

# William & Mary Environmental Law and Policy Review

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Volume *Volume 45 (2020-2021)*  
Issue 3 *Symposium Issue: Sustainability in the City*

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Article 6

April 2021

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### Repository Citation

Timothy Beatley and JD Brown, *The Half-Earth City*, 45 Wm. & Mary Envtl. L. & Pol'y Rev. 775 (2021), <https://scholarship.law.wm.edu/wmelpr/vol45/iss3/6>

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# THE HALF-EARTH CITY

TIMOTHY BEATLEY\* & JD BROWN\*\*

## I. THE HALF-EARTH CITY

At the intersection of the biophilic city and the global commitment to halt biodiversity declines lies the half-earth city.

E.O. Wilson inspired the global effort to conserve and restore half the Earth, to sustain remaining biodiversity, necessarily focused on areas where the human footprint is small and the conversion of land to anthropogenic land use is less pronounced.<sup>1</sup> However, given the increasing urbanization of the globe, cities must also play a central role in the conservation of global biodiversity. Holistic ecoregional planning must account for the impact of cities and work to ensure that urban areas are built in harmony with a world where nature receives half.<sup>2</sup>

Cities provide both a known challenge, but also lesser understood opportunities. Uncontrolled urban expansion and expanding ecological footprints are a primary driver of habitat loss and species decline.<sup>3</sup> To the extent that these trends can be slowed or even reversed, cities can work to limit damaging impacts *beyond* the borders of cities. With their global economic influence, it is critical for cities to assume a leadership role in the stewardship of global biodiversity by participating in city-to-city diplomacy and supporting global commitments. Cities can contribute significantly to the half-earth vision by pursuing a more sustainable path of consumption, while also committing to a resolve to conserve irreplaceable biodiversity at the global scale.

As growing science and the vision of the biophilic city suggests, cities can also provide for flourishing biodiversity *within* the borders of

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<sup>1</sup> EDWARD O. WILSON, *HALF-EARTH: OUR PLANET'S FIGHT FOR LIFE* (2016).

<sup>2</sup> See generally Paul Downton, *Half-Earth Cities*, *THE NATURE OF CITIES* (Dec. 26, 2017), <https://www.thenatureofcities.com/2017/12/26/half-earth-cities/> [https://perma.cc/FC7F-VPKN].

<sup>3</sup> Ingo Kowarik et al., *Biodiversity Conservation and Sustainable Urban Development*, 12 *SUSTAINABILITY* 4964 at 1–2 (June 18, 2020); see also Nancy B. Grimm et al., *Global Change and the Ecology of Cities*, 319 *SCIENCE* 756, 756 (2008).

the city.<sup>4</sup> Through the conservation of remnant habitat and the nurturing of unique human-influenced habitats found only in cities, new spaces and connections through and across the urban landscape can be forged.

A central tenant of the biophilic cities' vision is the acknowledgment that despite the many challenges presented by increasing urbanization, cities are laboratories for continued experimentation and identification of innovative means to balance an improved quality of life with continued flourishing of human and nonhuman species alike.<sup>5</sup> The benefits derived from the integration of nature across the cities are well documented and manifold. These include: improved health and well-being; increased community resilience in the form of the equitable distribution of critical infrastructure such as tree canopies; multimodal transportation; environmental benefits of enhanced stream health, improved water quality, and reduced flood risk; and the promotion of biodiversity through preserved and enhanced ecosystems and habitats.<sup>6</sup> Thus, biodiversity conservation in the form of abundant and accessible nature is part of a larger biophilic city vision that seeks to reverse the negative trends of urban areas and "create healthy, resilient cities and towns for both people and biodiversity."<sup>7</sup>

Indeed, cities are already at the forefront of biodiversity conservation and the goal of half-earth. The City of Boulder, Colorado, augments its own conservation within the city by building a seamless connection to surrounding national park and federal wilderness areas, and through these collective efforts more than half of the land within surrounding

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<sup>4</sup> See generally ROBERT McDONALD & TIMOTHY BEATLEY, *BIOPHILIC CITIES FOR AN URBAN CENTURY: WHY NATURE IS ESSENTIAL FOR THE SUCCESS OF CITIES* 63–65, 70, 76–77 (2020); see also J.A. Puppim de Oliveira et al., *Cities and Biodiversity: Perspectives and Governance Challenges for Implementing the Convention on Biological Diversity (CBD) at the City Level*, 144 *BIOLOGICAL CONSERVATION* 1302, 1307–12 (2011) (noting opportunities for cities to conserve biodiversity within cities and surrounding regions and by limiting ecological footprints).

<sup>5</sup> TIMOTHY BEATLEY, *BIOPHILIC CITIES* 79–81 (2011); see also Mark J. McDonnell & Ian MacGregor-Fors, *The Ecological Future of Cities*, 352 *SCIENCE* 936, 936 (May 20, 2016) ("[C]ities serve as important living laboratories that present opportunities to test fundamental social and ecological questions, such as the effect of landscape fragmentation on the distribution of organisms, the effect of night lighting on the circadian rhythms of humans and other organisms, and the role of urban green spaces in providing ecosystem services to urban dwellers.").

<sup>6</sup> Harvey Locke, *Nature Needs Half: A Necessary and Hopeful New Agenda For Protected Areas*, 19.2 *PARKS* 13, 19 (2013).

<sup>7</sup> BEATLEY, *supra* note 5, at 45, 50–51; see also Mark J. McDonnell & Amy K. Hahs, *The Future of Urban Biodiversity Research: Moving Beyond the 'Low-Hanging Fruit'*, 16 *URB. ECOSYSTEMS* 397, 398 (2013).

Boulder County is protected.<sup>8</sup> Perhaps even more impressive is the feat of Singapore, a partner city in the Biophilic Cities Network, which has protected more than half of the city through a combination of large-scale, connected reserves and smaller scale neighborhood parks.<sup>9</sup>

This Article examines the law, policy and practices available to cities to nurture the unique biodiversity possible within urban landscapes and to contribute to the larger global effort to regenerate lost migratory pathways and core conservation areas, thereby contributing to the biophilic city and half-earth visions and halting the decline of global biodiversity.

## II. FLOURISHING BIODIVERSITY *WITHIN* THE BORDERS OF THE BIOPHILIC CITY

While the lens of biodiversity conservation is most often focused on the untrammelled expanses of remaining wilderness, there remains significant occurrences of biological richness within the borders of cities. Opportunities exist for cities to conserve and enhance unique ecosystems, to allow for connectivity across the urban landscape and to inspire a connection to the larger living world.

Cities host a high richness of plants and animals, including threatened and endangered species.<sup>10</sup> Given the broad social and economic benefits of biodiversity, it is not surprising that cities are often founded and thrive in biodiverse landscapes with access to plant and animal species not found elsewhere.<sup>11</sup> A study of the distribution of threatened species in Australia concluded that its cities actually supported more threatened species by unit area than nonurban areas; approximately thirty percent of all threatened species in the country.<sup>12</sup> The study surmises that contributing to this result is the common location of cities in biodiverse locations and the fragmentation of habitat and species specialization that occurs in cities.<sup>13</sup> Researchers concluded that the conservation of threatened species *requires* a national conservation policy that recognizes the

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<sup>8</sup> *Wild Boulder*, WILD, <https://www.wild.org/wildboulder/> [<https://perma.cc/FX5P-F5T9>] (last visited Mar. 10, 2021).

<sup>9</sup> NAT'L PARKS BD. (NPARKS), A CELEBRATION OF PARKS, PARKS & LANDSCAPES 54 (2018).

<sup>10</sup> Kowarik et al., *supra* note 3, at 1.

<sup>11</sup> McDonnell & Hahs, *supra* note 7, at 397–98, 405.

<sup>12</sup> Christopher D. Ives et al., *Cities are Hotspots for Threatened Species*, 25 GLOB. ECOLOGY BIOGEOGRAPHY 117, 117 (2016).

<sup>13</sup> *Id.* at 118.

contribution of cities, especially for distinct assemblages of species not found elsewhere.<sup>14</sup>

Through a variety of legal mechanisms and planning policies, cities are establishing conditions within cities that are conducive to flourishing biodiversity conservation.<sup>15</sup> At the outset, this requires taking stock of the quantity and quality of habitat that is currently present and taking steps to ensure that development does not encroach upon or adversely impact high quality habitat where it exists. It also requires the city to adopt policies and incentives to create new expressions of highly functioning, opportunistic habitat with landscapes that bear heavier human footprints.<sup>16</sup> Such expressions include applying a new ecosystem layer upon developed lands, such as green roofs or parklets, or allowing wild nature to regain footing in areas within cities that are underutilized, such as steep slopes.<sup>17</sup> In-between are many opportunities for dispersed nature across the city located on vacant lots and riparian corridors.

#### A. *Informed Biodiversity Planning*

Planning for effective urban biodiversity conservation requires understanding the variances in the abundance and spatial distribution of nature across the city.<sup>18</sup> An accurate assessment of the potential for urban areas to support biodiversity also requires understanding not only the abundance of urban nature but also the quality of the nature in order to predict its potential to sustain biodiversity and other important ecosystem functions.<sup>19</sup> With these baselines in mind, urban plans and policies can effectively plan for future development, while seeking to conserve critical areas for biodiversity.<sup>20</sup>

Biophilic Cities Network partner city, Washington, D.C., has put a focus on data and monitoring into practice and has been recognized for

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<sup>14</sup> *Id.* at 118, 120, 122–24.

<sup>15</sup> THE NATURE CONSERVANCY, *NATURE IN THE URBAN CENTURY* 1, 51–53 (2018) [hereinafter TNC] (identifying that as of the 2018 report at least 123 cities from 31 countries had produced plans or reports specifically focused on city biodiversity planning).

<sup>16</sup> *Id.* at 53, 57.

<sup>17</sup> *Id.* at 7, 57–58.

<sup>18</sup> Darren R. Grafius et al., *Linking Ecosystem Services, Urban Form and Green Space Configuration Using Multivariate Landscape Metric Analysis*, 33 *LANDSCAPE ECOLOGY* 557, 571 (2018).

<sup>19</sup> *Id.* at 557; Nadina Galle, *You Can't Manage What You Can't Measure: How GeoAI Transforms Indonesia's Human-Nature Conflict Zones*, 3 *BIOPHILIC CITIES J.* 46, 47 (2019).

<sup>20</sup> TNC, *supra* note 15, at 51.

its comprehensive planning approach for biodiversity conservation and multifaceted approach that combines a focus on ecosystems services with the conservation of biodiversity.<sup>21</sup> Originally adopted in 2006 and updated in 2015, the D.C. plan is extensive and begins with a baseline presentation of the presence of species and critical habitat.<sup>22</sup> The plan identifies principal threats with a specific emphasis on the impacts of climate change.<sup>23</sup> The city has identified a shift in emphasis from 2006 to 2015 to supporting the city's conservation efforts with baseline data updated by monitoring.<sup>24</sup>

Most efforts to map critical biodiversity areas often occur at the global scale, a scale too broad to understand the opportunities present within the urban landscape and its small-scale substantial variations.<sup>25</sup> This leads to, in part, an undervaluing of cities as potential contributors to global conservation solutions because a bioregional scale view can discount the scale at which biodiversity benefits are offered by cities.<sup>26</sup>

When planning for urban biodiversity long-standing landscape conservation principles still apply and a network of connected large-scale (greater than fifty hectares) patches of habitat remains critical to urban biodiversity.<sup>27</sup> But the fine spatial scales at which urban areas are fragmented and specialized also demonstrate a need to plan across multiple scales.<sup>28</sup> Research supports a more integrated view of urban habitats and disputes a binary, simplistic view of patches of hospitable habitat surrounded by inhospitable landscapes.<sup>29</sup>

Accordingly, biodiversity planning within the city must account for both the larger patches of intact greenspace and their connectivity, and

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<sup>21</sup> Charles H. Nilon et al., *Planning for the Future of Urban Biodiversity: A Global Review of City-Scale Initiatives*, 67 *BIOSCIENCE* 332, 332–33, 338 fig. 2 (2017).

<sup>22</sup> *2015 District of Columbia Wildlife Action Plan*, D.C. DEP'T OF ENERGY & ENV'T, <https://doee.dc.gov/service/2015-district-columbia-wildlife-action-plan> [<https://perma.cc/VMU5-7589>] (last visited Mar. 10, 2021).

<sup>23</sup> DEP'T OF ENERGY & ENV'T FISHERIES & WILDLIFE, D.C. WILDLIFE ACTION PLAN, GOV'T OF D.C. 93–130 (2015).

<sup>24</sup> Jonathan Wilson, *New Wildlife Action Plan Takes Data-Based Approach to Protecting D.C. Ecosystems*, AMU 88.5 (July 24, 2015), [https://wamu.org/story/15/07/24/dc\\_gone\\_wild\\_city\\_develops\\_new\\_mechanism\\_for\\_protecting\\_urban\\_plants\\_and\\_animals](https://wamu.org/story/15/07/24/dc_gone_wild_city_develops_new_mechanism_for_protecting_urban_plants_and_animals) [<https://perma.cc/VHR7-EFGC>].

<sup>25</sup> Nilon et al., *supra* note 21, at 333.

<sup>26</sup> Joscha Beninde et al., *Biodiversity in Cities Needs Space: A Meta-Analysis of Factors Determining Intraurban Biodiversity Variation*, 18 *ECOLOGY LETTERS* 581, 581–82 (2015).

<sup>27</sup> *Id.* at 589.

<sup>28</sup> Briony A. Norton et al., *Urban Biodiversity and Landscape Ecology: Patterns, Processes and Planning*, 1 *CURRENT LANDSCAPE ECOLOGY REP.* 178, 185 (2016).

<sup>29</sup> *Id.* at 181.

also the potential for small scale interventions to assist. The success of this matrix can only be understood with robust data collection and analysis.<sup>30</sup>

One tool that seeks to collectively document this complex matrix is the Singapore Index on Cities' Biodiversity ("Singapore Index").<sup>31</sup> The index, identified as a self-assessment tool for cities to evaluate and monitor the progress of their biodiversity conservation efforts against their own individual baselines, has been applied in a diverse group of global cities.<sup>32</sup> Recently updated, the Singapore Index now includes twenty-eight indicators that measure native biodiversity, ecosystem services provided by biodiversity, and governance and management of biodiversity.<sup>33</sup> The Singapore Index includes a measure of existing biodiversity in terms of species counts, acreage of protected habitat, and connectivity, but also includes measures that look beyond the hard science of species numbers and habitat acreage to the extremely relevant larger question of coexistence between humans and nonhumans in the urban landscape.<sup>34</sup> Such indicators examine a broad application of the ecosystem services that nature in the city can provide, such as a contribution to health and well-being in the form of proximity and accessibility of parks, and the inclusion of awareness of urban nature in school curriculums or public outreach, which are all relevant to the biophilic cities vision.<sup>35</sup>

In Los Angeles, the city has customized the application of the Singapore Index to include additional considerations of specific value to the city.<sup>36</sup> Specifically, the city found that the incorporation of environmental justice and equity considerations, including access to nature and biodiversity, cultural sensitivities and values of biodiversity, and potential disproportionate impacts or benefits of urban ecosystem services, should be monitored more directly by modifying existing indicators or establishing new indicators.<sup>37</sup>

Lisbon, Portugal, has also applied the Singapore Index as a driver of the city's target to increase urban biodiversity within the city by 20% by

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<sup>30</sup> See, e.g., TNC *supra* note 15, at 17 (there are a variety of existing tools to assist in the collection of biodiversity data).

<sup>31</sup> L. CHAN ET AL., NPARKS, USER'S MANUAL SINGAPORE INDEX CITIES' BIODIVERSITY 5 (2014).

<sup>32</sup> *Singapore Index on Cities' Biodiversity*, NPARKS, <https://www.nparks.gov.sg/biodiversity/urban-biodiversity/the-singapore-index-on-cities-biodiversity> [<https://perma.cc/2WMZ-64L9>] (last visited Mar. 10, 2021).

<sup>33</sup> *Id.*

<sup>34</sup> See CHAN ET AL., *supra* note 31, at iii.

<sup>35</sup> See *id.* at 17, 23; BEATLEY, *supra* note 5, at 46–50.

<sup>36</sup> CITY OF L.A., 2018 BIODIVERSITY REPORT 70 (2018).

<sup>37</sup> See *id.*

2020.<sup>38</sup> In 2018, the city adopted a Local Action Plan for Biodiversity that adapts the Singapore Index, the parameters of which it seeks to quantify as a central guiding framework for biodiversity protection within the city.<sup>39</sup>

Another emphasis on data gathering is to require a wildlife impact assessment for new city projects or for new private developments, akin to the reporting requirements imposed by the National Environmental Protection Act.<sup>40</sup> As mentioned above, within Boulder County, half of lands are protected for conservation.<sup>41</sup> As a means to ensure protection of biodiversity, the County requires proposals for new development to include a wildlife impact report.<sup>42</sup> These reports require a documentation of the baseline presence of species and habitat and an identification for mitigation of potential impacts to wildlife from the new development.<sup>43</sup>

### *B. Protecting Remnant and Existing Intact Habitat Areas*

Global cities are utilizing a variety of legal and policy mechanisms to conserve and even regenerate highly valued habitat within the borders of cities, including natural remnant forests, wetlands and grasslands.<sup>44</sup> A primary emphasis, within and beyond cities, is the protection of large, intact, high-quality habitat.<sup>45</sup> This is the basis for the half-earth vision, that strategic conservation of land (and water) can prevent mass extinctions of species at risk.<sup>46</sup> In fact, related to cities, because of the spatial concentration of city's biodiversity impacts, a targeted increase in land protection could prevent extinctions of the majority of species at risk

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<sup>38</sup> See C. SOUTO CRUZ ET AL., COMMC'N & INFO. RES. CTR. FOR ADMIN., BUS. & CITIZENS (CIRCABC), EUROPEAN UNION, A STRATEGY FOR BIODIVERSITY, THE LISBON CASE 1–2 (2013).

<sup>39</sup> See MONITORING REPORT OF THE LOCAL ACTION PLAN FOR BIODIVERSITY OF LISBON, LISBON CITY COUNCIL (2018), [https://www.lisboa.pt/fileadmin/cidade\\_temas/ambiente/biodiversidade/documentos/Relatorio\\_Monitorizacao\\_Biodiversidade.pdf](https://www.lisboa.pt/fileadmin/cidade_temas/ambiente/biodiversidade/documentos/Relatorio_Monitorizacao_Biodiversidade.pdf) [<https://perma.cc/S4MU-4EDN>] (presented in Portuguese).

<sup>40</sup> See *National Environmental Policy Act Review Process*, EPA, <https://www.epa.gov/nepa/national-environmental-policy-act-review-process> [<https://perma.cc/9JKB-JGLF>] (last visited Mar. 10, 2021).

<sup>41</sup> See WILD, *supra* note 8.

<sup>42</sup> BOULDER CNTY., COLO., LAND USE CODE art. 7, § 7-1700 (2015).

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

<sup>44</sup> See Kowarik et al., *supra* note 3, at 2.

<sup>45</sup> See *Preserve Habitats*, EVERYTHING CONNECTS, <https://www.everythingconnects.org/serve-habitats.html> [<https://perma.cc/WBH6-BJ4V>] (last visited Mar. 10, 2021).

<sup>46</sup> See *Half-Earth Project*, EO BIODIVERSITY WILSON FOUND., <https://eowilsonfoundation.org/half-earth-project/> [<https://perma.cc/2AAR-8NPX>] (last visited Mar. 10, 2021).

from urban growth.<sup>47</sup> Targeted conservation of intact areas can halt the expedited decline of urban species and protect endemic populations found only in cities.<sup>48</sup> Accordingly, large-scale land protection (at a scale appropriate for cities) remains the most direct mechanism for protecting critical habitat.<sup>49</sup>

This strategy is incorporated into multiple levels of legal structure, from international agreements to city law and policy, and reflects that biodiversity conservation measures at the most local levels are part and parcel of a larger global effort.<sup>50</sup> At the international level, the parties to the Convention on Biological Diversity (“CBD”) established the Aichi Biodiversity Targets in 2010.<sup>51</sup> At that time, parties to the convention agreed to land protection targets that included protecting 17% of terrestrial land and inland water areas by 2020 (Aichi Biodiversity Target 11).<sup>52</sup> As of 2015, approximately 15% of global land is protected.<sup>53</sup> Subsequent research has identified that the Aichi target is likely insufficient to prevent catastrophic losses and instead proposed the half-earth goal of 50% as a scientifically supported alternative threshold necessary to halt the decline of biodiversity.<sup>54</sup> A post-2020 framework for implementing the CBD will be developed when the parties to the convention next meet in May 2021, and it will be interesting to see if international consensus can be moved towards the half-earth threshold.<sup>55</sup>

The CBD defines “protected area” as “a geographically defined area which is designated or regulated and managed to achieve specific

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<sup>47</sup> See R.I. McDonald et al., *Conservation Priorities to Protect Vertebrate Endemics from Global Urban Expansion*, 224 *BIOLOGICAL CONSERVATION* 290, 296–97 (2018).

<sup>48</sup> See Myla F.J. Aronson et al., *A Global Analysis of the Impacts of Urbanization on Bird and Plant Diversity Reveals Key Anthropogenic Drivers*, *PROC. ROYAL SOC'Y B: BIOLOGICAL SCI.* 281, 282 (2014).

<sup>49</sup> See TNC, *supra* note 15, at 56.

<sup>50</sup> See Kowarik et al., *supra* note 3, at 2.

<sup>51</sup> See *Strategic Plan for Biodiversity 2011–2020, Including Aichi Biodiversity Targets*, CONVENTION ON BIOLOGICAL DIVERSITY (Jan. 21, 2020), <https://www.cbd.int/sp/> [<https://perma.cc/QD9W-S5NN>].

<sup>52</sup> *Aichi Biodiversity Targets*, CONVENTION ON BIOLOGICAL DIVERSITY, <https://www.cbd.int/sp/targets/> [<https://perma.cc/K8C7-77XE>] (last visited Mar. 10, 2021).

<sup>53</sup> See *Mapping the World's Special Places*, U.N. ENV'T PROGRAMME WORLD CONSERVATION MONITORING CTR., <https://www.unep-wcmc.org/featured-projects/mapping-the-worlds-special-places> [<https://perma.cc/5Q5M-H4Y3>] (last visited Mar. 10, 2021).

<sup>54</sup> See Reed Noss et al., *Bolder Thinking for Conservation*, *CONSERVATION BIOLOGY* 1, 1–2 (2012).

<sup>55</sup> *Calendar of SCBD Meetings*, CONVENTION ON BIOLOGICAL DIVERSITY (Feb. 8, 2021), <https://www.cbd.int/meetings/> [<https://perma.cc/4MJP-MWPT>].

conservation objectives.”<sup>56</sup> Finding that this definition “does not provide specific guidance about the range of protected area types that could be adapted to different situations,” half-earth researcher Harvey Locke proposed the adoption of the more specific International Union for Conservation of Nature (“IUCN”) formulated definition that identifies protected areas as: “A specifically delineated area designated and managed to achieve the conservation of nature and the maintenance of associated ecosystem services and cultural values through legal or other effective means.”<sup>57</sup> Applying this definition in the context of cities means adjusting zoning and transportation decisions to reduce development pressure on known critical habitat within the city.<sup>58</sup> Within cities, it means recognizing the presence and abundance of habitat and associated species and decisively, proactively planning to preserve such areas as an element of an integrated network of nature across the city.<sup>59</sup> Beyond cities, it means “decoupling” urbanization from growing resource consumption and planning for the efficient use of lands to reduce loss of habitat.<sup>60</sup>

### C. *Human-Nature Ecosystems*

Cities provide unique ecological landscapes for biodiversity to take hold in habitat only found in human-built environments. Planning for urban biodiversity is a combination of preserving intact protected areas, and increasing the presence of urban nature through innovative mechanisms.<sup>61</sup> While these features may not harbor the same degree of biodiversity as intact habitat, they can play a critical role for urban biodiversity in the form of living architecture, native species abundance, and resilience adapted infrastructure.<sup>62</sup>

Biodiversity is often subsumed within larger city policies and plans that more generally focus on broader goals.<sup>63</sup> For example, biodiversity

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<sup>56</sup> *Text of the Convention*, CONVENTION ON BIOLOGICAL DIVERSITY (May 13, 2016), <https://www.cbd.int/convention/text/> [<https://perma.cc/BJ95-FQXX>].

<sup>57</sup> See Locke, *supra* note 6.

<sup>58</sup> See TNC, *supra* note 15, at 56.

<sup>59</sup> See *id.* at 51.

<sup>60</sup> U.N. ENV'T PROGRAMME, DECOUPLING RESOURCE USE AND ENVIRONMENTAL IMPACTS FROM ECONOMIC GROWTH 44 (2011).

<sup>61</sup> *Perspectives: Nature in the Urban Century*, THE NATURE CONSERVANCY (Nov. 13, 2018), <https://www.nature.org/en-us/what-we-do/our-insights/perspectives/nature-in-the-urban-century/> [<https://perma.cc/G22E-4BFU>].

<sup>62</sup> See generally Jose G. Vargas-Hernandez & Justyna Zdunek-Wielgolaska, *Urban Green Infrastructure as a Tool for Controlling the Resilience of Urban Sprawl*, ENV'T, DEV., & SUSTAINABILITY 1, 12 (2020).

<sup>63</sup> See Norton et al., *supra* note 28, at 184.

conservation is often part and parcel of city plans for green infrastructure.<sup>64</sup> City plans often combine a focus on preserving large intact natural areas in combination with newly designed infrastructure that seeks to provide ecosystem services that include stormwater management, carbon sequestration and urban heat island reduction.<sup>65</sup> Such plans utilize a diversity of habitat types that can improve biodiversity within the city.<sup>66</sup>

Planning for biodiversity within the city, as an aspect of green infrastructure, must set forth goals that can apply to the scale of fragmentation and variation in urban nature.<sup>67</sup> This requires a recognition that not all urban greenspace provides the same level of biodiversity value. If cities are to value the conservation of biodiversity, green infrastructure efforts must elevate the consideration of biodiversity as part of larger planning efforts.

This includes developing the research to understand the biodiversity value provided by new forms of urban nature, such as green roofs.<sup>68</sup> This research should answer several fundamental questions regarding the capacity of urban areas to support biodiversity to aid planners and legislators in developing appropriate policy schemes.<sup>69</sup>

### 1. Living Infrastructure

Increasingly, cities are using new development standards as a means to influence the presence of nature on private lands.<sup>70</sup> Recognizing that such infrastructure can provide multiple ecosystem services, cities are requiring a consideration and inclusion of native species to promote increased biodiversity.

Washington, D.C. has adopted a Green Area Ratio (“GAR”), which is a minimum green infrastructure and design standard for new development.<sup>71</sup> The GAR is a comparative weighing of nature-based landscape features with the aim of increasing the quantity and quality of the urban

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<sup>64</sup> See Nilon et al., *supra* note 21, at 332.

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

<sup>66</sup> *Id.* (identifying as one component the biodiversity benefits of microhabitats of private gardens).

<sup>67</sup> See Norton et al., *supra* note 28, at 184; see also C.A. Lepczyk et al., *Biodiversity in the City: Fundamental Question for Understanding the Ecology of Urban Green Spaces for Biodiversity Conservation*, *BIOSCIENCE* 799, 802 (2017).

<sup>68</sup> Lepczyk et al., *supra* note 67, at 801 (setting forth five primary questions for urban ecology focus).

<sup>69</sup> See *id.* at 802–04.

<sup>70</sup> Sristi Kamal et al., *Conservation on Private Land: A Review of Global Strategies with a Proposed Classification System*, 58 *J. ENV'T PLAN. & MGMT.* 576, 576–77 (2015).

<sup>71</sup> *Green Area Ratio Overview*, D.C. DEP'T OF ENERGY & ENV'T, <https://doee.dc.gov/service/green-area-ratio-overview> [<https://perma.cc/Y9JV-L7WU>] (last visited Mar. 10, 2021).

landscape’s “environmental performance.”<sup>72</sup> D.C.’s guidance for the GAR promotes the use of native species; for example, in street level storm-water projects, like bioretention and constructed wetlands.<sup>73</sup> The city has developed demonstration sites that promote native vegetation for these project types.<sup>74</sup> The similar use of native plants for green roofs is more challenging given the need to emphasize particularly hardy species that can tolerate more intense rooftop conditions.<sup>75</sup> However, the recommended plant lists for green roofs also include plant species that are native to the region and the United States, such as various species of wild stonecrop from the succulent *Sedum* family.<sup>76</sup>

Singapore has created a Skyrise Greenery Incentive that seeks to replace nature lost on the ground from new development with green roofs and walls.<sup>77</sup> Through the incentive the city will fund up to fifty percent of installation costs of green rooftops and vertical greenery.<sup>78</sup> Through this program, the city also looks to add another layer of space for recreation and gathering.<sup>79</sup> This incentive program is administered by the National Parks Board of Singapore (“NParks”), which manages the city’s extensive, connected system of parks and nature reserves.<sup>80</sup> A priority for NParks is facilitating the conservation and use of native plant species throughout the city.<sup>81</sup> In part to accomplish this, NParks both manages a native plant nursery in the heart of the city’s botanic gardens and has cultivated extensive gardens at HortPark to demonstrate how native species can be incorporated into the urban landscape.<sup>82</sup>

The City of Toronto has adopted—and continues to evolve—detailed Green Standards that guide new sustainable development within the city.<sup>83</sup> The standards regulate many different aspects of building and

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<sup>72</sup> *GAR Design Development and Submittal*, D.C. DEP’T OF ENERGY & ENV’T, <https://doee.dc.gov/node/619592> [<https://perma.cc/8WTU-FXSB>] (last visited Mar. 10, 2021).

<sup>73</sup> GREEN AREA RATIO GUIDEBOOK, D.C. DEP’T OF ENERGY & ENV’T 43, 48 (2017).

<sup>74</sup> STORMWATER MANAGEMENT GUIDEBOOK, CTR. FOR WATERSHED PROTECTION 73 (2020).

<sup>75</sup> *Id.* at 33.

<sup>76</sup> *Id.*

<sup>77</sup> *Skyrise Greenery Incentive Scheme 2.0*, NPARKS, <https://www.nparks.gov.sg/skyrise-greenery/incentive-scheme> [<https://perma.cc/8V6G-KX7F>] (last visited Mar. 10, 2021).

<sup>78</sup> *Id.*

<sup>79</sup> Amy Kolczak, *This City Aims to Be the World’s Greenest*, NAT’L GEOGRAPHIC, <https://www.nationalgeographic.com/environment/urban-expeditions/green-buildings/green-urban-landscape-cities-Singapore/> [<https://perma.cc/3K89-PHCK>] (last visited Mar. 10, 2021).

<sup>80</sup> See NPARKS, *supra* note 77.

<sup>81</sup> *Id.*

<sup>82</sup> See *HortPark*, NPARKS, <https://www.nparks.gov.sg/gardens-parks-and-nature/parks-and-nature-reserves/hortpark> [<https://perma.cc/DG4X-KCRX>] (last visited Mar. 10, 2021).

<sup>83</sup> *Toronto Green Standard: Overview*, CITY OF TORONTO, <https://www.toronto.ca/city-gov>

landscape design to improve the level of ecosystem services provided by new development, including standards that “[p]rotect and enhance ecological functions, integrate landscapes and habitats and decrease building-related bird collisions and mortalities.”<sup>84</sup> The standards consist of four tiers of requirements, with Tier 1 being mandatory, while higher tiers are voluntary tiers that seek to raise the bar and are supported by city financial incentives in the form of development fee refunds.<sup>85</sup>

Provisions to support the use of native species are included throughout the Toronto Green Standards.<sup>86</sup> Slight variations in the standards are provided for low-rise versus high-rise buildings, as well as for government owned properties, but all include specific provisions for native biodiversity enhancement. For example, the “Biodiversity in Landscapes” element of the low-rise standards includes Tier One requirements such as a minimum of 50% native plant species for landscaped areas and a prohibition against the use of invasive species.<sup>87</sup> Tier Two standards aim higher with standards that include restoration or protection of a minimum of 30% (including the building footprint) of all portions of the site identified as previously disturbed, with native vegetation that includes at least two native flowering species that bloom at all periods over the growing season, and the provision of a minimum of 50% of available roof space as a biodiverse green roof.<sup>88</sup>

## 2. Resilient, Climate Change Adapted Infrastructure

A related and often connected goal to greater biophilia is increased resilience through nature-based infrastructure. Cities are at the forefront of innovative planning for resilience in the face of climate adaptation, in part, because cities represent unique and disturbed assemblages of natural landscapes.<sup>89</sup>

Moreover, the cultivated permanence of urban landscapes provides a potential habitat for species not able to adapt to changing climatic

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ernment/planning-development/official-plan-guidelines/toronto-green-standard/toronto-green-standard-overview/ [https://perma.cc/U8SC-8AWU] (last visited Mar. 10, 2021).

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

<sup>85</sup> *Id.*

<sup>86</sup> See generally TORONTO GREEN STANDARD, CITY OF TORONTO (2018).

<sup>87</sup> *Ecology for Low-Rise Residential Development*, CITY OF TORONTO, <https://www.toronto.ca/city-government/planning-development/official-plan-guidelines/toronto-green-standard/toronto-green-standard-version-3/low-rise-residential-version-3/ecology-for-low-rise-residential-development/> [https://perma.cc/7GXL-SWAD] (last visited Mar. 10, 2021).

<sup>88</sup> *Id.*

<sup>89</sup> Nilon et al., *supra* note 21, at 332–33.

conditions found outside cities. Many of the resilience standards adopted by cities recognize that native species have proven over time to be the most hardy and efficient for local environmental conditions.<sup>90</sup> Accordingly, cities include, as an aspect of resilience standards, a requirement or preference for use of native species for reasons apart, or in addition to, the value that these species provide for the overall biodiversity of the city.<sup>91</sup>

The City of Tucson, Arizona, has adopted a Native Plant Preservation Ordinance, which protects native vegetation in upland areas.<sup>92</sup> The city adopted the ordinance with the following intent:

Tucson's setting is in the Sonoran Desert, a unique biological community known as the Arizona Uplands found only in southern Arizona and limited areas of northern Mexico. Some of the plants and animals living in this area are found nowhere else in the world. One of the most distinctive plants is the Saguaro cactus (*Carnegiea gigantea*), a visual symbol synonymous with Tucson and the Sonoran Desert. The Saguaro, along with certain other Sonoran genus and species, is extremely slow growing and not easily transplanted with success. . . .

Development in the Tucson area has decreased the number of these unique native plants resulting in the loss of a natural resource. . . . In conjunction with development, [sic] buffelgrass invasion is spreading along roadways, [sic] wash systems and into the undisturbed Sonoran Desert. Buffelgrass (*Pennisetum ciliare*) is converting a fire-resistant desert to flammable grassland. . . . Buffelgrass is a wildfire risk to desert ecosystems threatening life, property, tourism and the regional economy. Buffelgrass, as it burns, can kill the Saguaro cactus, other native vegetation and is detrimental to desert wildlife species, including the desert tortoise and mule deer. . . .

This section is intended to encourage preservation-in-place of healthy native plants through sensitive site design that

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<sup>90</sup> *Why Native Plants Matter*, NAT'L AUDUBON SOC'Y, <https://www.audubon.org/content/why-native-plants-matter> [<https://perma.cc/BH3L-6JVW>] (last visited Mar. 10, 2021).

<sup>91</sup> NORFOLK, VA, ZONING ORDINANCE, art. 5.12 (2020).

<sup>92</sup> TUCSON, ARIZ. UNIFIED DEV. CODE § 7.7.1 (2020).

minimizes the disruption of areas within the site containing native plants, while allowing for salvage and transplanting plants on the site that are likely to survive.<sup>93</sup>

Also notable and worth setting forth here, the ordinance identifies the variety of purposes that are served by the preservation of native species:

These standards provide for the preservation, protection, transplanting, and replacement of existing designated native plants including cacti, succulents, trees, and shrubs through the establishment of comprehensive procedures, requirements, and standards that protect the public health, safety, and general welfare by:

- A. Preserving a sense of place through the potential enhancement of the community's appearance from public streets and between incompatible land uses; [sic]
- B. Maintaining property values, the quality of life, and lifestyles valued and enjoyed by the community through the preservation of the unique Sonoran vegetation;
- C. Contributing to economic development through the maintenance of a regional identity that attracts tourism and new businesses, while promoting business retention and expansion;
- D. Improving air quality through the preservation of mature vegetation that removes carbon monoxide and filters dust and particulates from the air;
- E. Promoting water conservation through retention of existing drought-tolerant vegetation that requires no supplemental irrigation;
- F. Assisting in climate modification and reducing energy costs through the use of native vegetation to shade buildings, streets, sidewalks, [sic] and other outdoor areas;

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

- G. Retaining vegetative features of habitats that are important to native wildlife species; and,
- H. Stabilizing desert soils by minimizing soil erosion through preservation of or revegetation with native plants.<sup>94</sup>

The first step set forth by the ordinance is for all covered projects to submit a Native Plant Preservation Plan that will identify native plants to protect and invasive plants to eradicate, and set forth a plan, pursuant to proscribed methodology, for how both will be accomplished.<sup>95</sup> To accomplish the intent and purpose of the ordinance, the city has sought to put in place a no-net-loss safety net for native vegetation by encouraging new development to plant native vegetation—and to ensure that if native vegetation is disturbed that mitigation will revegetate at a compensatory ratio and maintain a species composition similar to undisturbed sites.<sup>96</sup>

In Norfolk, Virginia, in recognition of its status as one of the most highly threatened cities in the United States from rising sea levels from a combination of global sea level rise and local land subsidence, the city has adopted several legal provisions to guide city planning into the next century.<sup>97</sup> For example, in 2018, the city adopted a Resilience Quotient to incentivize the incorporation of nature-based infrastructure and biophilic elements like green roofs into new developments to meet adaptation requirements.<sup>98</sup> In adopting the Quotient, the city stated a commitment “to being the coastal community of the future, with the capacity to endure and quickly recover from climatic and environmental shocks and stresses and bounce back quickly and stronger.”<sup>99</sup>

Satisfaction of the Quotient is an alternative means by which applicable development can forego site development review related to resilience if the projects incorporate resilient features.<sup>100</sup> The Quotient provides credit for the conservation of native plant species.<sup>101</sup> For example, to aid in stormwater management (where one to two points total is required), the Quotient provides the following point credits related to native species:

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<sup>94</sup> *Id.* § 7.7.2.

<sup>95</sup> *Id.* § 7.7.4(A).

<sup>96</sup> *Id.* § 7.7.1(D).

<sup>97</sup> NORFOLK, VA, ZONING ORDINANCE, art. 5.12 (2020).

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

<sup>99</sup> *Id.* art. 5.12.1.

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

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

- 0.75 points for retention of “at least 20 percent of existing pre-development natural, non-exotic vegetation”;
- 0.25 points “[f]or new tree plantings, enhance tree pits with specially engineered soils and native plants to absorb and filter runoff”; and
- 0.10 points per tree for the onsite preservation of non-exotic, large trees.<sup>102</sup>

### 3. Biophilic Cities as Pathways

Cities can be understood to act as pathways that can help to bridge the expanse of human density by creating ecological corridors that connect intact green cores across urban landscapes. Cities are developing and nurturing an ecological network approach to nature in the city with the growing understanding that robust networks provide biodiversity and more human focused benefits alike.

Several partner cities in the Biophilic Cities Network provide examples of cities prioritizing ecological connectivity as a primary element of city design going forward.<sup>103</sup> In Edmonton, Canada, the city identified habitat loss and fragmentation as the single largest threat to biodiversity conservation in the city.<sup>104</sup> In response, the city created Wildlife Passage Engineering Design Guidelines to encourage the development of wildlife passages at many critical fragmentation points within the city.<sup>105</sup> The guidelines target locations that have been impacted by development and offer ecologically sensitive planning approaches to enhance biodiversity in the region.<sup>106</sup> The primary value in creating the guidelines was to create an understanding in both the parlance of planners and engineers about what the city sought from new development projects in regard to creating ecological connectivity.<sup>107</sup> Over the first few years of the project, twenty-seven wildlife passage structures had been

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<sup>102</sup> *Id.* art. 5.12.6–5.12.7 (providing similar credits to promote native species for both residential and non-residential projects).

<sup>103</sup> *Cities in the Network-Biophilic Cities*, BIOPHILIC CITIES, <https://www.biophiliccities.org/partner-cities> [<https://perma.cc/9WBV-RL7K>] (last visited Mar. 10, 2021).

<sup>104</sup> CITY OF EDMONTON, BIODIVERSITY REPORT 1, 18 (2008).

<sup>105</sup> CITY OF EDMONTON, WILDLIFE PASSAGE ENGINEERING GUIDELINES, 1-1 (2010).

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

<sup>107</sup> *See generally* Elise Stolte, *Moose Underpass and Wildlife Bridges Win Kudos for Edmonton*, EDMONTON J. (June 6, 2015) <https://edmontonjournal.com/news/local-news/moose-underpass-and-wildlife-bridges-win-kudos-for-edmonton#:~:text=A%20new%2030%2Dmetre%20bridge,natural%20areas%20in%20the%20city> [<https://perma.cc/5QYS-B7JJ>].

designed and constructed, resulting in a fifty-one percent reduction in wildlife collisions.<sup>108</sup>

Curridabat, Costa Rica, has developed a comprehensive plan to conceptualize the city as Ciudad Dulce (“Sweet City”).<sup>109</sup> Recognizing that the city had limited economic resources but is rich in natural resources, the city has built an economic plan with pollinators as “efficient agents of prosperity.”<sup>110</sup> Based on a foundation of ecological connectivity for native pollinator species, Sweet City aims to improve the quality of life for its residents.<sup>111</sup> Specifically related to biodiversity conservation, the plan indicates:

Biodiversity is the foundation from which all aspects of development arise. The main objective of the Sweet City model is to reintroduce biodiversity into the urban space, which basically means ‘to bring the park back into the neighborhood, to bring the river back into the city’. Cities, and the quality of life of their inhabitants, depend upon the plethora of ecosystem services that urban nature provides . . . . Including all organisms in the development vision of an urban environment, from trees to pollinators to seed dispersers to soil microorganisms, is key to the growth and betterment of a city.<sup>112</sup>

The efforts of the city have garnered international accolades as a model for deriving social and economic benefits from sound ecological planning.<sup>113</sup>

Cities have also taken steps to minimize the impacts of the building environment on migratory species.<sup>114</sup> For example, cities such as

<sup>108</sup> CITY OF EDMONTON, *Designing for Wildlife Passage in an Increasingly Fragmented World*, EMERALD FOUND. (2015), [https://emerald.foundation.ca/aef\\_awards/designing-for-wildlife-passage-in-an-increasingly-fragmented-world/](https://emerald.foundation.ca/aef_awards/designing-for-wildlife-passage-in-an-increasingly-fragmented-world/) [https://perma.cc/E24U-WNSX].

<sup>109</sup> CIUDAD DULCE: CURRIDABAT, CURRIDABAT: SWEET CITY, A CITY MODELLING APPROACH BASED POLLINATION 2 (2019), [https://static1.squarespace.com/static/5bbd32d6e66669016a6af7e2/t/5c757759e2c4835d3cbc174f/1551202139913/Curridabat\\_Sweet\\_City\\_Magazine.pdf](https://static1.squarespace.com/static/5bbd32d6e66669016a6af7e2/t/5c757759e2c4835d3cbc174f/1551202139913/Curridabat_Sweet_City_Magazine.pdf) [https://perma.cc/UY5B-73PC].

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

<sup>111</sup> *Id.* at 13.

<sup>112</sup> *Id.* at 8.

<sup>113</sup> Patrick Greenfield, ‘Sweet City’: The Costa Rica Suburb that Gave Citizenship to Bees, Plants and Trees, GUARDIAN (Apr. 29, 2020), <https://www.theguardian.com/environment/2020/apr/29/sweet-city-the-costa-rica-suburb-that-gave-citizenship-to-bees-plants-and-trees-aoe> [https://perma.cc/2KM8-SJ9G].

<sup>114</sup> CITY OF TORONTO: GREEN DEV. STANDARD, BIRD-FRIENDLY DEVELOPMENT GUIDELINES 30 (2007).

Toronto and San Francisco have adopted mandatory design standards to ensure that new development is “bird-friendly.”<sup>115</sup> In Toronto, the same Green Standards that set forth requirements for native plant species also set forth standards to minimize the potential for new construction to attract bird species and cause fatal bird collisions.<sup>116</sup> In San Francisco, the city first adopted requirements in 2011 that seek to reduce glazed surfaces on buildings without some modification, such as fritted glass, to make the surfaces visible to birds.<sup>117</sup> These regulatory provisions reflect a broader effort by cities to reduce urban threats to birds, as well as to positively enhance bird habitats in the form of large scale natural areas like wetlands and small scale interventions like green rooftops.<sup>118</sup>

#### D. *Biophilic Cities as Inspiration*

Cities can be understood to act as sources of inspiration that connect urban populations to the wonders of nature and inspire them to understand and act to protect the importance of conserving biodiversity before it is lost. Part of the promise of biophilic cities is the opportunity to connect a large number of people within a relatively small area to nature, and to inspire a conservation ethic through engagement with and education about nature as a part of daily life.<sup>119</sup> In point of fact, research has identified that urban biodiversity plans elevate community engagement as an important component that exceeds the traditional planning emphasis on engagement.<sup>120</sup> Such engagement includes education about the presence and value of nature in cities and programs for citizen science to aid in the hands-on collection of critical biodiversity data.

An increased connection with nature inspires support and action for biodiversity conservation.<sup>121</sup> Exposure to nature during childhood

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<sup>115</sup> *Id.*; S.F. PLAN. DEP'T, STANDARDS FOR BIRD-SAFE BUILDINGS 3 (2011).

<sup>116</sup> CITY OF TORONTO: GREEN DEV. STANDARD, *supra* note 114, at 4–6.

<sup>117</sup> S.F. PLAN. DEP'T, *supra* note 115, at 3; *see also* Tegan Jarchow, *Bird-Friendly Window and Lighting Standards*, SUSTAINABLE DEV. CODE, <https://sustainablecitycode.org/brief/bird-friendly-window-and-lighting-standards/> [<https://perma.cc/HBT2-LKU3>] (last visited Mar. 10, 2021).

<sup>118</sup> TIMOTHY BEATLEY, *THE BIRD-FRIENDLY CITY: CREATING SAFE URBAN HABITATS* 134–35 (2020).

<sup>119</sup> BEATLEY, *supra* note 5, at 64–65; *see also* McDonnell & MacGregor-Fors, *supra* note 5, at 937.

<sup>120</sup> Nilon et al., *supra* note 21, at 335, 338.

<sup>121</sup> CHERYL CHARLES, ROSALIE S. CHAPPLE, & KAREN KEENLEYSIDE, CHILDREN & NATURE NETWORK, *HOME TO US ALL: HOW CONNECTING WITH NATURE HELPS US CARE FOR OURSELVES AND THE EARTH* 6 (2018).

correlates with a greater tendency to develop a conservation ethic as an adult.<sup>122</sup> Studies support the oft stated belief that people will value and care for that which they know and understand.<sup>123</sup> Emotional connections to nature can be leverage as support for global conservation.<sup>124</sup> In this respect, cities provide a tremendous opportunity to influence how people and communities experience and understand biodiversity through urban planning and policy.<sup>125</sup>

One way that cities can inspire and influence the conservation of nature is through the designation of legal rights to natural systems, something cities have started to support and encourage. The Lake Erie Bill of Rights (or “LEBOR”) is the best recent example and provides some clues about the important role that cities can play in the global Rights of Nature movement.<sup>126</sup> In February 2019, the citizens of the City of Toledo (on the banks of Lake Erie) passed by sixty-one percent an initiative to provide heightened protection for the lake.<sup>127</sup> The initiative was born from years of frustration around the limited protections provided for the lake from pollution resulting from excessive agricultural runoff.<sup>128</sup> More specifically the LEBOR establishes legal recognition for Lake Erie in its own right: “Lake Erie, and the Lake Erie watershed, possess the right to exist, flourish, and naturally evolve. The Lake Erie Ecosystem shall include all natural water features, communities of organisms, soil as well as terrestrial and aquatic sub ecosystems that are part of Lake Erie and its watershed.”<sup>129</sup>

LEBOR is perhaps the first rights of nature example explicitly involving a city and its urban residents.<sup>130</sup> There is considerable potential for other efforts by biophilic (and biocentric) minded cities to help in the assignment of rights for many other larger ecosystems. Cities can create

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<sup>122</sup> *Id.* at 21.

<sup>123</sup> See generally Kai M. A. Chan et al., *Why Protect Nature? Rethinking values and the environment*, 113 *PROCS. NAT'L ACAD. SCIS. U.S.* 1462, 1463 (2016).

<sup>124</sup> See Christopher D. Ives et al., *Reconnecting with Nature for Sustainability*, 13 *SUSTAINABILITY SCI.* 1389, 1391 (Feb. 28, 2018).

<sup>125</sup> Nilon et al., *supra* note 21, at 332.

<sup>126</sup> CITY OF TOLEDO, LAKE ERIE BILL OF RIGHTS 1 (2019).

<sup>127</sup> LUCAS CTY. BD. OF ELECTIONS, CERTIFICATION OF OFFICIAL RESULTS OF THE FEB. 26, 2019 SPECIAL ELECTION 1–2 (Feb. 26, 2019), <https://co.lucas.oh.us/DocumentCenter/View/73444/Official-Results-and-signature-form-2-26-19> [<https://perma.cc/Y5FV-NYY5>].

<sup>128</sup> CITY OF TOLEDO, *supra* note 126, at 1.

<sup>129</sup> *Id.* at 2.

<sup>130</sup> Stephanie Vermillion, *Ohio Residents Fight to Give Lake Erie Legal Rights*, HOWSTUFF WORKS (Apr. 7, 2020), <https://science.howstuffworks.com/environmental/conservation/issues/nature-legal-rights.htm> [<https://perma.cc/U34U-DBT3>].

the mechanisms and processes through which these rights of nature are exercised and can serve a guardian role, instituting legal action on behalf of the Lake Erie Ecosystem. It is interesting that the effort to assign legal rights was spearheaded by residents of a city, largely to protect and defend an ecosystem from threats outside the city's own boundaries (namely agricultural pollutants).

To be sure, there will be obstacles to this pathway, legal and psychological. A year later a federal court declared that LEBOR is unconstitutional, a significant setback; yet there remains momentum in the United States and beyond in the direction of assigning legal protections and personhood to larger ecosystems.<sup>131</sup>

### III. HOW BIOPHILIC CITIES CAN PROTECT NATURE BEYOND THEIR BORDERS

As we have set forth, there are many ways that even dense, compact cities can set aside a minimum of half their area for nature.<sup>132</sup> Biophilic cities are places of abundant and, ideally, immersive nature. Nature in the biophilic city is a seamless, ecological system, where rooftops and other spaces become meaningful habitat and spaces for nature.

Still, the total land area of urban areas globally is estimated at around three percent.<sup>133</sup> Even if cities are able to reach high targets in terms of the percentage of land area and aggregate amount of nature protected and regenerated, the total extent of this nature will be relatively small compared to the size of the planet overall and would contribute only modestly to the global half-earth vision.<sup>134</sup>

The economic impact and global influence of cities is, however, far greater than the land area they comprise.<sup>135</sup> Here, an important planning

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<sup>131</sup> Peggy Kirk Hall & Ellen Essman, *Case Watch: The Lake Erie Bill of Rights Battle Ends*, OHIO AG L. BLOG (Mar. 6, 2020), <https://farmoffice.osu.edu/blog/fri-03062020-1252pm/case-watch-lake-erie-bill-rights-battle-ends> [<https://perma.cc/5BL7-U6F8>].

<sup>132</sup> See WILD, *supra* note 8; NPARKS, *supra* note 9.

<sup>133</sup> See Michael Schirber, *Cities Cover More of Earth than Realized*, LIVESCIENCE (Mar. 11, 2005), <https://www.livescience.com/6893-cities-cover-earth-realized.html> [<https://perma.cc/9A3M-L8WH>].

<sup>134</sup> See generally Paul Downton, *Half-Earth Cities*, THE NATURE OF CITIES (Dec. 26, 2017), <https://www.thenatureofcities.com/2017/12/26/half-earth-cities/> [<https://perma.cc/FC7F-VPKN>].

<sup>135</sup> See *Urban World: Mapping the Economic Power of Cities*, MCKINSEY GLOB. INST. (Mar. 2011), [https://www.mckinsey.com/~media/McKinsey/Featured%20Insights/Urbanization/Urban%20world/MGI\\_urban\\_world\\_mapping\\_economic\\_power\\_of\\_cities\\_full\\_report.pdf](https://www.mckinsey.com/~media/McKinsey/Featured%20Insights/Urbanization/Urban%20world/MGI_urban_world_mapping_economic_power_of_cities_full_report.pdf) [<https://perma.cc/9MNZ-F8EC>].

distinction is between the urban footprint of a city (the land area needed to accommodate the physical form of buildings, streets, parks), and the ecological footprint of a city, which represents the accumulated global land area needed to sustain the human production and consumption occurring in the city, or in response to the demands of urban residents.<sup>136</sup> Unlike the urban footprint, the ecological footprint of a city is indeed quite large.<sup>137</sup>

There currently exist a number of ways that cities today can influence conservation beyond their borders or boundaries. We will provide some current examples of what is possible, but then we will go on to describe some future mechanisms whereby cities can become even more important actors on the global conservation scene.

We believe the potential force and impact of cities in supporting the half-earth goal can occur in ways that extend beyond the singular tool of establishing protected areas. Rather, we know that simply setting out boundaries and establishing protected areas does not ensure their effective management and protection. In this way, we can identify several broad categories of city support: (1) establishment—and political support for establishment—of protected areas; (2) support for effective implementation and management of protected areas; (3) actions and policies that seek to reduce impacts on global biodiversity and ecological systems more generally, including those fully or partially included in protected areas.

Below are some of the more specific actions, programs, policies and initiatives cities can undertake to positively influence extra-local global conservation generally and protected areas specifically.

#### A. *City Diplomacy: Exerting the Political and Diplomatic Power of Cities in the World*

In a recent article published by the *World Economic Forum*, Robert Muggah declares, “Look to Cities, Not Nation-States, to Solve Our Biggest Problems.”<sup>138</sup> As this headline suggests, there is a growing recognition that cities can and must be more active on the global scene; larger cities are especially able to wield impressive economic and political power.<sup>139</sup>

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<sup>136</sup> See *Ecological Footprint*, GLOB. FOOTPRINT NETWORK, <https://www.footprintnetwork.org/our-work/ecological-footprint/> [https://perma.cc/3482-7YFK] (last visited Mar. 10, 2021).

<sup>137</sup> See *World Data*, GLOB. FOOTPRINT NETWORK, [https://data.footprintnetwork.org/?\\_ga=2.128749196.144426105.1610637847-1317663527.1610637847#/](https://data.footprintnetwork.org/?_ga=2.128749196.144426105.1610637847-1317663527.1610637847#/) [https://perma.cc/JQP9-AVPH] (last visited Mar. 10, 2021).

<sup>138</sup> Robert Muggah, *Look to Cities, Not Nation-States, to Solve Our Biggest Challenges*, WORLD ECON. F. (Jan. 23, 2020), <https://www.weforum.org/agenda/2020/01/cities-mayors-not-nation-states-challenges-climate/> [https://perma.cc/37ZY-HSUD].

<sup>139</sup> See *id.*

Cities concentrate the majority of foreign direct investment and are the drivers of innovation and productivity. As a result, cities are rivalling nation-states—in terms of their economic clout, diplomatic influence and international connectivity. Nation-states are not about to go away, but they are giving way to alternative networks and distributed forms of power.<sup>140</sup>

The economic clout of cities on the global scene is undeniable, with the GDP of the metro area of New York City reaching \$1.53 trillion in 2018 (pre-pandemic), for example.<sup>141</sup> Larger cities especially are more active in international affairs in recent years and better positioned to influence and even undertake conservation projects and activities that may be physically distant. According to Acuto et al.:

City diplomacy is the conduct of external relations undertaken by official representatives of cities with other actors, particularly other cities, nation-states, NGOs, and corporations. Today, city diplomacy has become more than a symbolic relationship or cultural exchange, and cities are increasingly recognized in their potential to shape international processes and global agendas.<sup>142</sup>

Often referred to now as “city diplomacy,” larger cities including New York and Los Angeles have established administrative units to address foreign policy.<sup>143</sup> Acuto et al., in their sampling of twenty-seven global cities, found that most had a dedicated budget for diplomacy, a dedicated international office, and a “dedicated senior figure in charge of city diplomacy,” often with the title “chief advisor on international matters.”<sup>144</sup> Acuto et al. lay out some “sample responsibilities” for the position of “City Director of Global Affairs.”<sup>145</sup>

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

<sup>141</sup> Erin Duffin, *GDP of the New York Metro Area from 2001 to 2019*, STATISTA (Dec. 9, 2020), <https://www.statista.com/statistics/183815/gdp-of-the-new-york-metro-area/> [<https://perma.cc/9C2S-E7AT>].

<sup>142</sup> MICHELE ACUTO ET AL., TOWARD CITY DIPLOMACY: ASSESSING CAPACITY IN SELECT GLOBAL CITIES, CHI. COUNCIL ON GLOB. AFF. (July 7, 2018).

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

<sup>144</sup> *Wetland City Accreditation*, RAMSAR, <https://www.ramsar.org/activity/wetland-city-accreditation> [<https://perma.cc/FY7U-QXPH>] (last visited Mar. 10, 2021).

<sup>145</sup> ACUTO ET AL., *supra* note 142, at 6.

The growing diplomatic role for cities could influence global conservation in several ways. Cities might be parties to international agreements, such as the Ramsar Convention,<sup>146</sup> which cities are already implementing.<sup>147</sup> They might also develop positions about and actively advocate on behalf of proposed protected areas and global conservation initiatives more generally.<sup>148</sup> There are many examples of diplomatic and political steps cities can take to make a difference. A recent example is the Trump Administration's efforts to remove protections for the Northeast Canyons and Seamounts, the only national marine monument on the U.S. East Coast.<sup>149</sup> This monument is home to remarkable marine biodiversity but is located at quite a distance beyond and away from major U.S. population centers (approximately 130 miles seaward of Cape Cod<sup>150</sup>) and is not widely known or fully appreciated. The lack of a political constituency may be a factor in why it has been vulnerable to loss of protection. Diplomatic and political action by cities such as Boston or New York might be especially impactful in opposing the removal of protections, and other cities will have similar opportunities to defend as well as support the expansion of terrestrial and marine protected areas.<sup>151</sup>

How else could cities leverage their increasing economic power and political influence on behalf of global nature? In the sections to follow, we identify a few specific ways cities could begin to implement or support a half-earth vision beyond their borders.

### 1. City-to-City Networks and Beyond

Cities can join with other cities to maximize their influence and coordinate their global investments in conservation and advocacy. It is

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<sup>146</sup> Ramsar Convention on Wetlands of International Importance Especially as Waterfowl Habitat.

<sup>147</sup> *Ramsar Wetland City Accreditation*, ICLEI CITIES BIODIVERSITY CTR., <https://cbc.iclei.org/icleis-role-in-the-ramsar-wetland-city-accreditation/> [<https://perma.cc/KSJ9-X7SE>] (last visited Mar. 10, 2021).

<sup>148</sup> See generally ACUTO ET AL., *supra* note 142.

<sup>149</sup> See Press Release, Nat'l Parks Conservation Ass'n, Trump Calls to Illegally Remove Protections for Marine National Monument (June 5, 2020), <https://www.npca.org/articles/2559-trump-calls-to-illegally-remove-protections-for-marine-national-monument> [<https://perma.cc/K9CN-AG4N>].

<sup>150</sup> *Northeast Canyons and Seamounts Marine National Monument*, NOAA FISHERIES, <https://www.fisheries.noaa.gov/new-england-mid-atlantic/habitat-conservation/northeast-canyons-and-seamounts-marine-national> [<https://perma.cc/THC5-S4KP>] (last visited Mar. 10, 2021).

<sup>151</sup> See Lauren Wenzel et al., *Marine Protected Areas 2020: Building Effective Conservation Networks*, NAT'L MARINE PROTECTED AREAS CTR. (May 2020), <https://nmsmarineprotectedareas.blob.core.windows.net/marineprotectedareas-prod/media/docs/2020-mpa-building-effective-conservation-networks.pdf> [<https://perma.cc/SL4M-XTC5>].

now estimated that there are at least 200 city-to-city networks, a remarkable increase since the 1980s.<sup>152</sup> Among some of the more notable are: C40, The U.S. Conference of Mayors, ICLEI (the Global Network for Local Governments for Sustainability), The Global Covenant of Mayors, and the Global Resilient Cities Network.<sup>153</sup>

Our own global Biophilic Cities Network is growing in size and import and shows the value and potential impact of such peer-to-peer city networks. Currently twenty-four cities are “partner cities,” and have agreed to work towards the aspiration of creating nature-conserving and nature-immersive cities.<sup>154</sup>

## 2. Intercity Cooperative Agreements and Treaties

City-to-city treaties are unusual given that the exercise of the treaty power is vested in the national government. But with the growing political and economic influence of cities globally, it makes sense that cities will begin to explore agreements and even treaties.

In the United States, one interesting long-standing conservation program is the U.S. Fish and Wildlife Service’s Urban Bird Treaty program.<sup>155</sup> Begun more than twenty years ago, there are now thirty U.S. cities participating.<sup>156</sup> While not technically a treaty, cities agree to develop and implement a set of bird conservation actions, including habitat restoration and protection efforts, supported by a small federal grant program.<sup>157</sup> Cities are also officially designated as “Urban Bird Treaty Cities.”<sup>158</sup>

Perhaps it is time for cities to truly engage in direct diplomacy with other cities to mutually protect habitat for birds and other biodiversity. There are, of course, many examples of migratory birds that travel long

<sup>152</sup> See Anthony Pipa & Max Bouchet, *How to Make the Most of City Diplomacy in the COVID-19 Era*, BROOKINGS (Aug. 6, 2020), <https://www.brookings.edu/blog/up-front/2020/08/06/how-to-make-the-most-of-city-diplomacy-in-the-covid-19-era/> [https://perma.cc/Q964-ACX4].

<sup>153</sup> See *Mayors, City Networks and Urban Stakeholders Worldwide Call for an IPCC Special Report on Cities and Climate Change*, C40 BLOG (Apr. 7, 2016), [https://www.c40.org/blog\\_posts/mayors-city-networks-and-urban-stakeholders-worldwide-call-for-an-ipcc-special-report-on-cities-and-climate-change](https://www.c40.org/blog_posts/mayors-city-networks-and-urban-stakeholders-worldwide-call-for-an-ipcc-special-report-on-cities-and-climate-change) [https://perma.cc/Z4JU-Y3SU].

<sup>154</sup> *Partner Cities*, BIOPHILIC CITIES, <https://www.biophiliccities.org/partner-cities> [https://perma.cc/YY8G-LV8P] (last visited Mar. 10, 2021).

<sup>155</sup> See *Urban Bird Treaty*, USFWS, <https://www.fws.gov/birds/grants/urban-bird-treaty.php> [https://perma.cc/6FGL-RSPA] (last visited Mar. 10, 2021).

<sup>156</sup> *Id.*

<sup>157</sup> See *Urban Bird Treaty Program Guidebook V.3*, USFWS (Jan. 2020), <https://www.fws.gov/migratorybirds/pdf/grants/UrbanBirdTreatyV3.pdf> [https://perma.cc/H6QD-YVM5].

<sup>158</sup> USFWS, *supra* note 155.

distances, pass through multiple cities, and rely on habitats that, depending on the season and time of year, are far-flung and distant. Together, signatory cities could magnify and maximize the habitat protected and restored for such species.<sup>159</sup> Similar logic would extend to migratory marine species, for instance Humpback Whales,<sup>160</sup> that spend time in multiple cities. City-to-city conservation treaties or agreements could be used as a vehicle for protecting habitat and conservation lands beyond any single city's borders, which is essential for the protection and thriving of a species that spend some time in each city.

### 3. City Climate Action Plans

Many cities have now developed and are implementing climate action plans that seek to both reduce greenhouse gas emissions and adapt to changing climate. The greenhouse gas emissions targets are often quite ambitious and reflect a strong sense of the ethical importance of taking steps to address a global problem and challenge.

Pittsburgh, for example, had adopted a Climate Action Plan with the ambitious target of reducing greenhouse gas emissions by half (50%) by 2030, and using 100% renewable energy to power all city's facilities.<sup>161</sup> It lays out in considerable detail the ways the city will reach these goals, for instance by setting modal targets and investing in non-auto mobility such as walking and bicycling.<sup>162</sup> The plan also identifies the target of increasing carbon sequestration 100% by 2030.<sup>163</sup>

Pittsburgh and Western Pennsylvania have been in the midst of significant internal conflict over the future of the region and the extent to which the economy needs to be weaned from fossil fuel dependence.<sup>164</sup>

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<sup>159</sup> USFWS, *supra* note 157.

<sup>160</sup> Eastern U.S. populations of Humpback Whales travel some 3000 miles, spending some winter months at Silver Bank off the coast of the Dominican Republic. An example of an especially important area to protect—as a calving ground—an area (which already is protected area) of essential habitat to a species that multiple cities (and the residents who live in these cities) count as their own. Joining together to ensure that such areas are protected could be the focus on joint-city actions or treaties. *Humpback Whale Migrations*, STELLWAGEN BANK NAT'L MARINE SANCTUARY (Jan. 2011), [https://nmsstellwagen.blob.core.windows.net/stellwagen-prod/media/archive/sister/pdfs/sbnms\\_fs\\_mig\\_2011\\_1.pdf](https://nmsstellwagen.blob.core.windows.net/stellwagen-prod/media/archive/sister/pdfs/sbnms_fs_mig_2011_1.pdf) [<https://perma.cc/85PF-GHUD>].

<sup>161</sup> *Climate Action Plan*, CITY OF PITTSBURGH, [https://apps.pittsburghpa.gov/redtail/images/7101\\_Pittsburgh\\_Climate\\_Action\\_Plan\\_3.0.pdf](https://apps.pittsburghpa.gov/redtail/images/7101_Pittsburgh_Climate_Action_Plan_3.0.pdf) [<https://perma.cc/3X43-XYJE>] (last visited Mar. 10, 2021).

<sup>162</sup> *Id.* at 41.

<sup>163</sup> *Id.* at 71.

<sup>164</sup> Tracy Certo, "Toppose any additional petrochemical companies . . ." *Here's what Mayor*

City leaders such as Mayor Bill Peduto (consistent with the City's Climate Action Plan) see a much different future, one based more on an economy based around new technologies and education.<sup>165</sup> In contrast, there has been support outside the city for the new so-called "cracker plants" that utilize natural gas to create plastics, and that represent an economy different from steel and coal, but just as fossil-fuel oriented.<sup>166</sup>

The Pittsburgh plan even addresses the climate implications of food.<sup>167</sup> "Encourage Plant-Rich Diets" reads one of the headings of the Plan.<sup>168</sup> There is a growing recognition that a city's diet significantly affects its climate emissions, as indicated by the "Good Food Cities Declaration," signed by 14 cities in 2019.<sup>169</sup> Through the declaration, the cities commit to transitioning to a "Planetary Health Diet," better for the health of both humans and planet<sup>170</sup>:

As mayors of some of the world's largest cities, we recognize the power of food policy to reduce GHG emissions and deliver on the 1.5°C ambition of the Paris Agreement. . . . The planetary health diet has the potential to dramatically reduce emissions and provide a balanced, nutritional diet for 10 billion people while saving 11 million lives every year. . . . supporting an overall increase of healthy plant-based food consumption in our cities by shifting away from unsustainable, unhealthy diets.<sup>171</sup>

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*Peduto said at the Climate Action Summit*, NEXT PITTSBURGH (Oct. 31, 2019), <https://nextpittsburgh.com/features/i-oppose-any-additional-petrochemical-companies-heres-what-mayor-peduto-said-at-the-climate-action-summit/> [<https://perma.cc/2DSR-9U4N>].

<sup>165</sup> See *Pittsburgh Mayor Bill Peduto: "Your Future Does Not Have to be Your Past"*, CLIMATE REALITY PROJECT (Sept. 5, 2017), <https://climaterealityproject.org/blog/pittsburgh-mayor-bill-peduto-your-future-does-not-have-be-your-past> [<https://perma.cc/7HHM-8JSB>]; Brent Heard, *Peduto Visits Campus, Talks About the Future of Pittsburgh*, THE TARTAN (Mar. 1, 2015), <https://thetartan.org/2015/3/1/news/peduto> [<https://perma.cc/D9FU-KYFJ>].

<sup>166</sup> See Michael Corkery, *A Giant Factory Rises to Make a Product Filling Up the World: Plastic*, N.Y. TIMES (Aug. 12, 2019), <https://www.nytimes.com/2019/08/12/business/energy-environment/plastics-shell-pennsylvania-plant.html> [<https://perma.cc/9UGZ-P7ZD>].

<sup>167</sup> CITY OF PITTSBURGH, *supra* note 161, at 62.

<sup>168</sup> *Id.* at 66.

<sup>169</sup> *Good Food Cities: Achieving a Planetary Health Diet for All*, C40 CITIES, <https://www.c40.org/other/good-food-cities> [<https://perma.cc/HG9Y-9VYR>] (last visited Mar. 10, 2021).

<sup>170</sup> *Good Food Cities Declaration*, C40 CITIES, [https://c40-production-images.s3.amazonaws.com/other\\_uploads/images/2405\\_C40\\_Good\\_Food\\_Cities\\_Declaration\\_EN\\_Final\\_-\\_CLEAN\\_original.pdf?1570711845](https://c40-production-images.s3.amazonaws.com/other_uploads/images/2405_C40_Good_Food_Cities_Declaration_EN_Final_-_CLEAN_original.pdf?1570711845) [<https://perma.cc/R2ZD-Z2XF>] (last visited Mar. 10, 2021).

<sup>171</sup> *Id.*

Less consumption of meat will in turn mean fewer pressures to convert tropical rain forests and other global habitats to farming and ranching.

Other kinds of city plans also commonly contain such global-oriented targets and goals. Washington, D.C.'s *Sustainability Plan*, for example, sets a similar goal of 50% reduction in greenhouse gas emissions by 2032, and the goal of 50% of the city's energy provided from renewable sources.<sup>172</sup> It also contains goals about its food system, including the goal of sourcing at least 25% of its food from within a 100 mile radius.<sup>173</sup>

#### 4. Ecological Sister Cities

Many cities in the United States have developed sister city relationships with other cities around the world. Many of these relationships have occurred through the auspices of the organization Sister Cities International ("SSI"), the largest of these sister city organizations, with more than 500 active cities in 138 countries.<sup>174</sup>

The usual sister city model is one of mutually learning about the people, culture and cuisine of participating cities.<sup>175</sup> There is also usually an exchange element as delegations visit and are hosted by sister cities.<sup>176</sup> Rarely are activities focused on environmental or ecological issues, but they could be. And sister city relationships could take the form of more focused mutual work around conservation and protection.

One idea would be to transform the usual sister city impulse to learn about other cities and regions into something new and different that could help to advance the vision of half-earth. An ecological sister city could take several forms. One would be to develop a relationship between two or more cities with a focus on a nearby (or equal-distanced) ecosystem, and steps and actions these cities could embark upon together to protect and restore this ecosystem.<sup>177</sup> A more radical version would be for a city

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<sup>172</sup> *Sustainable DC 20 Plan*, SUSTAINABLE DC 43, 76, [https://sustainable.dc.gov/sites/default/files/dc/sites/sustainable/page\\_content/attachments/SDC%20Final%20Plan.pdf](https://sustainable.dc.gov/sites/default/files/dc/sites/sustainable/page_content/attachments/SDC%20Final%20Plan.pdf) [<https://perma.cc/25JB-ZSVE>] (last visited Mar. 10, 2021).

<sup>173</sup> *Id.* at 90.

<sup>174</sup> *What's Unique About Sister City International*, SISTER CITIES INT'L, <https://sistercities.org/wp-content/uploads/2019/11/What's-Unique-About-SCI.pdf> [<https://perma.cc/8A6Y-888Q>] (last visited Mar. 10, 2021).

<sup>175</sup> *Id.*; see *Exchanges*, SISTER CITIES INT'L, <https://sistercities.org/what-we-do/exchanges/> [<https://perma.cc/4J7M-DMNV>] (last visited Mar. 10, 2021).

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

<sup>177</sup> *San Antonio and Darmstadt—Looking to the Future With Optimism*, SISTER CITIES INT'L, <https://sistercities.org/2020/12/04/san-antonio-and-darmstadt-looking-to-the-future>

to adopt an ecosystem or ecoregion as its equivalent of a sister city.<sup>178</sup> Charlotte, North Carolina could, instead of adopting Manaus, Brazil, as a sister city, adopt Amazonia, or a portion of the Brazilian Amazon. Similar ideas have been proposed for ocean cities: adopting an ocean region or specific oceanic habitat to learn about and actively work to protect.<sup>179</sup>

## 5. Intercity Mutual Aid

Cities regularly enter into a variety of mutual aid agreements, typically to share police, fire and emergency response capabilities during times and events when local capacity is exceeded.<sup>180</sup> Typically these mutual aid agreements are with other local jurisdictions in the same state or metropolitan region.<sup>181</sup>

Might it be possible for cities to enter into such agreements with more distant cities, where the assistance offered might allow the sending of personnel and equipment to say battle a wildfire event or assist in an ecological restoration work on a scale beyond local capacity?

### B. *How and What Cities Buy and Consume*

There a variety of methods by which cities might adopt policies to direct sustainable procurement and consumption in the city.

#### 1. Municipal Procurement

Local governments can also make a significant impact by shifting their own purchases and many have now adopted green procurement policies. For example, the City of Seattle's Sustainable Purchasing Policy

-with-optimism/ [https://perma.cc/UR92-U9U9] (last visited Mar. 10, 2021); see *Wunderbar Together: The Impact and Potential of U.S.-German Sister City Collaboration in Climate Resilience*, SISTER CITIES INT'L, <https://sistercities.org/posts/us-german-city-climate-resilience> [https://perma.cc/CEA9-EK4Y] (last visited Mar. 10, 2021).

<sup>178</sup> U.S. FOREST SERV., CLASSIFICATION OF AMERICAN CITIES BY ECOREGION, <https://www.fs.fed.us/rm/ecoregions/docs/papers-presentations/city-classification.pdf> [https://perma.cc/29JZ-U4MD] (last visited Mar. 10, 2021).

<sup>179</sup> See TIMOTHY BEATLEY, *BLUE URBANISM: CONNECTING CITIES AND OCEANS* (2014) [hereinafter BEATLEY, *BLUE URBANISM*].

<sup>180</sup> *Using Mutual Aid Contracts in Times of Emergency*, LEAGUE OF MINN. CITIES (June 1, 2020), <https://www.lmc.org/news-publications/news/all/mutual-aid-contracts/#.~:text=https://perma.cc/7YA8-RLLB>.

<sup>181</sup> DHS, LESSONS LEARNED INFO., MUTUAL AID AGREEMENTS: TYPES OF AGREEMENTS, <https://www.hsdl.org/?view&did=765527> [https://perma.cc/GV4W-KBPM].

states that the city “recognizes that the products and services the City buys have inherent social, human, health, environmental and economic impacts and that the City should make procurement decisions that embody, promote and encourage the City’s commitment to sustainability.”<sup>182</sup> The policy indicates that environmental impacts to be considered in making procurement decisions include “impacts on biodiversity.”<sup>183</sup>

Many such procurement policies seem to emphasize purchase of products that avoid chemical pesticides and other pollutants, reduce greenhouse gas emissions, and emphasize products that include high amounts of recyclables.<sup>184</sup> There seems to be less of an emphasis on the protection of habitat and the conservation of biodiversity.<sup>185</sup>

One exception is New York City’s policy against the purchase of tropical hardwoods.<sup>186</sup> Historically, the city has purchased such hardwoods especially for maritime and bridge uses (the Brooklyn Bridge is one example), yet the sourcing of this timber is increasingly understood to have negative effects on the biodiversity and ecosystem functions of Amazonia.<sup>187</sup>

The Good Food Cities Declaration mentioned above, signed by fourteen cities, prominently mentions food procurement.<sup>188</sup> The Declaration states: “Where our city governments directly purchase food that is served in schools, hospitals and other public institutions we will ensure those meals are healthy and sustainable and ideally sourced from organic agriculture.”<sup>189</sup>

Another creative idea connected to reforming the ways cities consume is to appreciate the role that global nature and biodiversity have played in how products are marketed and sold. Often endangered animals are featured in advertisements and product labels, from Australian koalas

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<sup>182</sup> CITY OF SEATTLE, CITY OF SEATTLE SUSTAINABLE PURCHASING POLICY, [https://www.seattle.gov/Documents/Departments/FAS/PurchasingAndContracting/Purchasing/green\\_SustainablePurchasingPolicy.pdf](https://www.seattle.gov/Documents/Departments/FAS/PurchasingAndContracting/Purchasing/green_SustainablePurchasingPolicy.pdf) [<https://perma.cc/B3B9-A2TN>] (last updated Aug. 11, 2008).

<sup>183</sup> *Id.* at 3.

<sup>184</sup> URBAN SUSTAINABILITY DIRECTORS NETWORK, THE BUCK STARTS HERE SUSTAINABLE PROCUREMENT PLAYBOOK FOR CITIES, 42, 69, 72, [http://responsiblepurchasing.org/purchasing\\_guides/playbook\\_for\\_cities/rpn\\_usdn\\_playbook\\_for\\_cities.pdf](http://responsiblepurchasing.org/purchasing_guides/playbook_for_cities/rpn_usdn_playbook_for_cities.pdf) [<https://perma.cc/4NZJ-SCKZ>] (last visited Mar. 10, 2021).

<sup>185</sup> *Id.* at 1–5.

<sup>186</sup> *New York City Ends Use of Amazon Rainforest Hardwoods in Parks*, MONGABAY (Jan. 8, 2008), <https://news.mongabay.com/2008/01/new-york-city-ends-use-of-amazon-rainforest-hardwoods-in-parks/#:~:text=representatives%20of%20environmental%20groups%20Rainforest,in%20the%20thousands%20of%20parks> [<https://perma.cc/GY8R-WBYY>].

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

<sup>188</sup> *Good Food Cities Declaration*, *supra* note 170.

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

to African elephants to many species of birds.<sup>190</sup> Yet, they do not directly benefit from the sale of these many products. This is a result that the Lion's Share Fund seeks to change.<sup>191</sup> Co-established in 2018 by U.N. Development Programme, the Lion's Share Fund provides an avenue for companies to contribute a small portion of their advertising campaign budgets (0.5%) to the fund to be used to support conservation projects.<sup>192</sup> Already, funds have been used productively for global nature:

The Fund has helped the Niassa National Reserve in Mozambique to eliminate elephant poaching, by improving critical radio systems for law enforcement officers protecting wildlife. It has also co-financed the purchase of land for critically endangered orangutans, elephants and tigers in North Sumatra, Indonesia, and is expanding its work, creating an all-female team of forest rangers and the island's first rhino sanctuary.<sup>193</sup>

## 2. Conservation-Oriented Urban Consumption

Many ideas and initiatives aim to harness the power of the free market to support conservation practices in distant locales. There are now a number of highly successful sustainable resource certification systems that rely on third-party verification, and consumer labeling of sustainable products. These include notably the Forest Stewardship Council ("FSC")<sup>194</sup> certification of sustainably managed forests, and the Marine Stewardship Council ("MSC")<sup>195</sup> certification of sustainably managed

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<sup>190</sup> *At Cannes, The Lion's Share Fund issues audacious challenge to give your #LionForLions*, THE LION'S SHARE FUND (June 16, 2019), <https://www.thelionssharefund.com/content/thelionssharefund/en/home/news/at-cannes-the-lions-share-fund-issues-lionforlions-challenge/> [<https://perma.cc/F2E9-FBFY>].

<sup>191</sup> *See THE LION'S SHARE FUND*, <https://www.thelionssharefund.com/content/thelionssharefund/en/home/> [<https://perma.cc/U9N2-P2UF>] (last visited Mar. 10, 2021).

<sup>192</sup> *Frequently Asked Questions*, THE LION'S SHARE FUND, <https://www.thelionssharefund.com/content/thelionssharefund/en/home/faq.html> [<https://perma.cc/FR8U-5LD5>] (last visited Mar. 10, 2021).

<sup>193</sup> *ICC Joins The Lion's Share Fund to Harness Private Sector Leadership to Protect Wildlife Habitats*, THE LION'S SHARE FUND, <https://www.thelionssharefund.com/content/thelionssharefund/en/home/news/ICC-joins-The-Lions-Share-Fund.html> [<https://perma.cc/6QRR-NNL7>] (last visited Mar. 10, 2021).

<sup>194</sup> *See FOREST STEWARDSHIP COUNCIL*, <https://fsc.org/en/facts-figures> [<https://perma.cc/QDM2-T9F9>] (last visited Mar. 10, 2021).

<sup>195</sup> *What is the MSC*, MARINE STEWARDSHIP COUNCIL, <https://www.msc.org/en-us/about-the-msc/what-is-the-msc> [<https://perma.cc/J6S3-Q8V3>] (last visited Mar. 10, 2021).

fisheries. Once certified, products (e.g., furniture made from wood, seafood, etc.) carry a logo that provides consumers the assurance that their purchases do in fact support sustainable management.<sup>196</sup>

Certification standards such as FSC or MSC are not without controversy and critique. These certification systems account (still) for a relatively small share of the total urban consumption of goods. Only about fifteen percent of the global wild catch comes from MSC-certified fisheries.<sup>197</sup> FSC has certified global forests of more than 221 million hectares in over eighty countries, but critics have questioned its stringency and enforcement, suggesting a flawed process that may serve to greenwash deforestation.<sup>198</sup> Despite the concerns FSC does seem to be an effective program in many parts of the world, for instance, as a force for conservation of Canadian Boreal forest.<sup>199</sup>

These are examples (imperfect as they are) of how urban citizens can adjust or modify or curtail their in-city consumption of goods connected with habitat destruction that is distant or far away. The local food movement, with its emphasis on support of local and regional producers, the reduction of “food miles” and the carbon and energy footprint of food, is also motivated by a concern for uncontrolled conversion of tropical rainforests to farming and ranching.<sup>200</sup> The ideas of “slow wood” and “slow furniture” have a similar focus on reducing the sourcing of more anonymous wood and timber resulting in destruction of distant ecosystems.<sup>201</sup>

Yet another important sector involving expenditures and consumption of urban residents, with often undesired global effects, is travel. The extent of global travel and tourism during the pandemic has diminished substantially, but is likely to rebound. Ecotourism has been a promising way to steer and guide this travel in support of global conservation, but

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<sup>196</sup> *What Does the Blue MSC Label Mean?*, MARINE STEWARDSHIP COUNCIL, <https://www.msc.org/what-we-are-doing/our-approach/what-does-the-blue-msc-label-mean> [https://perma.cc/L28T-S945].

<sup>197</sup> Marine Stewardship Council Annual Report 2019–2020 (2020), <https://www.msc.org/docs/default-source/default-document-library/about-the-msc/msc-annual-report-2019-2020.pdf> [https://perma.cc/Q4WT-6V7Y].

<sup>198</sup> See Richard Conniff, *Greenwashed Timber: How Sustainable Forest Certification Has Failed*, YALE ENV'T 360 (2018), <https://e360.yale.edu/features/greenwashed-timber-how-sustainable-forest-certification-has-failed> [https://perma.cc/95WW-8GET].

<sup>199</sup> Yale School of the Env't, Global Forest Atlas, Forest Certification in the Boreal, Table 1, <https://globalforestatlas.yale.edu/boreal-forest/conservation-initiatives/forest-certification-boreal> [https://perma.cc/2942-ZY6Q].

<sup>200</sup> See generally Daniel Philippon, *How Local is Slow Food?*, RCC PERSPECTIVES (2015), 7–12.

<sup>201</sup> *A Growing Movement: Community Forests*, JEFFERSON LAND TRUST (Aug. 31, 2017), <https://saveland.org/a-growing-movement-community-forests/> [https://perma.cc/R8ZM-CX6G].

there are growing calls for even bolder models.<sup>202</sup> “Regenerative travel” is the latest new terminology and vision for the travel sector that charts a path for travel and tourism to be less environmentally destructive and more energy efficient.<sup>203</sup> Several prominent nonprofits and a number of travel groups have embraced the concept, publishing case studies of emerging examples of regenerative travel and setting principles for guiding travel and tourism in the future.<sup>204</sup> Air travel is especially impactful in terms of greenhouse gas emissions, and here cities and the urban travel sector can help drive innovation and change.<sup>205</sup> United Airlines, for instance, announced in December of 2020 its intention to become the first carbon-neutral airline by 2050 through the further development of sustainable aircraft fuel and the bolder step of funding and underwriting direct air capture plants that will take carbon out of the atmosphere.<sup>206</sup>

### 3. Globally Responsible Cities

There are now a number of initiatives that involve cities demonstrating commitments to global conservation and taking specific actions to reduce impacts on biodiversity and global ecosystems. These usually involve limited performance requirements and are often initiated by a nongovernmental organization located within a city, for instance, a zoo or natural history museum.

It is now possible for a city to become a Sustainable Palm Oil City, for instance, and the City of Chester, United Kingdom, became the first in the world.<sup>207</sup> An initiative spearheaded by the Chester Zoo, it involves a commitment from a number of local organizations to purchase or stock

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<sup>202</sup> Elaine Glusac, *Move Over, Sustainable Travel. Regenerative Travel Has Arrived*, N.Y. TIMES (Aug. 27, 2020), <https://www.nytimes.com/2020/08/27/travel/travel-future-corona-virus-sustainable.html> [https://perma.cc/4DRC-5YDY].

<sup>203</sup> *Id.*

<sup>204</sup> *Regenerative Travel Principles for Hospitality*, REGENERATIVE TRAVEL, [https://www.regenerativetravel.com/?gclid=CjwKCAiA\\_eb-BRB2EiwAGBnXXrqH2KUjwTMBwksaOCBNtUrCw0qKAlYf84jroX1Peq-d99UIdAPfHxoCIWwQAvD\\_BwE](https://www.regenerativetravel.com/?gclid=CjwKCAiA_eb-BRB2EiwAGBnXXrqH2KUjwTMBwksaOCBNtUrCw0qKAlYf84jroX1Peq-d99UIdAPfHxoCIWwQAvD_BwE) [https://perma.cc/Y7EV-2T5S] (last visited Mar. 10, 2021).

<sup>205</sup> *United Makes Bold Environmental Commitment Unmatched by Any Airline; Pledges 100% Green by Reducing Greenhouse Gas Emissions 100% by 2050*, HUB UNITED (Dec. 10, 2020), <https://hub.united.com/united-pledges-100-green-2050-2649438060.html> [https://perma.cc/77GD-F5FP].

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

<sup>207</sup> *Chester Named World's First Sustainable Palm Oil City*, SUSTAIN (2019), [https://www.sustainweb.org/news/mar19\\_chester\\_named\\_first\\_sustainable\\_palm\\_oil\\_city/](https://www.sustainweb.org/news/mar19_chester_named_first_sustainable_palm_oil_city/) [https://perma.cc/PB86-L3QL].

only goods and products that use sustainably sourced palm oil.<sup>208</sup> Palm oil is now a ubiquitous ingredient in many food products and the global spread of palm oil plantations has become a serious cause of deforestation, especially in South East Asia.<sup>209</sup> The plight of the orangutans is closely tied to expansion of palm plantations.<sup>210</sup>

### C. *Reducing the Global Ecological Footprints of Cities*

Recognition of the size and extent of the average ecological footprint of a city has grown significantly over the last decade. The concept of an ecological footprint—an expression of the land area needed to support the consumption patterns and lifestyles of the citizens of a country or city—finds its beginning in the writing of University of British Columbia Planning Professor, William Rees (and later to the popular writings of Rees and Wackernagel).<sup>211</sup> The average size of an urbanite's footprint is indeed typically quite large, with the total land area needed to support a city typically many times larger than the land area of the city itself (or surrounding region). A study of London's ecological footprint found that the land area needed to support its population was nearly 300 times the land area of the city itself.<sup>212</sup>

The connections between loss of global biodiversity and habitat destruction, and the extent of urban consumption are undeniable.<sup>213</sup> The sourcing of a variety of goods and products, from timber to seafood, results in deforestation and conversion of natural habitat to agriculture and ranching, overharvesting, and diminution of ecological services and functioning.<sup>214</sup> Working to reduce the size of this urban footprint would help

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

<sup>209</sup> *Id.*

<sup>210</sup> *Id.*

<sup>211</sup> WILLIAM REES & MATHIS WACKERNAGEL, *OUR ECOLOGICAL FOOTPRINT: REDUCING HUMAN IMPACT ON THE EARTH* (1996); for discussion of the implications for cities, see William Rees & Mathis Wackernagel, *Urban Ecological Footprints: Why Cities Cannot Be Sustainable and Why They Are a Key to Sustainability*, 16 ENV'T IMPACT ASSESS. REV. 223–48 (1996).

<sup>212</sup> *London's Ecological Footprint*, LONDON.GOV (June 2003), [https://www.london.gov.uk/sites/default/files/ecological\\_footprint.pdf](https://www.london.gov.uk/sites/default/files/ecological_footprint.pdf) [<https://perma.cc/6MUM-QRWN>].

<sup>213</sup> UNU-IAS Policy Report, United Nations University Institute of Advanced Studies, *Cities, Biodiversity, and Governance: Perspectives and Challenges of the Implementation of the Convention on Biological Diversity at the City Level, Executive Summary*, 7, <https://i.unu.edu/media/ourworld.unu.edu-jp/article/1965/UNU-IAS-Cities-and-Bio-e-ver.pdf> [<https://perma.cc/ZV2X-V2X3>] (last visited Mar. 10, 2021).

<sup>214</sup> *Id.* at 10, 23, 33.

to reduce the resource demands on distant nature from which much of these urban consumption patterns are sourced.

Cities could set goals to reduce the ecological footprint of its residents and could utilize a variety of more specific tools to discourage global resource consumption. To date, few cities have actually set ecological footprint reduction targets. The City of Vancouver is one of the few, setting the goal of a 33% reduction in its footprint, and including this target in its *Greenest City Action Plan*.<sup>215</sup> It has already made significant progress reducing its footprint and partially reaching this goal.<sup>216</sup>

The precise tools and strategies that cities might adopt to reduce their global ecological footprints are many and varied, and could include environmental regulations that establish more stringent minimum energy standards for buildings, efforts at shifting to renewable energy, and efforts at import replacement through sustainable local production and sourcing (such as support for local sustainable fishers and local farmers through mechanisms such as Community-Supported Agriculture and Community-Supported Fisheries).<sup>217</sup>

The construction of homes, offices, and other buildings in a city offers a point of leverage to reduce the city's ecological footprint. The last several decades especially have seen a rise in the number of green building certifications. The U.S. Green Building Council's LEED Certification is the most popular and has to date resulted in certification of some 30,000 buildings.<sup>218</sup>

The Living Building Challenge, run by the Seattle-based International Living Future Institute ("ILFI"), is one of the most rigorous.<sup>219</sup> It requires certified projects to achieve net positive energy and net positive water standards, for instance, as well as use of sustainably sourced wood, and avoidance of toxic materials (those on the so-called Red List are prohibited).<sup>220</sup> Many of these performance standards are consistent with

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<sup>215</sup> *Greenest City Action Plan*, CITY OF VANCOUVER, <https://vancouver.ca/green-vancouver/greenest-city-action-plan.aspx> [<https://perma.cc/PS6B-X6AY>] (last visited Mar. 10, 2021).

<sup>216</sup> *Id.*

<sup>217</sup> See BEATLEY, BLUE URBANISM, *supra* note 179, at 46–48 for a discussion of CSFs.

<sup>218</sup> Sarah Stanley, *U.S. Green Building Council Releases Annual Top 10 Countries and Regions for LEED*, U.S. GREEN BLDG. COUNCIL (Jan. 22, 2018), <https://www.usgbc.org/articles/us-green-building-council-releases-annual-top-10-countries-and-regions-leed> [<https://perma.cc/6P8S-WDYP>].

<sup>219</sup> See *Living Building Challenge 4.0 Basics*, LIVING BLDG. CHALLENGE, <https://living-future.org/lbc/basics4-0/> [<https://perma.cc/LGD8-8A8J>] (last visited Mar. 10, 2021).

<sup>220</sup> See INT'L LIVING FUTURE INST., *LIVING BUILDING CHALLENGE 4.0: A VISIONARY PATH TO A REGENERATIVE FUTURE* 7, 19, 25, 39, 43, 52–54 (June 2019), [https://living-future.org/wp-content/uploads/2019/08/LBC-4\\_0\\_v13.pdf](https://living-future.org/wp-content/uploads/2019/08/LBC-4_0_v13.pdf) [<https://perma.cc/9DYL-MR8A>].

half-earth and would collectively advance the agenda globally if enough buildings and renovations sought certification. Under the Living Building Challenge certification, at least 50% of the wood used must be FSC-certified or “salvaged, or harvested on site either for the purpose of clearing the area for construction or to restore or maintain the continued ecological function of the site. The remainder must be from low-risk sources.”<sup>221</sup> There is also a minimum requirement stipulating locally or regionally sourcing of construction materials. More specifically, the standard requires: “20% or more of the materials construction budget must come from within 500 kilometers of [the] construction site.”<sup>222</sup>

*D. Cities as the Engines for Financing Global Conservation*

Cities have at their disposal the wealth and assets to fund global conservation. Increasingly, there are innovative and creative mechanisms for raising capital for conservation.

1. Carbon Offsets

Creating steady and reliable sources of income and revenue is a challenge for cities wishing to undertake conservation projects beyond their borders or boundaries. Increasingly, cities, and organizations within cities, are exploring how to harness the desire to purchase carbon offsets. Austin, Texas, a partner city in the Biophilic Cities Network is a case in point. Austin has joined with a local nonprofit, TreeFolks, to make available carbon credits to support the planting of trees and the restoration of riparian habitat in areas within the city’s watershed.<sup>223</sup> For the city of Austin, the purchase of credits generated from these regional tree-planting efforts is one way to begin to move towards its goal of becoming carbon-neutral, while at the same time providing for habitat restoration and meeting the water demands of the city. Through the Travis County Floodplain Reforestation Program, some 50,000 trees have been planted in a much larger effort to restore lost riparian habitat.<sup>224</sup> These initial carbon-credit financed plantings are described as a “pilot” program, “for a massive reforestation effort on 900 miles of creeks and streams in the

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<sup>221</sup> *Id.* at 52.

<sup>222</sup> *Id.*

<sup>223</sup> Lucia Athens & Mark McPherson, *Replanting Riparian Forest Buffers in Austin through City Forest Carbon+ Credits*, 3 *BIOPHILIC CITIES J.* 26–29 (Nov. 2019), <https://www.biophiliccities.org/bcj-vol-3-no-1> [<https://perma.cc/WT42-7C4K>].

<sup>224</sup> *Travis County Floodplain Reforestation Program*, TREEFOLKS, <https://www.treefolks.org/reforestation-services/central-texas-floodplain/> [<https://perma.cc/T5K4-7QLA>].

watershed of the City of Austin and the surrounding area.”<sup>225</sup> The Carbon+ Credits program has been facilitated by the Seattle-based City Forest Credits, which calculates and certifies the amount of carbon sequestered over 25 years.<sup>226</sup>

A similar example can be seen in the work of the Aburrá Valley region of Colombia, which includes the City of Medellín. Through a program called BanCO<sub>2</sub>, carbon credits are sold and used similarly for tree-planting and habitat conservation in the larger region.<sup>227</sup> The initiative is run by the regional metropolitan government Área Metropolitana del Valle de Aburrá, which coordinates planning and urban development for a river valley that includes ten different cities, including Medellín.

## 2. Climate Cap and Trade

Cap and trade systems, such as California’s, represent another opportunity to generate resources and funding for extra-local conservation actions and programs.<sup>228</sup> In 2019 alone, California’s cap and trade auctions (held quarterly) generated over \$1 billion in revenue for such investments.<sup>229</sup> These funds are deposited into the state’s Greenhouse Gas Reduction Fund.<sup>230</sup> Appropriations of these funds go to supporting a range of climate actions throughout the state.<sup>231</sup> And while many

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<sup>225</sup> Quigfu Xiao, *Verification Report: Reforesting Austin’s Parks and Riparian Zones Project* (Aug. 26, 2019), <https://www.cityforestcredits.org/carbon-credits/carbon-registry/austin-forest-carbon-offsets> [https://perma.cc/56E5-XMEM].

<sup>226</sup> Chris Davis, *Austin Buys Carbon Credits From New Tree-Planting Program as Carbon Neutrality Goal Looms*, KXAN (Dec. 12, 2019), [https://www.kxan.com/news/local/austin/austin-buys-carbon-credits-from-new-tree-planting-program-as-carbon-neutrality-goal-looms/#:~:text=My%20Personal%20Information-,Austin%20buys%20carbon%20credits%20from%20new%20tree%2Dplanting,as%20carbon%20neutrality%20goal%20looms&text=AUSTIN%20\(KXAN\)%20%E2%80%94%A%20new,locally%20kicks%20off%20this%20weekend.&text=Trees%20absorb%20carbon%20dioxide%2C%20a%20main%20driver%20of%20climate%20change](https://www.kxan.com/news/local/austin/austin-buys-carbon-credits-from-new-tree-planting-program-as-carbon-neutrality-goal-looms/#:~:text=My%20Personal%20Information-,Austin%20buys%20carbon%20credits%20from%20new%20tree%2Dplanting,as%20carbon%20neutrality%20goal%20looms&text=AUSTIN%20(KXAN)%20%E2%80%94%A%20new,locally%20kicks%20off%20this%20weekend.&text=Trees%20absorb%20carbon%20dioxide%2C%20a%20main%20driver%20of%20climate%20change) [https://perma.cc/5NQB-LP2P].

<sup>227</sup> BancO<sub>2</sub>, *Área Metropolitana del Valle de Aburrá*, <http://banco2.com/amva> [https://perma.cc/MR63-MASC] (last visited Mar. 10, 2021).

<sup>228</sup> See Stanley Young & Dave Clegern, *California Climate Investments Provided More than \$1 Billion for Underserved Communities in 2019*, CAL. AIR RES. BD. (Apr. 20, 2020), <https://ww2.arb.ca.gov/news/california-climate-investments-provided-more-1-billion-underserved-communities-2019> [https://perma.cc/8H9B-EMTG].

<sup>229</sup> *Id.*

<sup>230</sup> *California Climate Investments*, CAL. AIR RES. BD., <https://ww2.arb.ca.gov/our-work/programs/california-climate-investments> [https://perma.cc/F5DQ-BAQE] (last visited Mar. 10, 2021).

<sup>231</sup> *Id.*

directly pertain to more narrow climate change actions, such as support for renewable energy and energy efficiency (which are also supportive of the half-earth agenda), much of the funding also goes towards ecological restoration and carbon sequestration (such as forest projects around the state of California).<sup>232</sup>

### 3. Green Bonds and Environmental Impact Bonds

Various versions of environmental bonds are a second financing mechanism to raise capital for conservation. Green bonds have the potential to generate significant investor funds that could be used for global conservation and the establishment and management of new protected areas. In 2019, the Conservation Fund announced closing on \$150 million in green bonds, underwritten by New York City–based Goldman Sachs & Co. LLC.<sup>233</sup> Bonds proceeds will go to its “Working Forest Fund,” which is “dedicated to mitigating climate change, strengthening rural economies and protecting natural ecosystems through the permanent conservation of at-risk working forests.”<sup>234</sup>

One interesting city-connected nature application of these bond revenues can be seen in the recent purchase and protection of the 15,000 acres of the Chadbourne Tree forest in Maine.<sup>235</sup> While protecting forests and biodiversity, it also provides a significant portion of the watershed supplying drinking water to the City of Portland, Maine.<sup>236</sup>

An important new tool is the Environmental Impact Bond (“EIB”).<sup>237</sup> Pioneered by a company called Quantified Ventures, the City of Washington, D.C. (D.C. Water specifically), has been the first U.S. city to utilize it to fund nature-based infrastructure in the city, largely connected to addressing that city’s combined sewer overflows and stormwater

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<sup>232</sup> *The Conservation Fund Successfully Closes Debut \$150 Million Green Bond*, THE CONSERVATION FUND (Sept. 26, 2019), <https://www.conservationfund.org/impact/press-releases/2019-09-26-the-fund-successfully-closes-debut-150-million-green-bond> [<https://perma.cc/83P3-YEH4>].

<sup>233</sup> *Id.*

<sup>234</sup> *Id.*

<sup>235</sup> *See Chadbourne Tree Farm—Maine*, THE CONSERVATION FUND, <https://www.conservationfund.org/projects/chadbourne-tree-farm-maine> [<https://perma.cc/CU73-L5BT>] (last visited Mar. 10, 2021).

<sup>236</sup> *See id.*

<sup>237</sup> *See Sharing Risk, Rewarding Outcomes: The Environmental Impact Bond*, QUANTIFIED VENTURES (Oct. 31, 2018), <https://www.quantifiedventures.com/blog/what-is-an-environmental-impact-bond> [<https://perma.cc/35ZB-R6R2>].

challenges.<sup>238</sup> EIBs have now been used in three American cities, most recently the City of Hampton, Virginia, where the bonds have generated \$12 million in funds to support three key stormwater management projects that together will add additional capacity to retain 8.6 million gallons of stormwater and will significantly enhance resilience.<sup>239</sup>

Based on the premise that return on investment should be related to the performance of the biophilic projects, these bonds have been described as “pay-for-success” bonds.<sup>240</sup> A distinctive feature is the careful monitoring and evaluation of the outcomes of the project.<sup>241</sup> If projects underperform, the investors agree to provide cities with a “risk share payment,” allowing cities to shift to an alternative project or design.<sup>242</sup> If the projects perform better than an agreed upon threshold, the financial return to investors is higher.<sup>243</sup> While a new and innovative bond instrument, it is possible that EIBs can be used as a way to steer investment funds to locally endorsed (but non-local) conservation projects that serve to advance local goals and values.<sup>244</sup>

#### 4. How Cities Invest: Local Government Investments and Divestments

Many larger cities, such as New York City, have large pension funds with the potential to invest these funds (or divest them) in ways that could help the agenda of global conservation.

New York City became the largest city in the United States to announce its divestment intent for its pension funds, valued at \$155 billion (an estimated \$3 billion involved fossil fuel investments).<sup>245</sup> In addition to

<sup>238</sup> See *DC Water: First Ever Environmental Impact Bond*, QUANTIFIED VENTURES, <https://www.quantifiedventures.com/dc-water> [<https://perma.cc/PB2F-26AZ>] (last visited Mar. 10, 2021).

<sup>239</sup> See WAVY Web Staff, *Hampton Becomes First Virginia Municipality to Use Environmental Impact Bonds to Help Reduce Flooding, Pollution*, VIRGINIA NEWS (Dec. 5, 2020), <https://www.wric.com/news/virginia-news/hampton-becomes-first-virginia-municipality-to-use-environmental-impact-bond-to-help-reduce-flooding-pollution/> [<https://perma.cc/B2XV-U8ZT>].

<sup>240</sup> See QUANTIFIED VENTURES, *supra* note 237.

<sup>241</sup> See *Environmental Impact Bonds*, CHESAPEAKE BAY FOUND., <https://www.cbf.org/how-we-save-the-bay/programs-initiatives/environmental-impact-bonds.html> [<https://perma.cc/7P9Q-SYBE>] (last visited Mar. 10, 2021).

<sup>242</sup> See *id.*

<sup>243</sup> See Austin Thompson, *Environmental Impact Bonds: Where Are They Now?*, UNIV. OF N.C. SCH. OF GOV'T: THE ENV'T FIN. BLOG (July 2, 2020), <https://efc.web.unc.edu/2020/07/02/environmental-impact-bonds-where-are-they-now/> [<https://perma.cc/3TR6-CNJV>].

<sup>244</sup> See CHESAPEAKE BAY FOUND., *supra* note 241.

<sup>245</sup> Mayor Bill de Blasio, *Comptroller Stringer and Trustees Take Major Next Step to*

divestment, the city has announced its intention to double its portfolio investments in “climate solutions” to \$4 billion by 2021.<sup>246</sup> While mostly these investments will be in the renewable energy sector, it is not inconceivable or unreasonable to suggest that such investments could be funneled to companies and enterprises that would help to secure, protect and/or restore ecosystems and biodiversity in other regions and countries.

London has already divested a portion of its \$8.5 billion in pension funds, and other cities around the world are following suit.<sup>247</sup> “We need all cities to act now to help protect our planet for future generations,” said London mayor Sadiq Khan, who made the divestment pledge a part of his mayoral campaign platform.<sup>248</sup>

##### 5. Urban Offsetting Programs and Initiatives: City Offsets in Support of Global Conservation

Cities can undertake, start or support a variety of tools that can collectively be called conservation offsets. Offsets recognize the need to compensate for the impacts of consumption and development, in and near to cities on biodiversity and global conservation.<sup>249</sup>

Some offsets are mandated through the development approval process. There is a long history of wetlands mitigation requiring the restoration or compensation of wetlands elsewhere in situations where loss of wetlands is permitted (this often happens at the federal level through the Section 404 of the Clean Water Act, but also through state wetlands provisions).<sup>250</sup>

Carbon offsets are often purchased as a result of long-distance air travel, and there are now a number of commercial companies that sell

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*Achieve Fossil Fuel Divestment*, N.Y. CITY (Jan. 21, 2020), <https://www1.nyc.gov/office-of-the-mayor/news/032-20/mayor-de-blasio-comptroller-stringer-trustees-take-major-next-step-achieve-fossil-fuel> [<https://perma.cc/277D-VSXU>].

<sup>246</sup> *Id.*

<sup>247</sup> See Rachel Savage, *London, New York Mayors Urge Cities to Divest from Fossil Fuels*, REUTERS (Jan. 8, 2020), <https://www.reuters.com/article/britain-climate-finance-idINL8N29C4EZ> [<https://perma.cc/TX6G-G8FC>].

<sup>248</sup> *Id.*

<sup>249</sup> See INT’L UNION FOR CONSERVATION OF NATURE, BIODIVERSITY OFFSETS 1 (Sept. 2016), [https://www.iucn.org/sites/dev/files/biodiversity\\_offset\\_issues\\_briefs\\_final.pdf](https://www.iucn.org/sites/dev/files/biodiversity_offset_issues_briefs_final.pdf) [<https://perma.cc/3YHS-VZTT>].

<sup>250</sup> See *Background on Compensatory Mitigation*, ENV’T L. INST., <https://www.eli.org/compensatory-mitigation/background-compensatory-mitigation> [<https://perma.cc/SF3L-9WC4>] (last visited Mar. 10, 2021).

such offsets (for instance NativeEnergy and Terrapass).<sup>251</sup> Online calculators estimate the needed offset and the companies then arrange to use the collected funds for a variety of carbon sequestration projects, often tree planting.<sup>252</sup>

The construction of new homes and buildings in cities could become one important source of offsets and income that result in the protection of extra-local conservation lands. One example is the Living Building Challenge, which stipulates a minimum offset for habitat lost through development.<sup>253</sup> Called the Habitat Exchange Imperative, it stipulates the following: “For each hectare of development, an equal amount of land away from the project site must be set aside in perpetuity through the Institute’s Living Future Habitat Exchange Program or an approved Land Trust organization. The minimum offset amount is 0.4 hectare.”<sup>254</sup> The Living Future Habitat Exchange in turn “aggregates funds from participating teams in order to make a more substantial annual purchase of high-value, intact ecosystem in partnership with the Wildlife Conservation Society. This partnership results in lower costs per acre to project teams while simultaneously protecting large swaths of contiguous acreage, protecting critical habitat in perpetuity.”<sup>255</sup>

In the UK, there has been much discussion around the idea of “biodiversity net gain,” which is the idea that planning rules require a project or development to demonstrate that it will actually improve or enhance biodiversity rather than result in its loss or diminution.<sup>256</sup> Changes to national planning rules are under consideration through the proposed Environment Bill, which will require demonstration of a 10% net improvement in biodiversity.<sup>257</sup> Developers will need to submit a “biodiversity gain

<sup>251</sup> RICHARD KIM & BENJAMIN C. PIERCE, CARBON OFFSETS: AN OVERVIEW FOR SCIENTIFIC SOCIETIES 1, 5 (June 24, 2018).

<sup>252</sup> See *id.* at 1, 5, 15.

<sup>253</sup> Int’l Living Future Inst., *supra* note 220, at 43.

<sup>254</sup> *Place Petal*, INT’L LIVING FUTURE INST., [https://living-future.org/lbc-3\\_1/place-petal/](https://living-future.org/lbc-3_1/place-petal/) [<https://perma.cc/8GKS-KPXX>] (last visited Mar. 10, 2021).

<sup>255</sup> *FAQ*, INT’L LIVING FUTURE INST., <https://living-future.org/contact-us/faq/> [<https://perma.cc/57FG-3YCT>] (last visited Mar. 10, 2021).

<sup>256</sup> See, e.g., *Biodiversity Net Gain: Future Developments Must Improve Wildlife Habitats*, BIODIVERSITY IN PLANNING, <https://www.biodiversityinplanning.org/news/bd-net-gain/> [<https://perma.cc/VQ2Q-DHJL>] (last visited Mar. 10, 2021).

<sup>257</sup> Aidan Thompson & Isabelle Laborde, *A Roadmap to Biodiversity Net Gain Under the Environment Bill*, BRYAN CAVE LEIGHTON PAISNER (Sept. 25, 2020), <https://www.bclplaw.com/en-US/insights/a-roadmap-to-biodiversity-net-gain-under-the-environment-bill.html> [<https://perma.cc/JV94-UFYZ>].

plan” that shows how this will occur.<sup>258</sup> Off-site biodiversity conservation will be an option, and developers will be able to satisfy the requirements through the purchase of “biodiversity credits.”<sup>259</sup> While local and onsite conservation and enhancement are desirable, it is possible that such city planning provisions could help to stimulate conservation projects beyond a city’s borders.

## 6. Global Conservation Impact Fees or Linkage Fees

Lastly, a more radical idea is the creation by a city of an impact fee requirement or linkage standard that recognizes the long-term impacts on distant ecosystems from new residential or commercial construction. This concept is analogous to housing linkage fees that require contributions from new development where there is an explicit “linkage” made between urban growth and housing affordability, albeit with a less direct causal connection.<sup>260</sup>

There is precedent in some cities where additional fees are charged for large energy-intensive homes. The Aspen and Pitkin County REMP (Renewable Energy Mitigation Program) charges an off-site fee for homes over 5,000 square feet in size (where onsite renewable energy investment is not undertaken), with the funds used to support local wind and solar energy projects.<sup>261</sup>

### *E. Corporate Responsibility*

Cities might also consider how to support the development of new business models that give greater importance and priority to global conservation. Global companies such as Patagonia have been pioneers in reconceptualizing their corporate identities by supporting commitments such as regenerative agriculture and renewable energy as means to limit carbon footprints. Corporations can participate in the 1% for the Planet commitment, co-created by Patagonia founder Yvon Chouinard, whereby

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<sup>258</sup> *Id.*

<sup>259</sup> *See id.*

<sup>260</sup> *See Linkage Fee Programs*, INCLUSIONARY HOUSING, <https://inclusionaryhousing.org/developing-a-policy/program-structure/linkage-fee-programs/> [https://perma.cc/9CDP-97P4] (last visited Mar. 10, 2021).

<sup>261</sup> *See Renewable Energy Mitigation Program—Aspen and Pitkin County, CO*, INST. FOR LOCAL SELF-RELIANCE, <https://ilsr.org/rule/climate-change/2536-2/> [https://perma.cc/C5P8-5XB7] (last visited Mar. 10, 2021).

companies (along with individual and nonprofit partners) agree to dedicate 1% of sales to support environmental conservation efforts.<sup>262</sup> In 2019 alone, the initiative provided \$27.2 million in combined support to over 1,800 global nonprofits working on challenges such as climate mitigation, habitat conservation and access to local, healthy food.<sup>263</sup> A related model comes from the Bank of the West, which has recently established a new form of checking account that donates 1% of its profits to conservation (what it calls its “1% for the Planet Account”).<sup>264</sup> Such inducements offered by companies reflect the consumer demand for products that reflect an ethical commitment to more than simply financial gain.

The E.O. Wilson Biodiversity Foundation’s Half-Earth Project has joined with companies from diverse sectors, including energy, finance and travel, as part of the Companies for a Half-Earth Future initiative.<sup>265</sup> The intent of the initiative is to develop a framework “for purpose-driven business practice that supports a Half-Earth future.” The two driving goals of the initiative are:

1. To provide a science-based positive vision and focus for purpose-driven, long-term innovation and business development.
2. To explore how companies can use their value proposition and core business offering to innovate in driving value to their business, a sustainable planet and a Half-Earth future.<sup>266</sup>

Rethinking the extent of the ethical and legal responsibilities of the modern corporation operating in a globalized world remains an important task. Many U.S. states, for example, now allow for a different legal entity known as a benefit corporation, which in contrast to conventional shareholder corporations is duty-bound to think beyond simply profits and to consider

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<sup>262</sup> 1% FOR THE PLANET, <https://www.onepercentfortheplanet.org> [<https://perma.cc/45W7-H8KW>] (last visited Mar. 10, 2021).

<sup>263</sup> 2019 Annual Report, 1% FOR THE PLANET, <https://www.onepercentfortheplanet.org/annual-reports> [<https://perma.cc/S6TN-4RCY>] (last visited Mar. 10, 2021).

<sup>264</sup> See Kristin Toussaint, *This Checking Account Donates 1% of its Revenue to Climate Nonprofits*, FASTCOMPANY, <https://www.fastcompany.com/90529236/this-checking-account-donates-1-of-its-revenue-to-climate-nonprofits> [<https://perma.cc/D3XN-UGJX>] (last visited Mar. 10, 2021).

<sup>265</sup> *Companies for a Half-Earth Future*, HALF-EARTH PROJECT, <https://www.half-earthproject.org/companies> [<https://perma.cc/7XAF-2PNS>] (last visited Mar. 10, 2021).

<sup>266</sup> *Id.*

a larger set of stakeholders and a larger public interest.<sup>267</sup> The benefit corporation is described as follows:

This increasingly available corporate form provides a mandate, and a safe harbor, for corporate leaders to pursue societal good along with shareholder profits. Directors are required to consider the impact of their decisions not only on the company's shareholders, but on the entity's larger social purpose. Investors who wish to support a company's mission can be confident that it is an integral part of the company's purpose and a consistent goal of its governance.<sup>268</sup>

Just about any business activity or kind of company could become a benefit corporation, such as real estate development companies, not commonly seen as supportive of environmental and biodiversity conservation goals.<sup>269</sup> The benefit corporate structure acknowledges responsibilities to a larger public interest than just stockholders, raising the possibility that companies may operate more responsibly on the global scene and may legitimately see conservation of global biodiversity as an equally important goal to maximizing short term profits.

Urban populations can also help to generate income for local in-country conservation-oriented or conservation-friendly businesses. Future effective conservation will require a shift from what has been called the "fortress conservation" model for protection of biodiversity, whereby protected areas are conserved in preferred isolation from human populations, to one that recognizes the important role that local communities and indigenous populations living and working in close proximity to the biodiversity can play.

One example is the Proyecto Titi, an effort in Columbia to protect remaining populations of and habitat for Cotton-Topped Tamarins, of which there are only about 7,500 remaining.<sup>270</sup> The project utilizes a variety of techniques to advance conservation, including: education and

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<sup>267</sup> See, e.g., *Business for Good: What is a B Corporation?*, SALT PALM DEV., <https://saltpalm.com/business-for-good/> [<https://perma.cc/BNP2-997N>] (last visited Mar. 10, 2021) ("B Corps are for-profit businesses that have a wider purpose than maximizing profits").

<sup>268</sup> David A. Katz et al., *The Corporate Form for Social Good*, HARVARD L. SCH. FORUM ON CORP. GOVERNANCE (May 24, 2019), <https://corpgov.law.harvard.edu/2019/05/24/the-corporate-form-for-social-good> [<https://perma.cc/Z5EL-JNNP>].

<sup>269</sup> See, e.g., SALT PALM DEV., *supra* note 267.

<sup>270</sup> *Proyecto Titi: Conserving the Critically Endangered Cotton-top Tamarin in Colombia*, PROYECTO TITÍ, <https://www.proyectotiti.com/en-us/> [<https://perma.cc/X7HE-22LD>] (last visited Mar. 10, 2021).

awareness raising, working with local schools to engage students in a conservation mission and create the next generation of stewards and protectors of the tamarins, and assisting the efforts of local ranchers and farmers to protect remaining forested habitat. A recent effort of the project has been to create a network of corridors for the tamarins to move between larger forested blocks.<sup>271</sup> This tamarin species, like many, suffers from deforestation and habitat fragmentation, much of which is happening on private lands.<sup>272</sup> The effort invites local private actors and communities to aid in protecting and conserving global biodiversity.<sup>273</sup>

The project also provides financial support for local businesses by creating alternative streams of income. The project's website sells a variety of products, from plush toys to earrings and bags, made by local artisans to help build a local economy that supports and values the tamarins.<sup>274</sup> One new initiative is the sale of "titi posts" that are fence posts made from recycled plastic waste, which are more durable, longer-lasting fence posts that can be used by local ranchers instead of wood (usually made by cutting down young trees).<sup>275</sup> Through this Titi Post Campaign, supporters can purchase more sustainable materials to be used by local ranchers and farmers and hopefully reduce deforestation.<sup>276</sup>

## CONCLUSION

As presented in this Article, there are tremendous opportunities for cities to support the conservation of biodiversity both within the city and beyond. Within the city, this means a focus on conserving and augmenting, where possible, large intact natural areas, along with the creation of new unique urban nature that creates an ecological network within the city and can provide habitat for adaptable species. The ability to connect urban residents to nature can inspire a personal commitment to the conservation of biodiversity that would not otherwise exist without a daily relationship with nature.

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<sup>271</sup> Kaitlin Tillett, *Future Forests for Cotton-Top Tamarins*, WILDLIFE CONSERVATION NETWORK (Nov. 1, 2018), <https://wildnet.org/future-forests-for-cotton-top-tamarins/> [<https://perma.cc/35G7-2TYV>].

<sup>272</sup> PROYECTO TITÍ, *supra* note 270.

<sup>273</sup> Tillett, *supra* note 271.

<sup>274</sup> *Shop*, PROYECTO TITÍ, <https://www.proyectotiti.com/en-us/Shop> [<https://perma.cc/6SC9-5F25>] (last visited Mar. 10, 2021).

<sup>275</sup> *Buy a Titi Post, Save a Tree, Save a Tamarin*, PROYECTO TITÍ, <https://proyectotiti.net/workforgood.com/projects/91415-tit-post-campaign> [<https://perma.cc/FEP7-EXLB>] (last visited Mar. 10, 2021).

<sup>276</sup> *Id.*

Cities can and must be leaders for global biodiversity conservation beyond their borders. This can take many forms, from city diplomacy and intercity agreements to the new policies that reduce a city's ecological footprint and change its patterns of consumption. Lastly, cities can harness their economic influence to assist in the funding of biodiversity conservation as a global priority. In this respect, cities can internalize tremendous costs that human populations impose on global biodiversity and chart a new course forward that includes the health of nonhuman and human species alike as elements of a city's bottom line.