

# CLIMATE CHANGE AND INFRASTRUCTURE

Courtney Lauren Anderson

## ABSTRACT

The adverse effects of climate change impact all citizens of the world, yet the adverse effects of natural disasters, made more frequent and intense by climate change, persist in low-income, minority communities that do not have the luxury of mitigating such ills prior to the time the disaster strikes. This article examines how Low-Income Housing Tax Credits can provide a channel for building green infrastructure solutions to the climate change problem.

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## I. CLIMATE CHANGE AND LOW-INCOME COMMUNITIES

According to a study on heat-related mortality in New York City, when excess heat is properly conceptualized as an urban pollutant, it can be shown that this pollutant is relatively more prevalent in low-income neighborhoods due to the design and maintenance of the built environment and housing conditions.<sup>1</sup> Low-income communities and communities of color are disproportionately exposed to urban pollutants, including excess heat.<sup>2</sup> In New York City, elevated surface temperatures were significantly and positively associated with impervious cover, poverty rates, and percent black/African-American, and significantly and negatively associated with percent vegetative land cover, percent white, and mean household income.<sup>3</sup> Further, low-income communities and communities of color have less access to neighborhood and personal amenities that can mitigate harm caused by this excess heat.<sup>4</sup> Thus, there exists a positive correlation between increasing surface temperatures of lower-income communities and heat-mortality rates in those communities.<sup>5</sup> This rise in heat-mortality often results from heat-related exacerbation of cardiovascular or respiratory conditions.<sup>6</sup>

The urban heat island effect is a concept used to explain the existence of higher temperatures in high-density urban areas when compared to the suburban or rural areas nearby.<sup>7</sup> The Environmental Protection Agency ("EPA") states that air temperature in cities can be as much as 22 degrees Fahrenheit warmer than air temperature in the neighboring suburban regions.<sup>8</sup> However, this increased heating is not

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<sup>1</sup> Joyce Klein Rosenthal et al., *Intra-Urban Vulnerability to Heat-Related Mortality in New York City, 1997–2006*, 30 HEALTH & PLACE 45, 51 (2014).

<sup>2</sup> *Id.* at 56.

<sup>3</sup> *Id.* at 51.

<sup>4</sup> *Id.* at 56.

<sup>5</sup> *Id.* at 55–56.

<sup>6</sup> *Id.* at 45.

<sup>7</sup> *Id.* at 46.

<sup>8</sup> U.S. ENVTL. PROTECTION AGENCY, *Heat Island Impacts*, EPA.GOV, <https://www.epa.gov/heat-islands/heat-island-impacts> (last visited Nov. 11, 2017).

consistent throughout the entire urban environment—urban design leads to the development of microclimates, in which certain areas are cooler than others within the urban heat island.<sup>9</sup> In several cities, the primary factors that affect this spatial temperature variability inside an urban heat island are the presence of vegetative cover, tree canopy, or other albedo reduction measures.<sup>10</sup> In congruence, the EPA recommends using trees and vegetation, green roofs, cool roofs, cool pavements, and smart growth strategies to reduce the urban heat island effect.<sup>11</sup> Regrettably, the implementation of these EPA-sanctioned strategies requires a high level of community investment which is often absent in poorer communities.<sup>12</sup> Further, in many cities (e.g., Phoenix, Portland, New York City), it has been shown that minority populations are less likely than white populations to live in spaces that have tree canopy, and these populations often live in communities where the ground is covered with impervious surface, exacerbating the heating effects.<sup>13</sup>

Additionally, in the study on New York City, the quality of the neighborhood built environment and social determinants were concluded as relevant for determining heat-associated mortality risk.<sup>14</sup> For example, rates of home ownership had the strongest association with area-based, heat-related mortality. Prior research has shown that neighborhoods with higher rates of home ownership are associated with stronger locally-based social networks, greater local community involvement, lengthier resident tenure, and familiarity with the neighbors, which are all factors that have been shown to potentially protect against negative heat-related health outcomes.<sup>15</sup> Also, rates of property tax delinquency, foreclosures, and serious housing violations

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<sup>9</sup> Rosenthal, *supra* note 1, at 46.

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

<sup>11</sup> U.S. ENVTL. PROTECTION AGENCY, *Reduce Urban Heat Island Effect*, EPA.GOV, <https://www.epa.gov/green-infrastructure/reduce-urban-heat-island-effect> (last visited Nov. 12, 2017).

<sup>12</sup> *See generally* Rosenthal, *supra* note 1, at 46.

<sup>13</sup> *Id.*

<sup>14</sup> *Id.* at 53–54.

<sup>15</sup> *Id.* at 54.

showed strong associations with the area-based, heat-related mortality; these factors are commonly seen as indicators of the quality of the housing and physical environment and a measure of neighborhood stability and economic stress.<sup>16</sup> What is particularly discouraging is that these measures also suggest a significantly greater impact on communities of color in New York City.<sup>17</sup> The final socioeconomic indicator that was strongly associated with area-based, heat-related mortality was the lack of air conditioning—most people in this category could not afford an air conditioner, and of those that could, some were concerned about the electric bill expenses associated with owning one.<sup>18</sup>

### **A. Rising Sea Levels and Natural Disasters in Low-Income Communities**

Rising sea levels are no longer a potential outcome, they are occurring and will worsen.<sup>19</sup> As a result, the number of American communities that experience “chronic inundation” will double by the year 2035.<sup>20</sup> The Union of Concerned Scientists (UCS) defines “chronic inundation” as sea level rise-induced flooding that occurs 26 times per year or more.<sup>21</sup> For the sea-level related flooding to rise to become “inundation,” this flooding must have the ability to disrupt people’s routines, livelihoods, homes, and communities.<sup>22</sup> By 2035, nearly 170 coastal communities will suffer from chronic inundation, and 55% of those communities are home to socioeconomically vulnerable neighborhoods.<sup>23</sup> Even worse, UCS predicts that by the end of the

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<sup>16</sup> *Id.*

<sup>17</sup> *Id.*

<sup>18</sup> *Id.* at 56.

<sup>19</sup> Barbara Grady, *Sea Level Rise Threatens Oakland's Sewer System*, CLIMATE CENTRAL (June 17, 2014), <http://www.climatecentral.org/news/sea-level-rise-oakland-sewer-17567>.

<sup>20</sup> ERIKA SPANGER-SIEGFRIED ET AL., *WHEN RISING SEAS HIT HOME: HARD CHOICES AHEAD FOR HUNDREDS OF US COASTAL COMMUNITIES 2* (Pamela Worth et al. eds., 2017).

<sup>21</sup> *Id.* at 1.

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

<sup>23</sup> *Id.* at 2.

century, 60% of all East Coast and Gulf Coast communities could face chronic inundation.<sup>24</sup> In determining which neighborhoods are socioeconomically vulnerable,<sup>25</sup> UCS uses the Social Vulnerability Index (“SoVI”).<sup>26</sup>

Triaging the socioeconomic vulnerability of communities assists in the alleviation of chronic inundation and natural disasters because these communities face larger challenges and a more cumbersome rebuilding process.<sup>27</sup> This is evidenced in Alameda County, California, which encompasses Oakland.<sup>28</sup> In Oakland, city planners expect that climbing sea levels will lead to more flooding and storm surges, which will eventually overwhelm the city’s sewer system.<sup>29</sup> This would lead to sewage and industrial runoff backflowing out of sewers onto the streets, yards, and basements of Oakland residents.<sup>30</sup> Additionally, in Florida, low-income communities are bearing the brunt of climate change—a legacy of questionable housing policy has segregated vulnerable communities into areas that are affected “first and worst” by the impacts of climate change.<sup>31</sup> These “frontline” communities are disproportionately communities of color.<sup>32</sup> Even in the Northeast, the effects are being felt regularly. Southbridge, a neighborhood in Wilmington, Delaware, has begun feeling the impacts of sea-level rise.<sup>33</sup> Repeated flooding has led to sewer system discharge so strong

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<sup>24</sup> *Id.* at 25.

<sup>25</sup> *Id.* at 11. SoVI uses twenty-nine economic and demographic variables obtained through the U.S. Census at the tract level, including income; poverty; percentages of Black or African American, Hispanic, and Native American residents; education level; and age.

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

<sup>27</sup> *Id.* at 11–12.

<sup>28</sup> See generally Grady, *supra* note 19.

<sup>29</sup> See generally *id.*

<sup>30</sup> *Id.*

<sup>31</sup> Pamela Worth, *Where Climate Change Hits First and Worst*, UNION CONCERNED SCIENTISTS: SCI. FOR HEALTHY PLANET & SAFER WORLD (Fall 2015), <https://www.ucsusa.org/publications/catalyst/fa15-where-climate-change-hits-first-and-worst#.WsaAp4jwaUk>.

<sup>32</sup> *Id.*

<sup>33</sup> See Bruce Stutz, *A Vulnerable Community Braces for the Impacts of Sea Level Rise*, YALE ENV’T 360 (Jan. 30, 2017), <http://e360.yale.edu/features/a-vulnerable-community-braces-for-the-impacts-of-sea-level-rise>.

that it lifted iron sewage plates, and the town already experiences regular street flooding.<sup>34</sup> Sometimes, this flooding will occur after only fifteen minutes of rain, according to resident of the neighborhood.<sup>35</sup> Illustrative of the problem, the traditionally lower-income community has nothing but a 100-year old system of iron tide-gates to protect it from the flooding.<sup>36</sup> This system regularly fails, inundating the Southbridge streets with water.<sup>37</sup>

Rising sea levels require coastal communities to have strong community resources to protect its citizens and its property. Unfortunately, nearly half of the communities that will be chronically inundated with sea-level related flooding in twenty years will be low-income communities and communities of color—neither of which have the resources to guard against this destructive effect of climate change.<sup>38</sup>

When natural disasters hit, people living in low-income communities are often hit the hardest.<sup>39</sup> This result is no coincidence—rather, it is the result of decades of racial zoning laws, redlining, and lack of availability of affordable housing.<sup>40</sup> Additionally, the high population of low-income families in flood zones may also be due to the availability of low-skilled jobs in these areas; for example, hotel staff or other service industries.<sup>41</sup> These factors worked together to steer minority and low-income groups towards housing most vulnerable to flood loss.<sup>42</sup> These communities have also more often

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<sup>34</sup> *Id.*

<sup>35</sup> *Id.*

<sup>36</sup> *Id.*

<sup>37</sup> *Id.*

<sup>38</sup> See SPANGER-SIEGFRIED, *supra* note 20; see Worth, *supra* note 31.

<sup>39</sup> See Laurel Blatchford, *Hurricane Matthew Will Hit African-Americans and Low-Income People Most*, TIME (Oct. 7, 2016), <http://time.com/4522780/hurricane-matthew-race-low-income-communities/>.

<sup>40</sup> *Id.*

<sup>41</sup> CAMILO SARMIENTO & TED E. MILLER, INEQUITIES IN FLOODPLAIN MANAGEMENT OUTCOMES 14, AM. AGRIC. ECON. ASS'N MEETINGS (2006), <http://ageconsearch.umn.edu/bitstream/21042/1/sp06sa08.pdf>.

<sup>42</sup> See Blatchford, *supra* note 39.

than not faced years of disinvestment; the old, outdated housing has few upgrades to protect from flooding, and in some cases, the protections are virtually non-existent.<sup>43</sup>

In addition to low-income communities being placed in harm's way, many of the families in these communities have little or no flood insurance.<sup>44</sup> One study analyzing Census Block data from flood zones noted those in low-income neighborhoods (defined as income between \$10,000-\$30,000) were more prone to live in low lying areas than those with a middle class income (\$30,000-\$75,000), despite the fact that those living with a low income probably cannot afford the associated flood insurance.<sup>45</sup> Another issue is that many of these structures are aged and not flood-proofed to begin with, making the associated insurance premiums higher because of the higher risk associated with insuring the properties against flood damage.<sup>46</sup>

After a particularly devastating storm in the 1960s, Congress chartered a study into what could be done to help in the aftermath of these types of natural disasters.<sup>47</sup> As a result, Congress passed the Natural Flood Insurance Act of 1968, which created the National Flood Insurance Program ("NFIP").<sup>48</sup> NFIP sought to level the playing field among victims of flooding, both through "(1) constraining the cost of damage caused by flooding, and (2) providing economically feasible relief to victims through insurance."<sup>49</sup> One way the damage is constrained is through regulations that require local communities to issue building permits in designated flood prone areas only if the new structures will comply with the "BFE" requirement, which is a requirement that all new structures be built at or above the base-flood

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<sup>43</sup> *See id.*

<sup>44</sup> SARMIENTO & MILLER, *supra* note 41.

<sup>45</sup> *See generally* DIXON ET AL., THE COST AND AFFORDABILITY OF FLOOD INSURANCE IN NEW YORK CITY: ECONOMIC IMPACTS OF RISING PREMIUMS AND POLICY OPTIONS FOR ONE- TO FOUR- FAMILY HOMES, (2017), [https://www.rand.org/content/dam/rand/pubs/research\\_reports/RR1700/RR1776/RAND\\_RR1776.sum.pdf](https://www.rand.org/content/dam/rand/pubs/research_reports/RR1700/RR1776/RAND_RR1776.sum.pdf); SARMIENTO & MILLER, *supra* note 41, at 13, 14.

<sup>46</sup> *See id.*

<sup>47</sup> SARMIENTO & MILLER, *supra* note 41 at 3, 4.

<sup>48</sup> *Id.* at 4.

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

elevation level.<sup>50</sup> The goal of this requirement is to reduce the probability of flooding to these structures to a less than 1% chance per year.<sup>51</sup> If structures do not meet this requirement, they are not eligible for flood insurance through the NFIP. Structures existing before the act's requirements went into effect are grandfathered in to the insurance program.<sup>52</sup>

To further the goal of economically feasible relief, Congress created a federally backed flood insurance program for property owners living in flood zones.<sup>53</sup> One way in which the flood insurance program is administered is through a mandatory purchase provision, which requires homeowners to get flood insurance before they can qualify for a mortgage in these areas.<sup>54</sup> It is important to note, however, that the mortgages of rental properties are not subject to the mandatory flood insurance provision.<sup>55</sup> As low-income families often cannot qualify for a mortgage and instead must rent their homes, these families are hit the hardest by flooding and natural disasters because there may not be insurance on their properties to help them rebuild.<sup>56</sup> Additionally, as rental properties are not subject to the mandatory flood insurance provision and its accompanying standards, there may be less incentive to keep these properties adequately protected from flooding and natural disasters.<sup>57</sup>

The resulting damages are portrayed in the statistics. The Census Block study noted that the majority of the impoverished population (income of \$10,000-\$20,000) suffered more flood damages than the middle-class population (income of \$30,000-\$75,000).<sup>58</sup> Conversely, high income populations (income of \$75,000+) suffered more flood

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<sup>50</sup> *Id.*

<sup>51</sup> *Id.*

<sup>52</sup> See DIXON ET AL., *supra* note 45.

<sup>53</sup> *National Flood Insurance Program*, BENEFITS.GOV, <https://www.benefits.gov/benefits/benefit-details/435> (last visited Mar. 2, 2018).

<sup>54</sup> SARMIENTO & MILLER, *supra* note 41 at 12.

<sup>55</sup> *Id.*

<sup>56</sup> *Id.* at 12, 13.

<sup>57</sup> *Id.* at 12.

<sup>58</sup> *Id.* at 12, 13.



damages than the middle-income populations as well.<sup>59</sup> These statistics evidence two factors in a person's choice to live near water. For the low-income populations, it is likely due to the aforementioned factors of decades of "steering" into these areas, coupled with no mandatory insurance provision for renters, who make up the majority of this class.<sup>60</sup> For the high-income populations, the statistics are indicative of the group's financial freedom to purchase beachfront property, along with the ability to take the risks of flood damage and the ability to afford the higher insurance premiums.<sup>61</sup> In addition to class-based distinctions, there are racial distinctions between flood-damage sufferers as well. On average, African-Americans are exposed to more flood damage than other races;<sup>62</sup> this statistic is again due to historical segregation practices in real estate and city planning.<sup>63</sup>

Recent natural disasters, like Hurricane Harvey, offer confirmation of these statistics. In Houston, low-income families were most negatively affected by Harvey.<sup>64</sup> Not only were these groups living in the most dangerous areas, but Houston's lack of spending on infrastructure in these communities played a big role in the aftermath as well.<sup>65</sup> Instead of spending money on flood barriers or other potentially critical flood protection systems where they are needed most, the city spent most of its money on the wealthier neighborhoods, adding bike trails and embankments to help seal off floodwaters.<sup>66</sup> Not only do these low-income neighborhoods not have flood protection structures in place, they lack basic utilities like a sewer drain system.<sup>67</sup> In the areas hit hardest by Harvey, ditches line the roads to catch storm

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<sup>59</sup> *Id.* at 3.

<sup>60</sup> *Id.* at 3, 12.

<sup>61</sup> *Id.* at 12.

<sup>62</sup> *Id.* at 13.

<sup>63</sup> See Blatchford, *supra* note 39.

<sup>64</sup> Jeremy Deaton, *Hurricane Harvey Hit Low-Income Communities Hardest*, HUFFINGTON POST, [http://www.huffingtonpost.com/entry/hurricane-harvey-hit-low-income-communities-hardest\\_us\\_59b007ece4b0bef3378cdcb](http://www.huffingtonpost.com/entry/hurricane-harvey-hit-low-income-communities-hardest_us_59b007ece4b0bef3378cdcb) (last updated Sept. 6, 2017).

<sup>65</sup> *Id.*

<sup>66</sup> *Id.*

<sup>67</sup> *Id.*

water.<sup>68</sup> The ditches quickly overflow, leading to flooding.<sup>69</sup> In addition, a portion of the city's only subsidized housing was built in an area designated by the Federal Emergency Management Agency ("FEMA") as a high-risk flood zone.<sup>70</sup> These same low-income families are also much less likely to carry flood insurance because of its high cost.<sup>71</sup>

Exacerbating the flood water damage in low-income Houston communities is the threat of pollution resulting from the neighborhoods' close proximity to chemical plants and oil refineries that are statistically more accident-prone.<sup>72</sup> When floodwaters cause these areas to lose power, the safeguards in place to protect the surrounding communities from these dangerous environmental contaminants can fail.<sup>73</sup> Yet another injustice that magnifies the problem is that the low-income and minority groups living in these areas lack a political voice to raise concerns about an oil refinery or chemical plant moving into town, while nearby white neighborhoods do have that ability.<sup>74</sup> As a result, their neighborhoods became heavily infiltrated with environmental hazards, and have come to be known as "sacrifice zones."<sup>75</sup>

Congress passed the Tax Reform Act of 1986 that created the Low-Income Housing Tax Credit ("LIHTC") program to provide incentive to private housing developers to develop affordable housing.<sup>76</sup> The LIHTC program provides tax credits to the private sector through housing agencies at the state level,<sup>77</sup> instead of providing a subsidy

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<sup>68</sup> *Id.*

<sup>69</sup> *Id.*

<sup>70</sup> *Id.*

<sup>71</sup> *Id.*

<sup>72</sup> *Id.*

<sup>73</sup> *Id.*

<sup>74</sup> *Id.*

<sup>75</sup> *See generally id.*

<sup>76</sup> John Baber, *Thank You Sir, May I Have Another: The Issue of the Unsustainability of Low Income Housing Tax Credits and Proposed Solutions*, 4 U. BALT. J. LAND & DEV. 39, 41 (2014).

<sup>77</sup> Mark Lipschultz, *Merging the Public and Private: The LIHTC Program and A Formula for More Affordable Housing*, 36 REV. BANKING & FIN. L. 379, 390 (2016).

directly to the tenants.<sup>78</sup> The federal tax credits are issued by the states for the acquisition, rehabilitation, or new construction of affordable rental housing.<sup>79</sup> The LIHTC program is one of the largest federal subsidies for the development and rehabilitation of affordable housing.<sup>80</sup> Through the LIHTC program, between 1995 and 2015, over 1,460 projects and 110,000 units were placed in service annually, and the program gives nearly \$8 billion in annual budget authority to issue tax credits to state agencies.<sup>81</sup> The program has expanded ever since its inception in 1986 by increasing its tax credit, extending the commitment period, and adding to the federal tax code.<sup>82</sup> Congress created the LIHTC program in an effort to alleviate the affordable housing crisis.<sup>83</sup> The Secretary of Housing and Urban Development labeled affordable housing crisis as the lack of affordable housing for low-income individuals,<sup>84</sup> which can be seen in the study mentioned *infra*. Affordable housing is broadly defined by the U.S. Department of Housing and Urban Development (“HUD”) as “housing for which the occupant(s) is/are paying no more than 30 percent of his or her income for gross housing costs, including utilities.”<sup>85</sup> Affordable housing is calculated based on geographical costs of living and housing.<sup>86</sup> Local governments estimate affordable housing using the area median

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<sup>78</sup> Megan J. Ballard, *Profiting from Poverty: The Competition Between For-Profit and Non-profit Developers for Low-Income Housing Tax Credits*, 55 HASTINGS L.J. 211, 212 (2003).

<sup>79</sup> U.S. DEP’T OF HOUSING & URBAN DEV., UPDATING THE LOW-INCOME HOUSING TAX CREDIT (LIHTC) DATABASE (Nov. 10, 2000), <https://www.huduser.gov/portal/datasets/lihtc/report9598.pdf>.

<sup>80</sup> Baber, *supra* note 76, at 39.

<sup>81</sup> U.S. DEP’T OF HOUSING & URBAN DEV., UPDATING THE LOW-INCOME HOUSING TAX CREDIT (LIHTC) DATABASE, *supra* note 79.

<sup>82</sup> U.S. DEP’T OF HOUSING AND URBAN DEV., *Updating the National Low-Income Housing Tax Credit Database: Projects Placed in Service Through 2002*, <https://www.huduser.gov/portal/datasets/lihtc.html#publications> (last updated July 10, 2017).

<sup>83</sup> Lipschultz, *supra* note 77, at 387.

<sup>84</sup> *Id.* at 385.

<sup>85</sup> U.S. DEP’T HOUSING & URBAN DEV., *Resources*, [https://www.huduser.gov/portal/glossary/glossary\\_a.html](https://www.huduser.gov/portal/glossary/glossary_a.html).

<sup>86</sup> Lipschultz, *supra* note 77, at 383–84.

income ("AMI") for federal subsidy programs, such as LIHTC.<sup>87</sup> AMI is used to determine the degree of low-income households by categorizing the household into three categories: low-income, very low-income, and extremely low-income.<sup>88</sup> "Low-income" households earn 50-80% of AMI.<sup>89</sup> "Very low-income" households earn less than 50% of AMI.<sup>90</sup> "Extremely low-income" households earn less than 30% of AMI.<sup>91</sup> A majority of families or individuals living in public housing fall into one of these categories.<sup>92</sup>

The program may be well funded and growing, however, it is still far from providing affordable housing to all in need. "As of 2014, approximately eleven million households in the United States spent over 50 percent of their income on housing."<sup>93</sup> Another study showed approximately eleven million low-income families and persons needing affordable housing, but there are only seven million affordable housing units.<sup>94</sup> Additionally, multiple reports from government agencies and law journal articles are critical of the program and the success it fails to bring.<sup>95</sup> Hurricane Irma made clear the kind of catastrophic damage that can occur to low-income families because of the cheap, poor quality housing that many live in.<sup>96</sup> Often, these are structures with inadequate foundations or are seated trailers.<sup>97</sup> Moreover, these residents often lack a way to evacuate to

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<sup>87</sup> *Id.* at 384.

<sup>88</sup> *Id.* at 384–85 (2016).

<sup>89</sup> 42 U.S.C. § 1437a(b)(2)(A)–(B).

<sup>90</sup> 42 U.S.C. § 1437a(b)(2)(B).

<sup>91</sup> 42 U.S.C. § 1437a(b)(2)(C)(i)–(ii).

<sup>92</sup> Lipschultz, *supra* note 77, at 385 (2016) (citing Matthew Desmond, *Unaffordable America: Poverty, Housing, and Eviction*, INST. FOR RES. ON POVERTY 1 (2015)).

<sup>93</sup> *Id.*

<sup>94</sup> *Id.* at 387.

<sup>95</sup> See generally, U.S. DEP'T OF HOUSING & URBAN DEV., DATA SETS: LOW-INCOME HOUSING TAX CREDITS, <https://www.huduser.gov/portal/datasets/lihtc.html>; Ballard, *supra* note 78.

<sup>96</sup> See Sandro Galea, *Hurricane Maria Shows That We Still Don't Know What It Means to Be Prepared*, FORTUNE (Sept. 19, 2017) <http://fortune.com/2017/09/19/hurricane-maria-harvey-irma-hurricane-preparedness/>.

<sup>97</sup> *Id.*

safer shelter.<sup>98</sup> In Puerto Rico, environmental disaster—similar to Houston—was inevitable in the weeks and months leading up to Hurricane Maria’s arrival. The territory’s bankruptcy, debt, and overall poverty level had its electrical system running on an “unsafe” status.<sup>99</sup> But, Puerto Rico houses something even more dangerous—twenty-three government Superfund sites, which are essentially hazardous waste dumps.<sup>100</sup> In addition, a five-story pile of coal ash stood in one southern Puerto Rico city, awaiting a violent storm to disperse it all around the neighboring communities and contaminate the air.<sup>101</sup> It would later leach into the drinking water supply once floodwaters rose.<sup>102</sup>

### **B. Combined Sewer Systems add to the Negative Effects of Climate Change**

Combined Sewer Systems (“CSS”) were introduced in the 1850s, as a sanitary alternative to “urban cesspool ditches.”<sup>103</sup> CSSs were “designed to dry out streets by collecting rainwater runoff, domestic sewage, and industrial waste-water all within the same pipe system.”<sup>104</sup> In the 20th century, sewage treatment plants were added to the infrastructure in order to help improve sanitation processes.<sup>105</sup> The problem with combined sewer systems is that “when too much storm water is added to the flow of raw sewage, the result is frequently an overflow.”<sup>106</sup> These overflows are referred to as Combined Sewer

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<sup>98</sup> *Id.*

<sup>99</sup> See Emily Atkin, *Even Before Hurricane Maria, Puerto Rico Was Already in Environmental Despair*, MOTHER JONES (Sept. 20, 2017, 11:31 AM), <http://www.motherjones.com/environment/2017/09/climatedesk-now-hammered-by-hurricane-maria-puerto-rico-was-already-in-environmental-despair/>.

<sup>100</sup> *Id.*

<sup>101</sup> *Id.*

<sup>102</sup> *Id.*

<sup>103</sup> John Tibbets, *Combined Sewer Systems: Down, Dirty, and Out of Date*, 113.7 ENVTL. HEALTH PERSP. A465 (2005), <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1257666/>.

<sup>104</sup> *Id.*

<sup>105</sup> *Id.*

<sup>106</sup> *Id.*

Overflows (“CSO”) and have negative impacts on lakes, rivers, and coastal waters across the United States.<sup>107</sup> Overflow pipes within combined sewer system infrastructures generally prevent sewage from backing up into buildings (both domestic and commercial).<sup>108</sup> In 1994, the Environmental Protection Agency implemented a CSO Control Policy, which mandated reduction or elimination of CSOs in order to reach goals articulated in the Clean Water Act; indicating the necessity to work directly with municipalities to achieve these goals.<sup>109</sup> Essentially, governing bodies had two options: (1) Communities with CSOs can build separate underground pipes for sewage and storm-water or (2) Keep the combined pipes, and find a way to store or treat peak rain-water flows.<sup>110</sup>

Approximately 40 million people in 32 states live in cities with combined sewer systems, and according to the EPA’s 2004 report to Congress, CSOs are a major water pollution concern for 772 of those cities.<sup>111</sup> Most of those communities have fewer than 10,000 people; “larger municipalities are more likely to have sufficient tax base and water users to finance remedies.”<sup>112</sup> There has been an increase in inundation because of CSOs following heavy rainfall: “Designs are based upon historical patterns of precipitation and stream flow . . . which are no longer appropriate guides.”<sup>113</sup> The annual precipitation rate in the Midwest is up 37% since 1958.<sup>114</sup> In April of 2013, “roughly 600 Chicago buildings” were flooded by sewage after a CSO.<sup>115</sup> In Detroit, record levels of rainfall has contributed to record levels of

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<sup>107</sup> *Id.*

<sup>108</sup> *Id.*

<sup>109</sup> *Id.* at A465–66.

<sup>110</sup> *Id.* at A466.

<sup>111</sup> *Id.*

<sup>112</sup> *Id.*

<sup>113</sup> See Jeff Spross, *Storms, Sewage, and Maggots: Climate Change Comes to Chicago*, THINKPROGRESS.ORG (July 23, 2014), <https://thinkprogress.org/storms-sewage-and-maggots-climate-change-comes-to-chicago-4963c84f7446/>.

<sup>114</sup> *Id.*

<sup>115</sup> *Id.*

untreated water discharge into nearby lakes and rivers.<sup>116</sup> The city's financial crisis caused street sweeping to stop, which increased the amount of trash finding its way into the sewer system.<sup>117</sup> Detroit's financial "turmoil" is compounded by this environmental crisis: "An aging, flood-prone sewer system sends raw sewage into the Detroit River during intense downpours."<sup>118</sup> These intense storms have increased 45% across the Midwest in the past fifty years, and Detroit is no exception.<sup>119</sup> With about 20 square miles of vacant land in the city, some groups have called for plans for creation of greenspace, such as "ponds, lakes, even forests, to ease sewer pressure and soak up other forms of pollution."<sup>120</sup> Detroit is not alone in seeking such vast greenspace solutions.

South Wilmington, Delaware has dealt with similar financial woes as Detroit since the end of World War II.<sup>121</sup> Instead of the threat of increased storm downpours, South Wilmington faces the threat of rising sea level across the Atlantic Coastline.<sup>122</sup> A hundred years ago, when Wilmington's combined sewer system was implemented, the tide was "eight to nine inches lower than it is today."<sup>123</sup> A system of tide gates was designed, at the time, to control tidal flows in conjunction with sewage treatment, but now "that aging flood-control system . . . fails during times of extreme tidal surges, filling Southbridge's streets with water."<sup>124</sup> As CSOs contribute to the effects of climate change, these problems become cyclical and compounding: "during most of the 20<sup>th</sup> century, sea levels were rising at 0.6 inches per decade. Since 1993, however, sea level has been rising at 1.2 inches per

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<sup>116</sup> Brian Bienkowski, *Sewage Overflow Adds to Detroit's Woes*, DAILY CLIMATE (Aug. 27, 2013), <http://www.scientificamerican.com/article/sewage-overflow-adds-to-detroits-woes>.

<sup>117</sup> *Id.*

<sup>118</sup> *Id.*

<sup>119</sup> *Id.*

<sup>120</sup> *Id.*

<sup>121</sup> Stutz, *supra* note 33.

<sup>122</sup> *Id.*

<sup>123</sup> *Id.*

<sup>124</sup> *Id.*

decade.”<sup>125</sup> Experts say “the kind of flooding that has plagued Southbridge will become chronic and sometimes catastrophic.”<sup>126</sup> These problems also impose significant health risks for South Wilmington residents because extreme surges have been known to back up systems inside peoples’ homes.<sup>127</sup>

Caswell Holloway and his co-authors of *Solving the CSO Conundrum: Green Infrastructure and the Unfulfilled Promise of Federal-Municipal Cooperation* identify four categories of urban sustainability development goals: (1) Public Health and Safety; (2) Environmental Quality; (3) Quality of Life; and (4) Economic Development; the balance of which governs the implementation of new infrastructure to solve problems like CSOs.<sup>128</sup> Holloway explains that public health policies include encouraging healthy behaviors and activities as well as increasing the availability of healthy foods.<sup>129</sup> Relevant environmental policies generally seek to improve water quality as well as the increase the availability of healthy foods, specifically, both of which, in turn, positively affect public health in general.<sup>130</sup> Quality of life is “something of a catchall category,” that is highly contextual; relying heavily on local priorities and community perspectives.<sup>131</sup>

With its roots in Euclidean zoning, municipal park development, and even nuisance law, the contemporary conception of “quality of life” incorporates public health and environmental goals alongside education, housing, transportation, public safety, recreation, aesthetics, and other values. In each locality, citizens may hold distinct values that yield particular priorities—whether economic, environmental, or social—for shaping the character of their community.<sup>132</sup>

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<sup>125</sup> *Id.*

<sup>126</sup> *Id.*

<sup>127</sup> *Id.*

<sup>128</sup> Caswell F. Holloway et al., *Solving the CSO Conundrum: Green Infrastructure and the Unfulfilled Promise of Federal-Municipal Cooperation*, 38 HARV. ENVTL. L. REV. 335, 340 (2014).

<sup>129</sup> *Id.* at 341.

<sup>130</sup> *Id.*

<sup>131</sup> *Id.* at 342.

<sup>132</sup> *Id.*



Economic development policies are concerned with whether infrastructure may offer opportunities for better job markets, housing markets, and private enterprise involvement.<sup>133</sup> “The vision of integrating economic development and environmental protection is at the core of many urban sustainability programs, whether acknowledged explicitly or simply implicit in their design.”<sup>134</sup> As Holloway makes clear, these goals must be balanced in efforts to combat CSO problems, but an additional challenge to this balancing act is the establishment of boundaries which influence the relevant considerations for each of these policy categories.<sup>135</sup> Therefore, answering the question of who decides how and where to establish these boundaries becomes an important step in the process.<sup>136</sup>

The federal government’s regulatory authority over environmental quality is at odds with the traditionally extensive municipal authority to exercise “police power.”<sup>137</sup> Holloway articulates the pros and cons of both sides:

. . . issues of larger geographic significance [such as air and water quality] may not be addressed by local officials due to the lack of perspective, funding, or support.’ By federalizing environmental protection, modern environmental law imposes uniform standards across the country . . . the inherent parochialism of local politics and the desire to avoid short-term costs, even in those cases where cleaner cities might provide longer-term benefits, provides one set of arguments in favor of federal authority to determine environmental goals. On the other hand, federal regulators do not face the financial and operational needs to balance competing or even contradictory programs that are specific to individual media . . . regulation at the federal level can often fail to take into consideration local conditions that, particularly when environmental objectives intersect with the

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<sup>133</sup> *Id.*

<sup>134</sup> *Id.*

<sup>135</sup> *Id.* at 343.

<sup>136</sup> *Id.* at 344.

<sup>137</sup> *Id.*

vagaries of land use control, may make all the difference for the success or failure of a given regulatory program.<sup>138</sup>

The ultimate resolution of this conflict between authorities is yet to be seen, though in the specific context of CSO mitigation, the statutory provisions of the Clean Water Act (“CWA”) govern.<sup>139</sup> “However, rather than creating a single standard for CSO control to apply uniformly to municipalities across the nation, EPA ‘recognized the site-specific nature of CSOs and their impacts and provided the necessary flexibility to tailor control to local situations.’”<sup>140</sup> Holloway uses a recent consent decree agreement, between the New York State Department of Environmental Conservation and the New York City Department of Environmental Protection, as an example of how green infrastructure progress can be made through the cooperation between state and local authorities.<sup>141</sup> The 2012 agreement “will reduce CSOs by approximately twelve billion gallons annually by 2030, approximately two billion gallons more than a prior plan that relied completely on traditional grey infrastructure.”<sup>142</sup> Further it is expected to save the contributing taxpayers approximately \$2.4 billion.<sup>143</sup> The city agreed “to control the stormwater generated by one inch of precipitation on 1.5 percent of the impervious surfaces in combined sewer areas” by 2015.<sup>144</sup> According to the fourth quarter, 2015, progress report for the consent decree, the New York City Department of Environmental Protection was “on schedule to achieve 0.7% impervious area managed by the end of 2015 and 1.5% by the end of 2016.”<sup>145</sup>

The milestones established in the order require the City to increase the amount of storm water managed at specified intervals: four percent

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<sup>138</sup> *Id.* at 344–45.

<sup>139</sup> *Id.* at 355.

<sup>140</sup> *Id.* at 357.

<sup>141</sup> *Id.* at 365.

<sup>142</sup> *Id.* at 365–66.

<sup>143</sup> *Id.* at 366.

<sup>144</sup> *Id.*

<sup>145</sup> N.Y.C. DEP’T OF ENVTL. PROTECTION, BUREAU OF WASTEWATER TREATMENT, Q. PROGRESS REP.: FOURTH QUARTER 2015 (OCTOBER 1 TO DECEMBER 30, 2015) 3-19 (2016).

by 2020; seven percent by 2025; and ten percent by 2030. To achieve these goals, the City is pursuing a multi-pronged strategy building green infrastructure on public property, establishing new storm water control requirements for new private and public construction, and funding the retrofitting of existing buildings with green infrastructure.<sup>146</sup>

This agreement allows for state level regulation while providing municipal autonomy over methods of implementation, and consequently the ability to balance the four urban sustainability policy goals through private and public cooperation.<sup>147</sup> As Holloway suggests this “experiment” may lend to necessary improvements in policies across the country, as evidenced by problems in other cities using exclusively grey infrastructure solutions.<sup>148</sup> “Farmers Insurance brought a landmark suit against the City of Chicago in Illinois court, citing the April 2013 sewage flooding as a preventable failure. The lawsuit alleged the city ‘should have known that climate change in Cook County has resulted in greater rainfall volume . . . than pre-1970 rainfall history evidenced,’ and that its existing infrastructure is inadequate.”<sup>149</sup> Chicago’s 2010 Climate Action plan “outlines new energy efficiency targets, efforts to build up reliance on renewables, and pollution cuts, among many other goals.”<sup>150</sup> The head of Chicago’s Metropolitan Water Reclamation District, has said that “the city is working to upgrade its storm and waste water storage system. It can now [in 2014] take on 2.7 billion gallons of overflow, and should be able to 7.5 billion gallons by 2015 and 17.5 billion by 2029.”<sup>151</sup>

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<sup>146</sup> Holloway et al., *supra* note 128, at 366.

<sup>147</sup> *Id.* at 367.

<sup>148</sup> *See id.* at 365.

<sup>149</sup> Spross, *supra* note 113.

<sup>150</sup> *Id.* (“Farmers Insurance eventually dropped their lawsuit. But the firm hopes the attempt will encourage cities and counties to take preventative steps, while laying precedent for future such lawsuits across the country if climate change persists.”).

<sup>151</sup> *Id.*

## II. THE BENEFITS OF GREEN INFRASTRUCTURE

A key component of recovery after natural disasters is the infrastructure of the affected area. In flood zones, infrastructure should be built with the idea in mind that floods are a reality. However, that is often not the case. When flood-prone areas are destroyed, billions in taxpayer money is often spent on rebuilding the area with structures that likely will not withstand another flood.<sup>152</sup> This kind of building creates a needless cycle of development, followed by natural disasters and then rebuilding.<sup>153</sup> Structures in flood-prone areas should withstand floods and mitigate flood damage. However, these zones are developed just like any other area, with expanses of vegetation and trees that would absorb water being replaced by pavement and asphalt.<sup>154</sup> Storm drain systems are built in flood zones when it is known that these systems cannot handle a natural disaster and will fail.<sup>155</sup> In addition to being an illogical approach to storm management, this cycle costs the government billions in unnecessary spending that could be saved had mitigation measures been taken.<sup>156</sup> In fact, “[s]tudies have found that for every \$1 spent on disaster mitigation, the government will save \$4 on post-disaster aid.”<sup>157</sup>

A potential solution to both the financial and functional ends of this problem is the implementation of green infrastructure in flood-prone areas. Green infrastructure uses vegetation and soil to “reduce[] and treat[] stormwater at its source while delivering environmental, social, and economic benefits.”<sup>158</sup> Green infrastructure can include

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<sup>152</sup> See Eliza Relman, *Trump Reversed Regulations to Protect Infrastructure Against Flooding Just Days Before Hurricane Harvey*, BUS. INSIDER (Aug. 28, 2017), <http://www.businessinsider.com/trump-reversed-obama-flooding-regulations-before-hurricane-harvey-2017-8>.

<sup>153</sup> *Id.*

<sup>154</sup> See, e.g., Ian Bogost, *Houston's Flood Is a Design Problem*, ATLANTIC (Aug. 28, 2017), <https://www.theatlantic.com/technology/archive/2017/08/why-cities-flood/538251/>.

<sup>155</sup> *Id.*

<sup>156</sup> Relman, *supra* note 152.

<sup>157</sup> *Id.* at 2.

<sup>158</sup> U.S. ENVTL. PROTECTION AGENCY, *What Is Green Protectionism?*, <https://www.epa.gov/green-infrastructure/what-green-infrastructure> (last visited Oct. 30, 2017).

rainwater harvesting for reuse, planter boxes in urban areas that provide soil and vegetation to absorb rainwater, permeable pavement, bioswales, vegetated rooftops, and planted parking areas, among other options.<sup>159</sup> The idea behind green infrastructure is to bring back a piece of what was lost in urban areas that have undergone development—the natural component.<sup>160</sup> When implemented on a large scale, green infrastructure provides places for water to go and prevents the spread of disease by avoiding issues associated with standing water and the distribution of trash and disease that traditional storm drainage systems can create.<sup>161</sup> In addition, green infrastructure slows the channeling of quickly accumulating water; often one of the major causes of flooding.<sup>162</sup> Equally as important is the fact that implementing green infrastructure reduces the costs of stormwater management, stormwater infrastructure, and the costs associated with property development.<sup>163</sup>

Without appropriate infrastructure in place to protect against flood loss, recovery is more difficult than necessary and often takes years.<sup>164</sup> Part of the reason is that the current infrastructure in flood-prone areas does not mitigate the risks of flood damage, which results in more catastrophic damages when floods occur.<sup>165</sup> The NFIP is reflective of this fact because its focus is on rebuilding what was lost rather than on modifying or building structures that could withstand flooding in future disasters.<sup>166</sup>

A related issue created by failing infrastructure in flood zones and the cycle of rebuilding is that it makes it very difficult for residents of these areas to permanently relocate out of flood zones. The high flood

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<sup>159</sup> *Id.*

<sup>160</sup> *Id.*

<sup>161</sup> *Id.*

<sup>162</sup> *Id.*

<sup>163</sup> *Id.*

<sup>164</sup> Kate Aronoff, *Now Comes the Uncomfortable Question: Who Gets to Rebuild After Harvey?*, INTERCEPT (Aug. 30, 2017), <https://theintercept.com/2017/08/30/national-flood-insurance-program-harvey-who-gets-to-rebuild/>.

<sup>165</sup> *Id.*

<sup>166</sup> *Id.*

risk, in combination with other racial and classical controls historically pushing low-income families into flood zones, have made property values lower in these areas.<sup>167</sup> In many cases, the flood-prone neighborhoods contain the only affordable housing.<sup>168</sup> Because of the way the NFIP is structured, for those that have flood insurance, their claims are paid to help them rebuild their home back to the condition it was pre-flood.<sup>169</sup> For those without flood insurance or relying on a landlord to make repairs, a natural disaster leaves them homeless and without any assistance to relocate to a new, safer neighborhood.<sup>170</sup> As a result, these flood prone areas are not only continually rebuilt, but the same residents are affected by natural disasters time and time again.

Though the problems with the current infrastructure in flood-prone areas seem obvious, little is being done at the federal level to address the situation across the nation. President Trump's notoriously unpopular stances on climate change and global warming coincide with a lack of appreciation for the positive impacts that the implementation of green infrastructure could have on our storm management systems.<sup>171</sup> Instead, the Trump administration is placing its focus—and its budget—on fixing roads, bridges, and other infrastructure,<sup>172</sup> a focus that will serve only to continue the cycle of building, disaster, and rebuilding that has come to characterize these flood-prone areas. In contrast, the Environmental Protection Agency

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<sup>167</sup> *Id.*

<sup>168</sup> Aronoff, *supra* note 164.

<sup>169</sup> *Id.*; see, e.g., *When Atlantic City Floods, Low-Income Neighborhoods Are Left Underwater*, PBS (May 12, 2017), <https://www.pbs.org/newshour/science/economic-injustice-atlantic-citys-floods>.

<sup>170</sup> See, e.g., Nathalie Baptise, *This Low-Income Houston Neighborhood Was Recovering from Last Year's Flood. Then Harvey Hit.*, GRIST (Aug. 30, 2017), <http://grist.org/article/this-low-income-houston-neighborhood-was-recovering-from-last-years-flood-then-harvey-hit/>.

<sup>171</sup> Amanda Rodewald, *Trump Plans for Updated Bridges But Ignores the Troubled Waters Down Below*, HILL (June 15, 2017, 11:53 AM), <http://thehill.com/blogs/pundits-blog/energy-environment/337928-trump-plans-for-updated-bridges-but-ignores-the>; Patrick Sisson, *Trump's Infrastructure Plan: Will It Ever Break Ground?*, CURBED (May 12, 2017, 4:07 PM), <https://www.curbed.com/2017/5/12/15632352/donald-trump-construction-roads-infrastructure>.

<sup>172</sup> Rodewald, *supra* note 171.

takes a strong stance encouraging the use of green infrastructure because of its potential damage-mitigation and cost-saving benefits.<sup>173</sup>

### III. MITIGATING CLIMATE CHANGE WITH LOW-INCOME HOUSING TAX CREDITS

Creating some mechanism whereby green infrastructure solutions are used as preventative measures to combat against the intense and frequent flooding caused by climate change is necessary to address the disparate impact of this problem on low-income individuals. The Low-Income Housing Tax Credit program provides an opportunity for federal support of such an initiative by building green infrastructure incentives into a popular, competitive program that provides a reduction of tax credit liability to private developers.

The LIHTC program provides a developer with “a public subsidy that can be applied directly to the building costs of a project in exchange for a dedicated amount of affordable housing units in that project.”<sup>174</sup> The LIHTC program allows developers to sell the tax credits to investors for a dollar for dollar offset of taxes on unrelated earned income.<sup>175</sup> The main benefit to the public is that it requires the developer to set aside a certain amount of rent-restricted units for low-income tenants.<sup>176</sup> Additionally, developers are required to comply with the rent restrictions for a minimum of thirty years.<sup>177</sup>

The decision about how the tax credits are distributed, is up to the individual states and the states’ “allocating agencies.”<sup>178</sup> Each allocating agency has a Qualified Allocation Plan (“QAP”) to

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<sup>173</sup> U.S. ENVTL. PROTECTION AGENCY, *Integrating Green Infrastructure into Federal Regulatory Programs*, <https://www.epa.gov/green-infrastructure/integrating-green-infrastructure-federal-regulatory-programs> (last visited Oct. 30, 2017).

<sup>174</sup> Baber, *supra* note 76, at 42 (2014).

<sup>175</sup> *Id.* at 43.

<sup>176</sup> *Id.*

<sup>177</sup> *Id.*

<sup>178</sup> *Id.* at 41.

determine where the tax credits are distributed.<sup>179</sup> There are, however, some criteria that the allocating agency must meet when it allocates tax credits under the LIHTC program. The federal requirements are the following:

The QAP must be approved by the governmental unit of which that agency is a part.<sup>180</sup>

The agency must notify the chief executing officer of the local jurisdiction where the building project is located and allow enough time for the chief executing officer to comment on the project.<sup>181</sup>

A comprehensive market study of the housing needs of low-income individuals in the area must be conducted prior to the credit allocation and at the expense of the developer.<sup>182</sup>

A written explanation is available to the general public regarding any allocation of the tax credit that is not made in accordance with the selection criteria of the housing agency.<sup>183</sup>

Additionally, the federal government has set forth other overall requirements for QAPs. QAPs must set forth selection criteria based on housing priorities appropriate to local conditions.<sup>184</sup> Also, QAPs must give preference in allocating housing credits to projects serving the lowest income tenants, projects serving qualified tenants for the longest periods, and projects located in qualified census tracts that contribute to concerted community revitalization plan.<sup>185</sup> Lastly, the QAPs must provide a procedure that the allocating agency must follow in monitoring for noncompliance of LIHTC, and notify the Internal Revenue Service of such noncompliance.<sup>186</sup>

Along with the overall requirements set forth by the federal government, there are ten other considerations that must be included

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<sup>179</sup> *Id.*

<sup>180</sup> 26 U.S.C. § 42(m)(1)(A)(i) (2015).

<sup>181</sup> 26 U.S.C. § 42(m)(1)(A)(ii).

<sup>182</sup> 26 U.S.C. § 42(m)(1)(A)(iii).

<sup>183</sup> 26 U.S.C. § 42(m)(1)(A)(iv).

<sup>184</sup> 26 U.S.C. § 42(m)(1)(B)(i).

<sup>185</sup> 26 U.S.C. § 42(m)(1)(B)(ii).

<sup>186</sup> 26 U.S.C. § 42(m)(1)(B)(iii).



in every QAP. The considerations that a QAP must include: project location; housing needs characteristics; project characteristics (including whether the project includes the use of existing housing as part of a community revitalization plan); sponsor characteristics; tenant populations with special housing needs; public housing waiting lists; tenant populations of individuals with children; projects intended for eventual tenant ownership; the energy efficiency of the project' and the historic nature of the project.<sup>187</sup> These considerations, however, may have different point values from state to state allowing states to address specific housing needs.<sup>188</sup> Point values are determined at the discretion of the allocating agency in each state in making the QAP and the project with the highest points will be award tax credits.<sup>189</sup>

The LIHTC program only requires that the QAP contain a consideration of "the energy efficiency of the project" as a part of the QAP's point system.<sup>190</sup> Depending on the state, QAP determines the benefit of developing an environmentally friendly plan and how much weight the state places on the energy efficiency aspect of the project. For example, Alabama, California, and Arizona all allocate points for environmentally friendly plans differently.<sup>191</sup>

In Alabama's 2017 QAP, projects do give points for installing appliances, such as washer, dryer, windows, shingles, and LED lighting that are "Energy Star Rated."<sup>192</sup> Energy Star Rated is a label given by the Environmental Protection Agency to products that are energy efficient, thus reducing emissions of pollutants.<sup>193</sup> Alabama's QAP is like most states and the requirement of Energy Star appliances throughout the rental unit is the bare minimum for energy efficiency.

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<sup>187</sup> 26 U.S.C. § 42(m)(1)(C)(i-x).

<sup>188</sup> Baber, *supra* note 76, at 42.

<sup>189</sup> *Id.* at 44.

<sup>190</sup> 26 U.S.C. § 42(m)(1)(C)(ix).

<sup>191</sup> ALA. HOUSING FIN. AUTHORITY, 2017 HOUSING CREDIT QUALIFIED ALLOCATION PLAN (2016), [http://www.novoco.com/sites/default/files/atoms/files/alabama\\_2017\\_final\\_qap\\_121516.pdf](http://www.novoco.com/sites/default/files/atoms/files/alabama_2017_final_qap_121516.pdf).

<sup>192</sup> See generally *id.*; CAL. CODE REGS. tit. 4, § 10325 (2017); and ARIZ. DEP'T. OF HOUSING, 2017 QUALIFIED ALLOCATION PLAN (2016).

<sup>193</sup> ENERGY STAR OVERVIEW, <https://www.energystar.gov/about> (last visited Apr. 2, 2018).

In California's QAP for 2017, projects may receive points for energy efficiency that meet the minimum requirements for green building certification from certain organizations, such as "Leadership in Energy & Environmental Design (LEED), Green Communities, Passive House Institute US (PHIUS), Passive House, Living Building Challenge, National Green Building Standard ICC/ASRAE – 700 silver or higher rating, or the GreenPoint Rated Program."<sup>194</sup> These organizations all incorporate Energy Star products in their criteria but Energy Star Rated appliances may only get a building to the bear minimum requirements for certification.<sup>195</sup> The organizations mentioned in California's QAP have different certifications for more energy efficient buildings. For example, LEED, an internationally recognized green building rating system, has four ratings: Certified, Silver, Gold, and Platinum.<sup>196</sup> Additionally, California's QAP also allocates more points for photovoltaic generation (solar energy generation) included in project designs.<sup>197</sup> California's QAP is an example of a QAP that requires a higher bar of energy efficiency to receive points, by requiring certifications from well-known organizations when compared to other states that only require Energy Star Rated appliances. Arizona's QAP is another example of a QAP that takes it a step further than most states. It gives developers three options to receive points under sustainable development.<sup>198</sup> The certification route gives developers full points (nineteen points) for Energy Star certification, Gold certification from LEED, or Gold

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<sup>194</sup> CAL. CODE REGS. tit. 4, § 10325(C)(6)(A) (2017).

<sup>195</sup> See generally Alysson Blackwelder, *Energy Star and LEED Work Together for Private-Sector Energy Efficiency*, U.S. GREEN BUILDING COUNCIL (Apr. 27, 2017), <https://www.usgbc.org/articles/energy-star-and-leed-work-together-privatesector-energy-efficiency>; see also GREEN COMMUNITIES CERTIFICATION: 2015 ENTERPRISE GREEN COMMUNITIES CRITERIA, <https://www.enterprisecommunity.org/sites/default/files/media-library/solutions-and-innovation/green/ecp-2015-criteria-manual-11-15.pdf>.

<sup>196</sup> Rukesh Samarasekera, *LEED Credits, Prerequisites and Points: How Are They Different?*, U.S. GREEN BUILDING COUNCIL (Mar. 6, 2017), <https://www.usgbc.org/articles/whats-difference-between-leed-credit-leed-prerequisite-and-leed-point>.

<sup>197</sup> CAL. CODE REGS. tit. 4, § 10325(C)(6)(E).

<sup>198</sup> ARIZ. DEP'T OF HOUSING., 2017 QUALIFIED ALLOCATION PLAN, 39–44 (2016).

certification from National Green Building Standard.<sup>199</sup> The Gold certification from LEED is a minimum of 60 points, whereas just being certified is 40 points, which is what California's QAP requires.<sup>200</sup> The second option is the performance-based path and requires a Home Energy Rating System (HERS) of at least 67.<sup>201</sup> A score of 67 means a building is 30% more efficient than a standard building.<sup>202</sup> This HERS rating only gives 10 points out of the nineteen possible points.<sup>203</sup> The rest of the nine points come from two categories, Materials and Indoor Air quality (seven points), and Water Efficiency (two points).<sup>204</sup> The two categories have a list of components, such as flooring, fans, toilets, etc., along with criteria that must be met to earn the nine total points.<sup>205</sup> The final option is the perspective based approach, which is very similar to Alabama's QAP approach to sustainable development, where having certain energy efficient products will earn points. The perspective approach uses the same two categories above, Materials and Indoor Air Quality and Water efficiency, and adds energy efficiency.<sup>206</sup> Although this approach is similar to Alabama's approach, Arizona awards more points to more efficient projects or requires more efficient products as the bare minimum. For example, Arizona's QAP has three tiers of energy efficiency for "Thermal Performance" in the roof.<sup>207</sup> The more efficient the roof, the more points are awarded.<sup>208</sup> Another example is the lighting required to meet the minimum in

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<sup>199</sup> *Id.* at 39.

<sup>200</sup> U.S. GREEN BUILDING COUNCIL, *LEED Is Green Building*, USGBC.ORG, <https://new.usgbc.org/leed>.

<sup>201</sup> ARIZ. DEP'T OF HOUSING, *supra* note 198.

<sup>202</sup> RESIDENTIAL ENERGY SERV. NETWORK, *What Is HERS Index?*, <https://www.resnet.us/hers-index>.

<sup>203</sup> ARIZ. DEP'T OF HOUS, *supra* note 198, at 70.

<sup>204</sup> *Id.* at 39.

<sup>205</sup> *See id.* at 38-43.

<sup>206</sup> *Id.* at 39.

<sup>207</sup> *Id.* at 41.

<sup>208</sup> *Id.*

Alabama, is Energy Star Rated lights,<sup>209</sup> but Arizona requires Energy Star advanced lighting.<sup>210</sup>

These three states provide guidance for incorporating green infrastructure into QAPs more broadly. Given the mitigation potential of green infrastructure for communities that are more vulnerable to climate change, which are also the same low-income and minority communities where LIHTC units are more likely to be placed, it is clear that including green infrastructure into QAPs, would provide a valuable solution. Focusing the intervening solution at the state level provides a more direct path to change with less complications. A change of QAP requirements at the federal level would necessitate an amendment to the tax code set forth by Congress. The controversial tax code changes of 2017 illustrate how onerous this process might be.<sup>211</sup> The low number of substantive changes to the tax code in the last few decades suggests that Congress may be reticent to take on such a task<sup>212</sup> as does the federal government's unresponsiveness to climate change mitigation, and, in some instances, refusal to acknowledge its existence. A state solution is much more accessible. Each state revises its QAP, annually.<sup>213</sup> The ability for advocates to suggest changes regarding the criteria for the allocation of tax credits is therefore much easier and the opportunity regularly arises. Allowing states to specify the type of green infrastructure and additional, necessary details would maintain state autonomy

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<sup>209</sup> ALA. HOUSING FIN. AUTHORITY, *supra* note 201.

<sup>210</sup> ARIZ. DEP'T OF HOUSING, *supra* note 198, at 44.

<sup>211</sup> Heather Long, *The Final GOP Tax Bill Is Complete. Here's What's in It.*, WASH. POST (Dec. 15, 2017), <https://www.washingtonpost.com/news/wonk/wp/2017/12/15/the-final-gop-tax-bill-is-complete-heres-what-is-in-it/>.

<sup>212</sup> Lisa Desjardins, *America's Long, Complicated History with Tax Reform*, PBS NEWS HOUR (Sep. 12, 2017), <https://www.pbs.org/newshour/politics/americas-long-complicated-history-tax-reform>.

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