the fires, the frequency of the fires, the risk level, water levels, and other statistics to help identify the risk facing a particular area.<sup>233</sup> Relatedly, some jurisdictions may seek to monitor air quality for purposes of wildfire hazards or water quality for run-off, pollution, and debris from flooding.<sup>234</sup> Communities may also seek to assess health related illness

<sup>230</sup> See AM. PLAN. ASS'N, EQUITY IN ZONING: POLICY GUIDE 12, 33–42 (2023) [hereinafter EQUITY IN ZONING: POLICY GUIDE] (discussing the importance of ensuring equity in “who is involved in drafting . . . and who is involved in enforcement” while instituting zoning reform).

<sup>231</sup> Matthew Cappucci, *Phoenix Just Posted the Hottest Month Ever Observed in a U.S. City*, WASH. POST (Aug. 1, 2023, 9:36 AM), <https://www.washingtonpost.com/weather/2023/08/01/phenix-record-hot-month-climate/> [https://perma.cc/8E83-X9CF] (“Phoenix’s average temperature for July was a blistering 102.7 degrees, taking into account average daytime high of 114.7 degrees and overnight low of 90.8.”); see also Gewecke & Winsor, *supra* note 4 (“The last 21 days on Earth have been the hottest on record.”).

<sup>232</sup> See Buis, *supra* note 4 (Explaining that “[e]xtreme levels of heat stress have more than doubled in the last 40 years,” which “is a leading cause of weather-related deaths in the United States each year.”).

<sup>233</sup> See *Climate Change Indicators: Wildfires*, ENV’T PROT. AGENCY, <https://www.epa.gov/climate-indicators/climate-change-indicators-wildfires> [https://perma.cc/AXD8-9BBV] (Nov. 1, 2023) (Explaining that “th[e] indicator tracks four aspects of wildfires over time: the total number of fires (frequency), the total land area burned (extent), the degree of damage that fires cause to the landscape (severity), and the acreage burned by fires starting in each month of the year (seasonal patterns).”); see also JOE H. SCOTT ET AL., U.S. DEP’T OF AGRIC. FOREST SERV., A WILDFIRE RISK ASSESSMENT FRAMEWORK FOR LAND AND RESOURCE MANAGEMENT 5, 6–8 (2013) (discussing wildfire intensity, hazard, risk, and likelihood).

<sup>234</sup> See Sheila F. Murphy et al., *A Call for Strategic Water-Quality Monitoring to Advance Assessment and Prediction of Wildfire Impacts on Water Supplies*, FRONTIERS WATER (Mar. 13, 2023), at 1, 2 (discussing “strategic, consistent post-wildfire water-quality data collection” as “[w]ildfires can lead to increased runoff, erosion, and conveyance of sediment, ash, pollutants, and debris to surface water”); see also *Wildfire Smoke Air Monitoring Response Technology (WSMART) Pilot*, EPA, <https://www.epa.gov/air-sensor-toolbox/wildfire-smoke-air-monitoring-response-technology-wsmart-pilot> [https://perma.cc/3KMZ-2SQA] (Nov. 6, 2023) (“EPA’s Office of Research and Development is making available specific air monitoring technologies for loan to state, local, and tribal air organizations

or injuries concerning the climate risk, such as heat exhaustion or asthma.<sup>235</sup> Additionally, equity concerns, including income levels, poverty, and demographics, may also be measured.<sup>236</sup>

Sacrifice Zones may have different siting criteria for inhabited and uninhabited areas. The most suitable areas for considering the implementation of Sacrifice Zones—the “lowest-hanging fruit” that should deliver the most benefit while incurring the least cost—are the uninhabited areas in the logical lines of development that are also facing significant climate impacts. These regions have yet to undergo development but are on the trajectory of potential growth,<sup>237</sup> making them highly suitable for applying the concept of Sacrifice Zones as they experience climate impacts that could worsen with development, increasing climate risks. Further, human relocation is not necessary in these areas because they are uninhabited.

The next category includes areas facing significant climate impacts but that are not in the direct path of development. These regions are crucial to prevent the sprawl of “leap-frog” development<sup>238</sup> and the exacerbation of future climate risks within the jurisdiction.

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to support supplemental air monitoring in areas affected by wildfire smoke and with observational data coverage gaps.”); COLO. REV. STAT. § 25-7-141(1)(c) (2023) (“Declar[ing] that facilities that emit air toxics have a responsibility to collect real-time air toxics data and to provide monitoring results as quickly as possible in a publicly accessible format to help communities understand their level of exposure.”).

<sup>235</sup> See, e.g., N.M. STAT. ANN. § 74-7A-3(D)(4)(c) (2024) (Declaring that “[t]he environmental database shall provide access to the state’s environmental data, including . . . child asthma rates across the state by zip code.”); Mike Iorfino, *Managing Asthma Amid the Summer Heat and Dips in Air Quality*, PENN MED. NEWS (June 18, 2019), <https://www.pennmedicine.org/news/news-blog/2019/june/managing-asthma-amid-the-summer-heat-and-dips-in-air-quality> [<https://perma.cc/JV4U-PCJV>] (discussing health effects of “summer heat waves and stifling humidity”).

<sup>236</sup> See, e.g., EQUITY IN ZONING: POLICY GUIDE, *supra* note 230, at 14 (Explaining how equitable zoning reform requires “communit[ies] . . . to identify . . . [their] historically disadvantaged and vulnerable communities based on its unique context[;] some relevant factors may include race and ethnicity, household composition and size, average median income, concentrations of substandard public facilities and infrastructure, poor access to good jobs and services, and other available historical data.”); CAL. HEALTH & SAFETY CODE §§ 50093(a), 39711 (West 2023) (identifying “[p]ersons and families of low income” and “disadvantaged communities”); N.M. STAT ANN. § 74-7A-3(D)(4)(b) (West 2024) (including “poverty levels across the state” in the “state’s environmental data”); COLO. REV. STAT. § 25-1-134(1)(d) (West 2024) (Requiring the “[e]nvironmental justice ombudsperson” to “promot[e] environmental justice” within low income, minority, and formerly redlined areas.).

<sup>237</sup> See Rui Li, *Management and Utilization of Uninhabited Islands*, 2ND INT’L CONF. ON SCI. & SOC. RSCH. 381, 382 (2013) (“Since most of the uninhabited island’s area is small, away from the mainland, traffic inconvenience, and no one is interested in long-term, without any form of development and pollution, the uninhabited island presents tremendous potential for development.”).

<sup>238</sup> Carol E. Heim, *Leapfrogging, Urban Sprawl, and Growth Management: Phoenix, 1950-2000*, 60 AM. J. ECON. & SOCIO. 245, 245 (2001) (“Developers may skip over properties to

When it comes to areas that are already inhabited, implementing Sacrifice Zones becomes more complicated. In such cases, the criteria to establish a Sacrifice Zone should be clear and stringent. The area should exhibit significant stress from climate-altering events, such as repeated and prolonged floods or heat that are already displacing people, which risks lives and produces significant economic costs. Avoiding such repeated climate changing events may have significant cost savings. Any costs that are avoided because of the Sacrifice Zones should be redirected to those relocated as discussed below.

### *B. Requirements Once a Sacrifice Zone is Situated*

Once a Sacrifice Zone is sited, a series of prescriptive regulations are imposed with the purpose of mitigating the climate vulnerabilities. These supplementary provisions ought to be precisely tailored to effectively counteract the specific climate risks involved, while leaving flexibility to adapt to future climate risks. These types of regulations may manifest in multiple forms, such as the elimination of existing zoning provisions that exacerbate climate hazards, the establishment of incentives to encourage landowners towards proactive protective measures, and the imposition of mandates compelling landowners to undertake adaptive strategies.<sup>239</sup>

Outlined below are key criteria that local authorities might consider incorporating into Sacrifice Zones to fortify community resilience, safeguard lives, promote cost-effectiveness, regenerate biodiversity, and mitigate greenhouse gas emissions. The precise regulations and prerequisites for each designated area must be contingent upon the unique amalgamation of local planning norms, community exigencies, and evolving climatic risks and conditions. The configuration of a Sacrifice Zone can be customized to effectively address a multitude of objectives and challenges specific to each district.

Identifying the regulations applicable to a Sacrifice Zone requires a nuanced understanding of the interplay between the local climate dynamics, the socio-economic fabric of the affected area, and local ecosystems and biodiversity. Policymakers and stakeholders must collaborate to formulate a cohesive framework that not only addresses immediate climate risks but also fosters sustainable long-term resilience.<sup>240</sup> This may necessitate the integration of diverse regulatory strategies that extend beyond traditional zoning practices and encompass a spectrum of financial incentives, such as climate-resilient

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obtain land further out, leaving vacant tracts behind. This process, called leapfrogging, is one manifestation of the broader phenomenon of urban sprawl.”).

<sup>239</sup> This structure of removing obstacles, creating incentives, and mandating minimums is modeled after that of the Sustainable Development Code. *E.g.*, *Chapter 3.1: Development Patterns and Infill*, SUSTAINABLE DEV. CODE, <https://sustainablecitycode.org/chapter/chapter-3/3-1/> [https://perma.cc/BJ6S-27R5].

<sup>240</sup> See Velasco & Cohen, *supra* note 66 (discussing the importance of implementing zoning reform geared towards “sustainable transition” and “climate resilience”).



rebates, incentives, tax credits, and grants<sup>241</sup>; performance-based financing; public-private partnerships to co-fund resilience projects<sup>242</sup>; carbon pricing; green bonds; or low-interest loans.<sup>243</sup> As an added benefit, Sacrifice Zones could also provide property tax and income tax benefits, such as those extended to conservation easements. This would require making them consistent with federal and state laws but would be a classic example of providing an individual a tax benefit in exchange for a widely distributed public service.

By blending these and other incentives, local governments can pave the way for a resilient future, fostering sustainable development while addressing the specific needs presented by each unique area. Presented below are several regulatory strategies for a Sacrifice Zone that can be tailored to suit the specific area.

Although an analysis of any Fifth Amendment violation is beyond the purview of this Article, I note that the proposals below not only fall within previously denied challenges based on *ultra vires* use of eminent domain and challenges based on a taking, but also the facts that lead to a Sacrifice Zone make a stronger case against such challenges. Relative to a claim of eminent domain and the failure to comply with the “public use” requirement, a Sacrifice Zone is almost exclusively designed for public use to protect the community, avoid future human and economic loss, and grow biodiversity.<sup>244</sup> While

<sup>241</sup> See Marian Van Pelt, *How Federal Agencies Can Leverage Climate Funding for Grant and Rebate Programs*, ICF CLIMATE CTR. (Mar. 7, 2023), <https://www.icf.com/insights/climate/grants-rebates-federal-climate-funding> [https://perma.cc/9BCX-9DZB] (discussing climate grants and rebates); see also Shannon Osaka, *3 Ways to Tap Billions in New Money to Go Green—Starting This Month*, WASH. POST <https://www.washingtonpost.com/climate-solutions/2022/12/29/climate-tax-credits-clean-energy/> [https://perma.cc/884S-CGCU] (Jan. 2, 2023, 1:22 PM) (discussing climate tax credits).

<sup>242</sup> See DONOVAN ESCALANATE & CARLA ORREGO, CLIMATE POL’Y INITIATIVE, RESULTS-BASED FINANCING: INNOVATIVE FINANCING SOLUTIONS FOR A CLIMATE-FRIENDLY ECONOMIC RECOVERY 2, 10–12 (2021) (discussing the use of “[r]esults-based [f]inance . . . [to] improv[e] sustainability efforts”); see also *Integrating Climate Into PPPs for Green and Resilient Infrastructure*, PUB.–PRIV. INFRASTRUCTURE ADVISORY FAC. (Jan. 26, 2022), [https://www.ppiaf.org/feature\\_story/integrating-climate-ppps-green-and-resilient-infrastructure](https://www.ppiaf.org/feature_story/integrating-climate-ppps-green-and-resilient-infrastructure) [https://perma.cc/5XVG-KM64] (discussing “climate considerations . . . integrat[ing] into potential PPP projects”).

<sup>243</sup> See WORLD BANK GRP., STATE AND TRENDS OF CARBON PRICING 2023 11 (2023) (discussing carbon pricing); see also WORLD BANK GRP., SUSTAINABLE DEVELOPMENT BONDS & GREEN BONDS 2022, at 35 (2023) (discussing green bonds); *Low-Interest Loan Program Helps Homeowners Finance Clean Energy Upgrades*, YALE CLIMATE CONNECTIONS (Apr. 5, 2023), <https://yaleclimateconnections.org/2023/04/low-interest-loan-program-helps-homeowners-finance-clean-energy-upgrades/> [https://perma.cc/X428-PMV5] (discussing climate-friendly low-interest loans).

<sup>244</sup> See *Kelo v. City of New London*, 545 U.S. 469, 478, 487, 489 (2005). Like the plan in *Kelo*, a Sacrifice Zone would (i) not be “the mere pretext of a public purpose, when its actual purpose was to bestow a private benefit,” (ii) “would be executed pursuant to a ‘carefully considered’ development plan,” and (iii) would not “benefit a particular class of identifiable individuals”; but unlike the land in *Kelo*, which was to be conveyed to a private party and provide only public benefits through economic development, the land here

private benefits may flow to the landowner and potentially other individuals, the principle and targeted beneficiaries of a Sacrifice Zone is the public.

Relative to a Takings challenge, the “value” of the property may increase and not suffer future decreases. The value of the property without a Sacrifice Zone would depreciate and possibly result in a net loss. A Sacrifice Zone is contingent upon several catastrophic events, such as mass flooding or wildfires (including the most recent that tips the area over the edge to make the Sacrifice Zone applicable). Such events lead to actual and measurable individual and societal costs, including potentially the complete decimation of edifices and loss of life.<sup>245</sup> The Sacrifice Zone is designed to avoid these events and associated loss as it is not the designated Sacrifice Zone that causes property loss, but rather climate changing conditions. Further, the zone is designed to increase biodiversity and associated ecosystem services values. Thus, instead of continuing to decrease in value, the Sacrifice Zones find new value in the form of ecosystem services and in the protection of the community.<sup>246</sup>

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would provide direct physical public benefits in addition to economic development. *Id.*; see also *Haw. Hous. Auth. v. Midkiff*, 467 U.S. 229, 241–42 (1984) (Holding that taking title from a landlord and transferring it to the tenant to reduce the “social and economic evils of a land oligopoly” qualified as a valid public use.); *Berman v. Parker*, 348 U.S. 26, 31–34 (1954) (Rejecting store owner’s claim that taking his property that was not “blighted” and conveying it to another private party to make a “better balanced, more attractive community” was not a valid public use.).

<sup>245</sup> See, e.g., Jon Kamp et al., *The Flooding in Vermont Is 'Historic and Catastrophic,' Governor Says*, WALL ST. J., <https://www.wsj.com/articles/rescue-teams-work-to-reach-vermont-residents-amid-catastrophic-floods-65d9969d> [<https://perma.cc/DW7J-FGRY>] (July 11, 2023 4:16 PM); Brian Snyder & Rich McKay, *Vermont Capital Submerged in Floodwaters with Dam on Verge of Capacity*, REUTERS, <https://www.reuters.com/world/us/vermont-reservoir-threatens-overflow-floods-lash-state-capital-2023-07-11/> [<https://perma.cc/CVT6-ADT5>] (July 12, 2023 2:09 AM); Jonathan Rosenbloom, *Catching Nutrients in a Net: Collective Action, Institutional Impediments, and the Mississippi River Watershed*, 6 MINN. L. REV. (forthcoming 2025) (on file with author) (Stating that “floods are sporadically frequent now in Iowa. In the five-year span from 2008–2013, Central Iowa (the region in and around Des Moines and Ames, Iowa) experienced the ‘100-year flood’ at least four times, including in 08, 10, 12, and 13. The 2008 flood was ‘roughly’ a ‘500-year flood.’” (footnote omitted) (citing *Higher Standards Following 2008 Flooding – Iowa City, Iowa*, ASS’N OF STATE FLOODPLAIN MANAGERS, <https://floodsciencecenter.org/products/elected-officials-flood-risk-guide/success-stories/higher-standards-following-2008-flooding-iowa-city-iowa/> [<https://perma.cc/H3R3-NMYF>]); Kimberlee K. Barnes & David A. Eash, *Flood of August 11–16, 2010, in the South Skunk River Basin, Central and Southeast Iowa*, U.S. GEOLOGICAL SURV. (2012), <https://pubs.usgs.gov/of/2012/1202/of2012-1202.pdf> [<https://perma.cc/UM4M-CFYK>]; Donnelle Eller, *Flooding Has Slammed Every Iowa County Since 1988, Some as Many as 17 Times*, DES MOINES REG., <https://www.desmoinesregister.com/story/money/agriculture/2018/04/29/iowa-flood-center-ranks-disaster-damages-billions-wapsipinicon-river/422336002/> [<https://perma.cc/E524-AT7E>] (Mar. 20, 2019). “The [2008] flood was 4 feet higher than the 100-year flood elevation, reaching roughly the mapped 500-year flood elevation.” *Higher Standards Following 2008 Flooding – Iowa City, Iowa*, *supra* note 245.

<sup>246</sup> Keith H. Hirokawa, *Sustaining Ecosystem Services Through Local Environmental Law*, 28 PACE ENV’T L. REV. 760, 824–25 (2011); Keith Hirokawa, *Local Planning to Preserve*

Finally, because of the regulatory nature involved, this would not be considered an exaction, and a *Nollan-Dolan-Koontz* analysis would not be applicable.<sup>247</sup> I have little doubt that in some areas of the United States, the cost of not implementing something like a Sacrifice Zone will ultimately cost more than implementing one. Such costs will come in the form of increased utility costs, building and infrastructure damage, biodiversity loss, and, ultimately, human casualties.

### 1. *Uninhabited Area: Moratorium*

In the event that the Sacrifice Zone is situated in an uninhabited area along the path of urbanization, the primary regulatory approach would involve the implementation of a zoning moratorium.<sup>248</sup> The principal objective of this moratorium would be to temporarily halt or significantly restrict all forms of land development within the designated Sacrifice Zone.<sup>249</sup> Justification for the imposition of such a moratorium arises from the realization that a discernible risk has materialized in the area, necessitating immediate action to safeguard the potential adverse impacts on the environment or society, or both.<sup>250</sup>

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*Wetlands Assets: Community, Baselines, and Ecosystem Services*, 39 ZONING & PLAN. L. REP. 1, 1, 3, 6, 8 (2016).

<sup>247</sup> For a summary of *Nollan/Dolan/Koontz* see Jim Rossi & Christopher Serkin, *Energy Exactions*, 104 CORNELL L. REV. 643, 703–07 (2019). For the full cases see *Nollan v. Cal. Coastal Comm’n*, 483 U.S. 825 (1987); *Dolan v. City of Tigard*, 512 U.S. 374 (1994); *Koontz v. St. Johns River Water Mgmt. Dist.*, 570 U.S. 595 (2013).

<sup>248</sup> Cinnamon P. Carlarne & Keith H. Hirokawa, *The Climate Moratorium*, TEX. A&M L. REV. (forthcoming 2024) (on file with author).

<sup>249</sup> See JAMES A. COON, N.Y. DIV. OF LOC. GOV’T SERVS., LAND USE MORATORIA 1, 2, 6, 14 (2023) (Defining “land use moratorium [a]s a local enactment which temporarily suspends a landowner’s right to obtain development approvals while the community considers and potentially adopts changes to its comprehensive plan and/or its land use regulations to address new circumstances not addressed by its current laws.”). See generally *id.* (further discussing moratoria).

<sup>250</sup> See *id.* at 2 (Stating that “moratoria are designed to preserve the status quo while planning or zoning changes are made[.] . . . [t]hese enactments are appropriate mechanisms for addressing long range community planning and zoning objectives.”). Further, “[t]he enactment of temporary restrictions on development has been held to be a valid exercise of the police power where the restrictions are reasonable and related to public health, safety or general welfare.” *Id.* at 2; see also *Charles v. Diamond*, 360 N.E.2d 1295, 1300 (N.Y. 1977) (Holding that “municipal power to act in furtherance of the public health and welfare may justify a moratorium on building permits or sewer attachments which are reasonably limited as to time. . . . We have held that police power enactments must be reasonable and that unreasonable exercises of the police power result in a deprivation of property without due process.” (first citing *Westwood Forest Ests., Inc. v. Vill. of S. Nyack*, 244 N.E.2d 700, 702–03 (N.Y. 1969); then citing *Fred F. French Investing Co. v. City of N.Y.*, 350 N.E.2d 381, 385 (N.Y. 1976))); *Golden v. Plan. Bd. of Ramapo*, 285 N.E.2d 291, 304–05 (N.Y. 1972) (Holding that “where it is clear that the existing physical and financial resources of the community are inadequate to furnish the essential services and facilities

The essence of the moratorium lies in its capacity to mitigate the potential hazards posed by development activities within the Sacrifice Zone and to ensure development does not exacerbate those hazards. Once the risks have been adequately mitigated or abated, the moratorium can be lifted,<sup>251</sup> allowing for a cautious and controlled resumption of land development in a manner that ensures sustainability and environmental integrity.<sup>252</sup>

It is important to acknowledge that the establishment of a zoning moratorium is a proactive step that underscores a commitment to responsible and conscientious zoning and development. The moratorium strikes a balance, ensuring the long-term well-being of the natural environment and the communities that are protected by the Sacrifice Zone.

Lands subject to the Sacrifice Zone moratorium should be managed in a sustainable way to maintain and enhance ecosystem services. Lands falling under the protective umbrella of the moratorium present a unique opportunity to implement sustainable practices that will effectively maintain or even amplify vital ecosystem services, including climate adaptation. A key aspect of this approach involves tailoring these services to directly address the specific risks faced in each region.

A prime example of such a strategy is found in riparian areas with a high risk of floods. To mitigate this risk, landowners can be encouraged or mandated to allow designated areas to undergo controlled natural growth,

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which a substantial increase in population requires, there is a rational basis for 'phased growth.'").

<sup>251</sup> See *Charles*, 360 N.E.2d at 1298 (describing the moratorium that prohibited "connect[ing] into the village sewage system until 'the Village undert[ook] a program to correct the deficiencies of their sewage system'"); see also COON, *supra* note 249, at 6 (Suggesting that moratoria on land use "have a valid public purpose justifying the . . . interim enactment" and "have a time certain when the moratorium will expire."). Moratoria need to be temporary to be valid. See COON, *supra* note 249, at 6, 11 (Stating that "courts will look carefully to see that the terms of a moratorium express a relatively short but specific duration," and that "[t]he courts have required a time certain for the expiration of a moratorium."); *Lake Illyria Corp. v. Town of Gardiner*, 352 N.Y.S.2d 54, 57-58 (N.Y. App. Div. 1974) (Striking down a lengthy moratorium on the grounds that "the absence of justification for such an exercise of power renders th[e] four-year delay unreasonable."); *Russo v. N.Y. State Dep't of Env't Conservation*, 391 N.Y.S.2d 11, 11 (N.Y. App. Div. 1977) (Requiring "the respondent, within 180 days of the date hereof, [to] set a date certain for the termination of the moratorium on alteration of tidal wetlands."); *Charles*, 360 N.E.2d at 1300 ("Temporary restraints necessary to promote the overall public interest are permissible. Permanent interference with the reasonable use of private property for the purposes for which it is suited is not.").

<sup>252</sup> This approach somewhat aligns with the precautionary principle. See EDITH BROWN WEISS, ENVIRONMENTAL CHANGE AND INTERNATIONAL LAW: NEW CHALLENGES AND DIMENSIONS 390-93 (Edith Brown Weiss ed., 1992). On one hand, like the precautionary principle, it advocates for preventive measures to address impending threats until scientific uncertainties are adequately resolved and any potential hazards are effectively minimized. On the other hand, as set forth in Section IV.A, Sacrifice Zones are not sited until the threat materializes to some degree. See *supra* Section IV.A.

permitting wild vegetation to thrive.<sup>253</sup> This carefully selected flora, adapted to the local climate and hydrological conditions, can play a pivotal role in absorbing excess rainfall, stabilizing soil, and reducing surface runoff.<sup>254</sup> In turn, this proactive measure acts as a natural buffer, alleviating the potential devastation of flooding events and safeguarding surrounding communities and infrastructure.<sup>255</sup>

The benefits of this approach extend beyond flood mitigation. By facilitating the proliferation of diverse vegetation in these critical areas, a myriad of ecological advantages can be reaped.<sup>256</sup> Flourishing vegetation can sequester significant amounts of carbon dioxide from the atmosphere,

<sup>253</sup> See NAT'L RSCH. COUNCIL., *RIPARIAN AREAS: FUNCTIONS AND STRATEGIES FOR MANAGEMENT* 308 (2002) (Discussing a case study in Oregon where "over [a] . . . six-year period of controlled grazing and livestock exclusion, riparian vegetation increased, the channel narrowed and deepened, and channel stability increased. Sediment, trapped by vegetation, can be seen on the banks in the reestablishing riparian area."); see also RUSSEL COHEN, DIV. OF ECOLOGICAL RESTORATION, MASS. DEP'T OF FISH & GAME, *FACT SHEET #1: FUNCTIONS OF RIPARIAN AREAS FOR FLOOD CONTROL 2* (2014) (Explaining that "[t]he most effective means to avoid . . . damage and to protect . . . riparian areas is to preserve and/or restore them to a naturally vegetated condition.").

<sup>254</sup> See COHEN, *supra* note 253, at 1 ("Water that floods into vegetated floodplains reenters the main channel slowly, enabling it to be soaked up by the 'sponge' of floodplain wetland soils and streamside forest leaf litter. Living, decaying and dead vegetation on riparian lands that falls or extends into the water provides numerous barriers against moving water, which slows it down so water is not delivered downstream as quickly. Such vegetation also intercepts and detains runoff from adjacent upland areas that would otherwise flow directly into rivers and exacerbate flooding conditions downstream. The root systems of streamside forest and emergent aquatic vegetation keep pores of the soil open so that two to three times more water can infiltrate the soil compared to lands used for cultivation or grazing."); see also Christina Rhyne *Landowners Can Use Techniques to Stabilize Riparian Areas*, BARNYARDS & BACKYARDS, Fall 2006, at 16 ("Natural vegetation . . . roots hold the soil together to increase bank stability.").

<sup>255</sup> See COHEN, *supra* note 253, at 1 ("Naturally vegetated riparian areas . . . serve a number of beneficial functions for flood control. An undeveloped, vegetated floodplain reduces the force, height and volume of floodwaters by allowing them to spread out horizontally and relatively harmlessly across the floodplain. . . . The combined effect of all of these functions is a significant reduction in peak flows and flooding downstream. Naturally vegetated riparian forests thus help prevent thousands of dollars in property damage and obviate the need for human-made flood control measures and structures.").

<sup>256</sup> See NAT'L RSCH. COUNCIL., *supra* note 253, at 23 ("[R]iparian plant communities support numerous functions including bank stabilization through root strength, sediment deposition on floodplains during periods of overbank flow, interstitial flow through the sediments, and large wood supply, which has a substantial influence on channel complexity and instream habitat features. Ecologically intact riparian areas naturally retain and recycle nutrients, modify local microclimates, and sustain broadly based food webs that help support a diverse assemblage of fish and wildlife."); see also Oluwayemisi S. Olokeogun et al., *Assessment of Riparian Zone Dynamics and Its Flood-Related Implications in Eleyele Area of Ibadan, Nigeria*, 9 ENV'T SYS. RSCH 1, 1 (2020) (Stating that riparian "zones also provide a range of ecosystem functions and services, e.g., bank stabilization and protection, water purification, reservoirs of biodiversity, [and] wetland products.").

mitigating greenhouse gases and abating global warming.<sup>257</sup> This natural carbon capture further underscores the importance of vegetation growth in the Sacrifice Zone.

## 2. *Inhabited Area: Relocation*

Implementing a moratorium in an uninhabited area may effectively halt future development, but the situation becomes more intricate when a Sacrifice Zone necessitates not only a moratorium on future development but also the relocation of current residents. While the paramount objective remains safeguarding the people and area through climate adaptation, it is equally crucial to address the needs of the relocated residents comprehensively. This may entail providing financial compensation that meets or exceeds the requirements of the Fifth Amendment Takings Clause,<sup>258</sup> alongside ensuring the residents' access to legal counsel, financial advisors, real estate brokers, and other essential support services to facilitate the relocated residents acquisition of real property outside the confines of the Sacrifice Zone, should they opt for such a course of action.

The ramifications of human activities on ecosystems worldwide, directly contributing to climate risks, have been profound, stemming from rapid industrialization and consumption, population growth, extensive fishing or

<sup>257</sup> Zongyao Sha et al., *The Global Carbon Sink Potential of Terrestrial Vegetation Can Be Increased Substantially by Optimal Land Management*, 3 COMM'NS EARTH & ENV'T 1, 2 (2022) ("Vegetation dominates most terrestrial ecosystems . . . and absorbs 112–169 PgC each year from the atmosphere through a biochemical process called photosynthesis."); Qilong Tian et al., *Plant Diversity Drives Soil Carbon Sequestration: Evidence from 150 Years of Vegetation Restoration in the Temperate Zone*, FRONTIERS PLANT SCI., June 6, 2023, at 1, 2 ("Vegetation restoration is often used to increase soil organic carbon (SOC) storage and sequestration to reduce CO<sub>2</sub> emissions and restore ecosystem functions.").

<sup>258</sup> U.S. CONST. amend. V ("[N]or shall private property be taken for public use, without just compensation."). "[T]he general principle in all cases is that just compensation means fair market value." Thomas W. Merrill, *The Compensation Constraint and the Scope of the Takings Clause*, 96 NOTRE DAME L. REV. 1421, 1422 (2021). The "market value is what a willing buyer would pay in cash to a willing seller." *United States v. Miller*, 317 U.S. 369, 374 (1943); Merrill, *supra* note 258, at 1422–23 ("The [fair market value] method most commonly used is (1) to examine recent transactions of other property similar to the property taken, making adjustments for differences in the size, age, location, and the quality of improvements. Other techniques that have been used less often include (2) considering recent transactions of the property in question, making adjustments for general changes in market prices since the date of those transactions; (3) estimating the rental value of the property in question, and capitalizing this to generate an imputed purchase price using a rate of return commonly used as a benchmark for investments in similar property; and (4) estimating the replacement cost of the property in question, making adjustments to reflect depreciation due to age and wear and tear of the property in question.").

hunting, widespread deforestation, and others.<sup>259</sup> Consequently, these actions have put humans and biodiversity at great risk.<sup>260</sup>

Removing humans from an area can have significant ecological and resilience advantages.<sup>261</sup> Such advantages arising from the absence of human presence are illustrated in the aftermath of the post-1986 Chernobyl disaster in Northern Ukraine. In the Chernobyl disaster, radiation was released from the Chernobyl nuclear power plant that “was 400 times higher than that released by the atomic bomb dropped on Hiroshima . . . in 1945.”<sup>262</sup>

Subsequent to the nuclear accident, humans left the affected zone.<sup>263</sup> The human evacuation from the area paved the way for wildlife to reclaim their territory and flourish, harkening back to the conditions of the pre-human development era.<sup>264</sup> Additionally, an endangered species of horse, the Przewalski wild horse, saw its numbers grow significantly since their release into

<sup>259</sup> IPCC AR6 SYNTHESIS REPORT, *supra* note 17, at 42, 46, 51.

<sup>260</sup> *See id.* at 42 (Finding that “[h]uman-caused climate change is already affecting many weather and climate extremes in every region across the globe. This has led to widespread adverse impacts on food and water security, human health and on economies and society and related losses and damages to nature and people.” (footnote omitted)).

<sup>261</sup> Laura Clark, *Would Earth Be Better Off Without Us?*, DISRUPTR (June 10, 2020), <https://disruptr.deakin.edu.au/environment/8579/> [<https://perma.cc/AN26-267W>] (Stating that, without humans, “billions of tonnes of plastic pollution would start to degrade without being replaced by new plastics. Natural waterways may reappear, carrying nutrients and flushing out toxins. Sea levels may fall and seas repopulate with new residents. New reefs may form. Wildlife would flourish. Rare and common species could expand their habitats and repopulate freely. Birds would proliferate life by spreading seeds. Nature would reclaim the environment and it may resemble the wilderness that existed before humanity.”); *see also* WORLD WILDLIFE FUND, LIVING PLANET REPORT 2020: BENDING THE CURVE OF BIODIVERSITY LOSS 12 (2020) (“Since the industrial revolution, human activities have increasingly destroyed and degraded forests, grasslands, wetlands and other important ecosystems, threatening human well-being. Seventy-five per cent of the Earth’s ice-free land surface has already been significantly altered, most of the oceans are polluted, and more than 85% of the area of wetlands has been lost. This destruction of ecosystems has led to 1 million species (500,000 animals and plants and 500,000 insects) being threatened with extinction over the coming decades to centuries, although many of these extinctions are preventable if we conserve and restore nature.”).

<sup>262</sup> Daniel Ward, *Chernobyl Demonstrates Man’s Hold over Nature, but Also Its Resilience if Given Time to Recover*, ENVIRONY, <https://web.archive.org/web/20220528082432/https://www.environy.co.uk/post/chernobyl-demonstrates-man-s-hold-over-nature-but-also-it-s-resilience-if-given-time-to-recover> [<https://perma.cc/S3LL-XST7>] (Jan. 2, 2021).

<sup>263</sup> T.G. Deryabina et al., *Long-Term Census Data Reveal Abundant Wildlife Populations at Chernobyl*, 25 CURRENT BIOLOGY 824, 824 (2015).

<sup>264</sup> *See id.* (“[L]ong-term empirical data showed no evidence of a negative influence of radiation on mammal abundance. Relative abundances of elk, roe deer, red deer and wild boar within the Chernobyl exclusion zone are similar to those in four (uncontaminated) nature reserves in the region and wolf abundance is more than 7 times higher.”); *see also* Ward, *supra* note 262 (“A study conducted in 2015 . . . estimated that wolf populations within the exclusion zone compared to those in nearby human-occupied territory were seven times higher, not only demonstrating population recovery but expansion also.”).

the area two decades ago, now reaching five times the founding population.<sup>265</sup> Flora and habitats also experienced remarkable growth without human intrusion, with wetland and forest areas increasing by 680 percent and 14 percent, respectively, from 1999 to 2017.<sup>266</sup>

An exemplary case is the resurgence of the globally endangered Greater Spotted Eagle, which was locally extinct in the Chernobyl area after the nuclear catastrophe.<sup>267</sup> However, thirty-three years later, the species made a comeback with at least thirteen nesting pairs recorded in the Belarusian part of the Chernobyl Exclusion Zone, making this region the only place in the world where the population of this rare species is growing.<sup>268</sup>

Although the Chernobyl region remains one of the most highly contaminated places on Earth,<sup>269</sup> the absence of human disturbance has allowed certain species to thrive and expand. Critically, removal of humans from Sacrifice Zones would not only foster wildlife populations, providing various ecosystem services, including buffering for climate adaptation, but would also remove people from the immediate path of climate destruction.

### 3. *Uninhabited or Inhabited Area: Limitations on Development*

Stepping away from the notion of a moratorium or relocation, several alternative methods emerge as viable means to adapt to climate change and curtail development within a Sacrifice Zone. Among these approaches, the concept of an inverted urban growth area, an inverted urban service area, and a vegetation zone stand out.

*Inverted urban growth area.* A traditional urban growth area constitutes a carefully delineated zone within a local jurisdiction, reserved for burgeoning development.<sup>270</sup> It encompasses both residential and commercial sectors, strategically selected to accommodate a mounting population and infrastructural requirements.<sup>271</sup> The objective behind establishing an urban growth area

<sup>265</sup> Ward, *supra* note 262.

<sup>266</sup> Valery C. Dombrovski et al., *Long-Term Effects of Rewilding on Species Composition: 22 Years of Raptor Monitoring in the Chernobyl Exclusion Zone*, 30 RESTORATION ECOLOGY 7 (2022).

<sup>267</sup> *Id.* at 9.

<sup>268</sup> *Id.* at 1, 9.

<sup>269</sup> Tiffany Winfrey, *4 Most Radioactive Places in the World: Where Are They Located?*, SCI. TIMES (Apr. 15, 2022, 3:31 AM), <https://www.sciencetimes.com/articles/37102/20220415/4-radioactive-places-world-where-located.htm> [<https://perma.cc/3HVD-LR9U>].

<sup>270</sup> Alec LeSher, *Create Urban Growth Area*, SUSTAINABLE DEV. CODE, <https://sustainable-citycode.org/brief/create-urban-growth-area/> [<https://perma.cc/MB9C-3K76>].

<sup>271</sup> *Id.*; see also WASH. REV. CODE § 36.70A.040 (2023) (requiring “[e]ach county that has both a population of fifty thousand or more” to “take other actions related to urban growth areas”).



is to concentrate growth in specific regions, thwarting urban sprawl, conserving precious natural resources, and fostering streamlined urban planning.<sup>272</sup>

However, within the context of a Sacrifice Zone, an entirely different approach comes to the forefront. Instead of incorporating a Sacrifice Zone within the boundaries of an urban growth area, the strategy involves drawing clear lines outside of it. In essence, this inverted urban growth area designates the Sacrifice Zone as a region excluded from the scope of new development, while development remains authorized in other designated areas only. This approach shares similarities with a moratorium but takes a distinct direction, concentrating on growth within specific zones outside of the Sacrifice Zone rather than imposing an outright prohibition in the Sacrifice Zone.

To illustrate this concept further, several real-world examples of urban growth boundaries can be found within the Sustainable Development Code's website.<sup>273</sup> For instance, locales such as Pitkin County, Colorado; San Jose, California; and Novato, California have enacted local urban growth boundaries, effectively defining areas where development can occur.<sup>274</sup>

*Inverted urban service area.* In connection with the concept of a Sacrifice Zone, local governments also have the option to establish an inverted urban service area. In a typical urban service area, the local government designates the area where specific urban services and infrastructure are provided and managed by the local government.<sup>275</sup> Outside the area such services are not provided.<sup>276</sup> By concentrating resources and efforts within the urban service area, a local government can avoid urban sprawl and ensure that urban services are cost-effective and readily available to the population.<sup>277</sup> The Sustainable Development Code also showcases various real-world instances of urban service areas, including those successfully implemented in Baltimore County, Maryland; Hillsborough County, Florida; and Gilroy, California.<sup>278</sup>

However, when it comes to addressing the needs of a Sacrifice Zone, a different approach is warranted—one that inverts the conventional urban

<sup>272</sup> Myung-Jin Jun, *The Effects of Portland's Urban Growth Boundary on Urban Development Patterns and Commuting*, 41 URB. STUD. 1333, 1334–35 (2004); LeSher, *supra* note 270; *see also, e.g.*, PORTLAND, OR., ORDINANCE 18-1427 (2018).

<sup>273</sup> *See generally* SUSTAINABLE DEV. CODE, [www.sustainablecitycode.org](http://www.sustainablecitycode.org) [<https://perma.cc/XC6X-GWTL>].

<sup>274</sup> LeSher, *supra* note 270.

<sup>275</sup> Alec LeSher, *Urban Service Areas*, SUSTAINABLE DEV. CODE, <https://sustainablecitycode.org/brief/establish-urban-service-area-3> [<https://perma.cc/W94T-MUAW>]; N.H. DEP'T OF ENV'T SERVS. ET AL., INNOVATIVE LAND USE PLANNING TECHNIQUES: A HANDBOOK FOR SUSTAINABLE DEVELOPMENT 120 (2008) [hereinafter N.H. HANDBOOK FOR SUSTAINABLE DEVELOPMENT].

<sup>276</sup> N.H. HANDBOOK FOR SUSTAINABLE DEVELOPMENT, *supra* note 275, at 120.

<sup>277</sup> *See* LeSher, *Urban Service Areas*, *supra* note 275 (Describing urban service areas as “a practical way of reducing urban sprawl and consequently increasing density by disincentivizing development outside of the” area.).

<sup>278</sup> *Id.*

service area model. By inverting the urban service area, local governments opt not to provide services within the boundaries of the Sacrifice Zone. Instead, they deliberately hold off on infrastructure development in the Sacrifice Zone, focusing on areas outside the Sacrifice Zone, until it aligns with the capacity to withstand climate-related impacts. This proactive strategy enables the local government to temporarily suspend the construction of new water supply systems, sewage networks, schools, transportation infrastructure, and others until climate risks are adequately addressed.

For instance, in areas prone to wildfires, the government may restrict construction activities until the wildfire risk is mitigated or until it possesses the necessary resources and capabilities to manage and service such hazardous conditions. By employing this approach, not only does it protect the environment and safeguard natural resources, but it also ensures that urban development remains resilient and sustainable in the face of climate uncertainty.

*Vegetation zones.* Finally, incorporating vegetation zones within a Sacrifice Zone is a strategic and ecologically based approach to adapt to climate change. Vegetation zones prioritize the preservation and restoration of nature, creating green corridors that act as essential buffers against extensive development pressures and climate risks.<sup>279</sup> By allowing specific areas within the Sacrifice Zone to thrive with diverse flora, local governments foster ecological stability and resilience.

Vegetation zones offer a multitude of benefits. Firstly, they serve as natural flood control systems, absorbing excess rainfall and minimizing the impact of flooding events on vulnerable communities.<sup>280</sup> Secondly, by actively

<sup>279</sup> Brandon Hanson, *Vegetation Protection Areas*, SUSTAINABLE DEV. CODE, <https://sustainablecitycode.org/brief/vegetation-protection-areas/> [<https://perma.cc/2A6Q-YDSW>]; see also LONGMONT, COLO., CODE OF ORDINANCES § 15.01.030 (2015) (conserving wildlife and plant habitat and species by enacting land use policies that restore and enhance the ecological and commercial benefits ecosystems provide residents); RHINEBECK, N.Y., CODE § 120-40(B)(3) (2022) (detailing requirements for the use of native plants, trees, and shrubs as buffers (“ecological transition zone[s]”) to conserve the health of wetlands, lakes, and streams to minimize harmful effects of development, and acknowledging the potential for boundaries of buffers to change due to impacts of regional hydrology and climate change); WOLFEBORO, N.H., CODE § 175-10.1(B)(2)(d) (2022) (discouraging the granting of special use permits within a wetlands conservation overlay district that harm wetlands resources, including fish and wildlife, and acknowledging the important role wetlands play in preserving public health, safety and welfare).

<sup>280</sup> See ENV’T PROT. AGENCY, *Stormwater Best Management Practice: Preserving Natural or Existing Vegetation* 1 (2021) (“[N]atural, existing or established vegetation generally . . . [c]an withstand greater quantities of stormwater flow[,] . . . [h]as a higher infiltration capacity than newly planted vegetation due to a more developed and deeper root structure[,] [and r]educes stormwater discharge through greater interception and evapotranspiration.”); see also Hanson, *supra* note 279 (Explaining that “[v]egetation protection areas[:] help reduce water consumption[:] . . . handle other environmental stressors better than non-native plants (i.e. extreme temperatures, droughts, increased rainfall, etc.); . . . [and] have significantly higher rates of water interception than traditional turf landscaping[,] . . . [which] helps keep water sheds healthy and has less of an impact on sewer and drainage systems.”).

sequestering carbon dioxide from the atmosphere, these green havens contribute to the fight against global warming, reinforcing the efforts to mitigate climate change on a broader scale.<sup>281</sup> Thirdly, the presence of vibrant vegetation in Sacrifice Zones enhances biodiversity, bolstering the region's overall ecological resilience.<sup>282</sup> Finally, vegetation zones serve as educational resources for the public, creating awareness about the significance of climate adaptation and climate change generally.<sup>283</sup> In sum, vegetation zones can serve as natural safeguards, mitigating environmental risks and fostering adaptive urban development.

The European Commission's adoption of the July 2023 European Union Nature Restoration Law serves as an insightful example. This legislation establishes binding targets for the regeneration of biodiversity and degraded ecosystems.<sup>284</sup> By 2050, the law aims to achieve "long-term and sustained recovery of biodiverse and resilient nature across the EU's land and sea areas by restoring ecosystems . . . . These measures should cover at least 20% of the EU's land and sea areas by 2030 and all ecosystems in need of restoration by 2050."<sup>285</sup>

The law also requires EU member states to develop National Restoration Plans and calls for "no net loss of green urban spaces by 2030 and a minimum of 10% tree canopy cover in European cities."<sup>286</sup> This proposed legislation recognizes the critical importance of restoring and regenerating lost ecosystems and habitats for a meaningful and sustainable future.<sup>287</sup> It acknowledges that the continued deterioration of biodiversity is ultimately self-destructive,

<sup>281</sup> See sources cited *supra* note 257; see also Hanson, *supra* note 279 (Explaining that "[v]egetation protection areas . . . promote soil health, . . . promote air quality[,] . . . [and] can also help reduce greenhouse gas (GHG) emissions.").

<sup>282</sup> See Hanson, *supra* note 279 (Explaining that "[v]egetation protection areas . . . provide critical habitat for local wildlife."); see also ENV'T PROT. AGENCY, *supra* note 280, at 1 ("[N]atural, existing or established vegetation generally . . . [p]rovides habitat for wildlife."); Sha et al., *supra* note 257, at 6 ("Reforestation, or planting trees in areas that have been degraded or deforested, can promote restoration of forest structure and vegetation productivity by regrowing tree canopy and preserving biodiversity, thus improve carbon sequestration.").

<sup>283</sup> See Nicole V. DeVille et al., *Time Spent in Nature Is Associated with Increased Pro-Environmental Attitudes and Behaviors*, 18 INT'L J. ENV'T RSCH. & PUB. HEALTH 1, 11 (2021) (Finding "that overall time spent in nature, regardless of the quality of environmental conditions, leads to increased perceived values ascribed to nature, which is associated with [pro-environmental attitudes and behavior].").

<sup>284</sup> EUR. COMM'N, NATURE RESTORATION LAW: FOR PEOPLE, CLIMATE, AND PLANET 1 (2022).

<sup>285</sup> EUR. PARL. DOC. (COM 304) 3–4 (2022).

<sup>286</sup> EUR. COMM'N, *supra* note 284, at 1–2.

<sup>287</sup> See *Nature Restoration Law*, EUR. COMM'N, [https://environment.ec.europa.eu/topics/nature-and-biodiversity/nature-restoration-law\\_en](https://environment.ec.europa.eu/topics/nature-and-biodiversity/nature-restoration-law_en) [<https://perma.cc/XG37-LWJG>] (Explaining that the law "aims to restore ecosystems, habitats and species across the EU's land and sea areas in order to[:] enable the long-term and sustained recovery of biodiverse and resilient nature[:] contribute to achieving the EU's climate mitigation and climate adaptation objectives[: and] meet international commitments.").

increasing climate risks.<sup>288</sup> The law underscores the recognition that the well-being of ecosystems and biodiversity is intrinsically linked to the well-being and future prospects of human societies.

#### 4. *Uninhabited or Inhabited Area: Additional and Less Intensive Steps*

Stepping further back from a moratorium, relocation, and the recommendations above, a local government could enact a variety of more narrow regulations in a Sacrifice Zone. Those regulations would vary depending upon the area and climate risks, but may include the following:

- a. **Large-Lot and Preservation Zoning:**<sup>289</sup> Requiring large residential lots in the Sacrifice Zone for purposes of preservation and restoration of open spaces and natural resources to help adapt.<sup>290</sup>
- b. **Purchase of Development Rights:** Requiring the local government to purchase development rights from landowners in the Sacrifice Zone, ensuring that the land remains undeveloped for conservation purposes.<sup>291</sup>
- c. **Transfer of Development Rights:** Allowing landowners to transfer their development rights from one property to another, encouraging denser development in designated areas while preserving sites in the Sacrifice Zone.<sup>292</sup>

<sup>288</sup> See *id.* (stating specific targets “for wetlands, forests, grasslands, river and lakes, heath & scrub, rocky habitats and dunes[,]... pollinating insects[,]... urban ecosystems[,]... agricultural ecosystems[,]... marine ecosystems[,]... and river connectivity”).

<sup>289</sup> It is important to note that large-lot and preservation zoning as discussed here far exceeds the traditional type of white, suburban development we see in “large lot” single-family home subdivisions across the country. Those typically have lot sizes of one to fifteen acres. The large-lot developments here are viewed as 300 acres and higher. While these larger lots may be expensive, the objective is to limit human footprint to one home on hundreds of acres such that biodiversity may flourish and build resilience.

<sup>290</sup> Alec LeSher, *Large-Lot and Preservation Zoning in Rural Areas*, SUSTAINABLE DEV. CODE, <https://sustainablecitycode.org/brief/adopt-large-lot-and-preservation-zoning-in-rural-areas/> [https://perma.cc/EX9F-4XZD] (“These regulations typically require new residential developments in rural areas to have lot sizes large enough to preserve existing vegetation, open space, and natural features for native wildlife. By requiring large lot sizes, a local government insures that new residential developments are more easily ‘integrated into the existing ecosystem,’ providing suitable space for wildlife habitats.” (quoting Blake Hudson, *Curbing Dense Sprawl*, NAT. RES. & ENV’T, Winter 2018, at 18, 18)). For examples, see *id.*

<sup>291</sup> Brandon Hanson, *Purchase of Development Rights*, SUSTAINABLE DEV. CODE, <https://sustainablecitycode.org/brief/purchase-of-development-rights/> [https://perma.cc/D9XQ-8LHB] (“If properly drafted, this results in privately owned land that cannot be developed in a way detrimental to wildlife, even if the current owners sell the property, and it provides financial compensation to the landowner.”). For examples, see *id.*

<sup>292</sup> Tyler Adams, *Transfer of Developmental Rights*, SUSTAINABLE DEV. CODE, <https://sustainablecitycode.org/brief/transfer-of-development-rights/> [https://perma.cc/ZB5H-XR3

- d. Mitigation of Lost Critical Habitats: Requiring landowners who wish to develop in the Sacrifice Zone to restore and build back lost critical habitats in the Sacrifice Zone.<sup>293</sup>
- e. Tree Canopy Cover: Protecting and growing the percentage of tree cover in the Sacrifice Zone at a level far more aggressive than outside the zone.<sup>294</sup>
- f. Amortization of Harmful Uses: Phasing out or discontinuing harmful land uses that are exacerbating climate risks in the Sacrifice Zone.<sup>295</sup>
- g. Trigger a Climate and/or Racial Impact Statement: Requiring assessments of potential climate and/or racial impacts of proposed projects or policies to ensure equitable and sustainable decision-making.<sup>296</sup>
- h. Prohibition on Permeable Concrete Surfaces and/or Parking Lots or Impermeable Roads, Walks: Restricting the use of impermeable surfaces in favor of permeable alternatives to reduce stormwater runoff and improve water management in the Sacrifice Zone.<sup>297</sup>

K] (Explaining that “[r]eceiving areas are typically locations where growth is desired and can accommodate the increased density.”). For examples, *see id.*

<sup>293</sup> Alec LeSher, *Mitigation of Lost Critical Habitats*, SUSTAINABLE DEV. CODE, <https://sustainablecitycode.org/brief/require-mitigation-of-lost-critical-wildlife-habitat/> [<https://perma.cc/LK7J-X2AY>] (“For example, a local government may require a developer to purchase undeveloped land, enhance the wildlife habitat features, and protect the land with a conservation easement.”). For examples, *see id.*

<sup>294</sup> Alec LeSher, *Tree Canopy Cover*, SUSTAINABLE DEV. CODE, <https://sustainablecitycode.org/brief/expand-tree-canopy-cover-2/> [<https://perma.cc/8Q98-36JK>] (“Local governments have a variety of options when it comes to drafting these ordinances. They may set canopy minimums by percentage or area, may make the minimums applicable to residential, commercial, and/or industrial uses, and may set different minimums for different lot or development sizes. In addition, local governments may take a carrot and/or stick approach in which they require minimum standards and create incentives for those projects that exceed the minimums.”). For examples, *see id.*

<sup>295</sup> *See* NEW CASTLE CNTY., DEL., CODE OF ORDINANCES § 28.01.003 (2023) (including environmental justice consideration and defining amortization as a tool to mitigate injustices); *see also* NAT’L CITY, CAL., CODE OF ORDINANCES § 18.11.010 (2023); DALL., TEX., CODE OF ORDINANCES § 51A-4.704 (2023); GARDEN GROVE, CAL., MUN. CODE § 9.36.160 (2023).

<sup>296</sup> Cassandra Carudo, *Racial Impact Analysis in Local Land Use Applications*, SUSTAINABLE DEV. CODE, <https://sustainablecitycode.org/brief/racial-impact-analysis-in-local-land-use-applications-2/> [<https://perma.cc/MT3Y-KZMJ>] (“These analyses, in the form of a Racial Impact Analysis attached to a land use application, can include assessments of the impact of development on housing affordability, the likelihood of community displacement, risks of gentrification, impact on the overall quality of the community, environmental hazards from development, and many other community-based concerns. Racial Impact Analyses may be required to be submitted with a land use application, with a further requirement that the information contained therein is considered when the application is reviewed.” (footnote omitted)). For examples, *see id.*

<sup>297</sup> *See* Brandon Hanson, *Parking Maximums*, SUSTAINABLE DEV. CODE, <https://sustainablecitycode.org/brief/parking-maximums-11/> [<https://perma.cc/TB4G-M4WC>]; *see also* Kerigan Owens, *Pervious Cover Minimums and Incentives*, SUSTAINABLE DEV. CODE, <https://sustainablecitycode.org/brief/pervious-cover-minimums-and-incentives-2/> [<https://perma.cc/JC8B-SU24>]. For examples *see* Hanson, *supra*; *see also* Owens, *supra*.

- i. Proactive Access to Explore Parts of the Sacrifice Zone: Granting controlled access for research and exploration to understand the Sacrifice Zone's ecological and environmental conditions.<sup>298</sup>
- j. Required Community Benefit Agreement Prior to Development: Demanding agreements between developers and local communities to outline specific benefits and commitments related to climate adaptation that the development in the Sacrifice Zone will provide to the community in exchange for approval.
- k. Building Standards that Help Adapt: The Sacrifice Zone can specify building codes and standards that promote climate resilience, such as requirements for elevated structures in flood-prone areas, improved insulation for energy efficiency, or measures to mitigate urban heat island effects.

### CONCLUSION

Local governments will have to adapt. Yet, zoning, one of local governments' most impactful tools, is often inflexible in the face of rapid changes. Undoubtedly, there are additional measures beyond implementing Sacrifice Zones that local governments will need to take to protect communities and ecosystems. However, Sacrifice Zones serve as one crucial component of the overall solution.

Placing emphasis on local legislation to tackle climate adaptation and biodiversity loss serves as a response to the current stagnation or even regression in the US Congress and the US Supreme Court. The federal government has taken limited, if any, action on climate change and biodiversity preservation.<sup>299</sup> Congress has failed to enact significant environmental legislation for

<sup>298</sup> See Elisabeth Schanz, *Reducing Barriers to Coastal Public Beach Access*, SUSTAINABLE DEV. CODE, <https://sustainablecitycode.org/brief/reducing-barriers-to-coastal-public-beach-access/> [https://perma.cc/MZK4-S7R5] (Discussing how "[t]h[is] action[] . . . [will] help local governments 'mak[e] the entire shoreline system a community amenity open to the public,'" because "[e]quitable access 'can and should go hand in hand with protecting and conserving coastal areas.'" (first quoting MICHAEL PAWLUKIEWICZ ET AL., TEN PRINCIPLES FOR COASTAL DEVELOPMENT (2007); then quoting Kat So et al., *How to Fix Americans' Diminishing Access to the Coasts*, CTR. FOR AM. PROGRESS (Oct. 4, 2022), <https://www.americanprogress.org/article/how-to-fix-americans-diminishing-access-to-the-coasts/> [https://perma.cc/9R79-NCQK])). For examples, see *id.*

<sup>299</sup> See Rachael Lyle, *Opinion: The Federal Government Alone Won't Save Us from Climate Change*, UNDARK (Aug. 11, 2022), <https://undark.org/2022/08/11/the-federal-government-alone-wont-save-us-from-climate-change/#> [https://perma.cc/EKY6-HM7Y] ("In light of the recent setback of *West Virginia v. EPA*, it's important to continue to push for those policies at every level of government. We can't rely on the federal government alone."); see also Lawrence Hurley & Valerie Volcovici, *U.S. Supreme Court Limits Federal Power to Curb Carbon Emissions*, REUTERS (June 30, 2023, 5:43 PM), <https://www.reuters.com/legal/government/us-supreme-court-limits-federal-power-curb-carbon-emissions-2022-06-30/> [https://perma.cc/CDP8-TUKJ] ("The U.S. Supreme Court on Thursday imposed limits on the federal government's authority to issue sweeping regulations to

over three decades.<sup>300</sup> Furthermore, the US Supreme Court has exhibited direct antagonism towards environmental regulation, as evident in cases such as *West Virginia v. Environmental Protection Agency* (concerning climate change) and *Sackett v. Environmental Protection Agency* (regarding water quality).<sup>301</sup>

reduce carbon emissions from power plants in a ruling that undermines President Joe Biden's plans to tackle climate change and could constrain various agencies on other issues.”).

<sup>300</sup> Robinson Meyer, *How the U.S. Protects the Environment, from Nixon to Trump*, ATLANTIC (Mar. 29, 2017), <https://www.theatlantic.com/science/archive/2017/03/how-the-epa-and-us-environmental-law-works-a-civics-guide-pruitt-trump/521001/> [<https://perma.cc/AHY6-5BGG>].

<sup>301</sup> See *West Virginia v. EPA*, 142 S. Ct. 2587, 2599, 2601, 2603, 2609 (2022) (Finding that generation shifting is not a valid extension of the EPA's emission reduction power under the Clean Air Act without “clear congressional authorization,” despite “the statute direct[ing] the EPA to (1) ‘determine[,]’ taking into account various factors, the ‘best system of emission reduction.’” (alteration in original) (first quoting *Util. Air Regul. Grp. v. EPA*, 573 U.S. 302, 303 (2014); then quoting 42 U.S.C. § 7411(a)(1))); see also Alice C. Hill & Madeline Babin, *The Supreme Court's EPA Ruling Will Delay U.S. Climate Action*, COUNCIL ON FOREIGN RELS. (July 6, 2022, 5:36 PM), <https://www.cfr.org/in-brief/supreme-court-epa-west-virginia-ruling-delay-us-climate-change-action> [<https://perma.cc/QD6A-98N5>] (“As a result [of the 2022 decision], any revised action proposed by the EPA will have to rest squarely on statutes likely drafted long before the dangers of climate change were widely recognized. This will hobble the EPA's ability to reduce emissions from the power sector.”); Lyle, *supra* note 299 (Describing the 2022 decision as a “devastating and regressive ruling severely hamper[ing] the EPA's authority to restrict greenhouse gas emissions from power plants, [and] weakening the ability of the federal agency to take significant action on major issues such as climate change.”); *Sackett v. EPA*, 143 S. Ct. 1322, 1329, 1341, 1344 (2023) (Narrowly interpreting which wetlands are protected by the Clean Water Act by holding that “the CWA extends to only those ‘wetlands with a continuous surface connection to bodies that are waters of the United States in their own right,’ so that they are ‘indistinguishable’ from those waters.” (quoting *Rapanos v. United States*, 547 U.S. 715, 742, 755 (2006))); Shannon Rose Selden et al., *Sackett v. EPA: Supreme Court Clarifies Clean Water Act Scope but Creates Uncertainty for Companies and Investors*, DEBEVOISE & PLIMPTON (July 7, 2023), <https://www.debevoise.com/insights/publications/2023/07/sackett-v-epa-supreme-court-clarifies> [<https://perma.cc/P7EF-Q7NG>] (“For regulations that alter the federal/state balance of power or the government's power over private property, there must be ‘exceedingly clear language’ in the statute authorizing such a regulatory scheme. This reasoning may be used in future cases to strike down a vast array of environmental regulations.”); *Supreme Court Catastrophically Undermines Clean Water Protections*, EARTHJUSTICE (May 25, 2023), <https://earthjustice.org/brief/2023/supreme-court-sackett-clean-water-act> [<https://perma.cc/UA9K-7V6T>] (Stating that the 2023 decision “drastically limits the kinds of wetlands that the law protects from pollution. More than half of the 118 million acres of wetlands in the United States are threatened by this ruling.”); Bob Needham, *5Qs: Mendelson on Sackett v. EPA's Impact on Wetlands Protection*, MICH. L. (June 15, 2023), <https://michigan.law.umich.edu/news/5qs-mendelson-sackett-v-epas-impact-wetlands-protection> [<https://perma.cc/J7ZN-7WKH>] (“[I]n both *West Virginia vs. EPA* and *Sackett vs. EPA*, the Court read statutory text very narrowly, sometimes giving it little or no effect at all. This undercut both the Clean Air Act and the Clean Water Act and in the future will make it far more difficult for Congress to pass legislation that protects our shared environmental resources.”).

In short, if citizens want to protect themselves and the local environment from climate changing conditions today, they should not look to the federal government. Sacrifice Zones, and other proposals set out in this Article, attempt to help local governments and communities fill the vacuum that has been left by the federal government.

Sacrifice Zones provide local governments with a framework that allows them to act decisively and confidently in response to climate change, while also considering legal parameters. By incorporating Sacrifice Zones into their toolkit, local governments can navigate the complexities of climate adaptation while continuing to protect and preserve their communities and natural environments.