Urban green space segregation: How do development and management practices reflect migration policy agendas?

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Green spaces support urban social systems by providing them with a multifunctional array of ecosystem services. Urban green spaces' positive contributions to people include heat regulation, stormwater management, and public health improvements, among other things. Urban green spaces also generate cultural ecosystems services, which underpin socio-economic functions like tourism and education. Migrants have been found to be among the most vulnerable urban resident groups globally. Thus, ensuring them accessibility to urban green space and ecosystem services is of the utmost importance. This study investigates the impacts that urban green space distribution and management have on im/migrants' ability to access social and financial capital. We compared urban green space management practices in the cities of Durham, North Carolina, and Bergamo, Italy. The United States and EU countries present very distinct migration and urban management settings. We used the US Forestry Department's Healthy Trees Healthy City (HTHC) index to measure urban green space management quality and Landsat 8 images to approximate urban green space distribution. Our sample consists of a stratification of city neighborhoods based on foreign-born resident density. We also took two distinct Latinx im/migrant communities as case studies, conducting semi-structured interviews and collecting observations about their relationship with urban green spaces in Durham and Bergamo, respectively. Our findings suggest that urban green space distribution and management favor non-migrant, high-SES residents. Urban im/migrant communities uniformly experience natural capital exclusion in the city, contributing from a broadly encompassing segregation from cultural, social, economic capital. This comparative study may contribute an additional layer to environmental and social justice discourses among urban im/migrant populations.

Urban green spaces, migrant capital, redlining, ecosystem multifunctionality, Healthy Trees Healthy Cities.

I. INTRODUCTION

The definition of urban green spaces is varied and controversial. Urban ecology literature features countless attempts to synthesize and redefine a concept that varies depending on its internal characteristics and the human communities that exist around it. In their survey of extant urban green space academic literature, Taylor and Hochuli noted a "lack of consensus" [1] on the concept's definition. The single most important factor to take into consideration when trying to define urban green spaces is our study's academic field [1]. Despite of field-specific differences, disciplines as disparate as urban ecology, architecture, and economics agree on a definition of urban green spaces as "urban vegetated space" [1]. In accordance with this definition, this study construes urban green spaces as any portion of urban space that features vegetation. This definition accepts the view that urban green spaces are merely urban vegetated space [1]. This definition views urban green spaces as a part of, rather than distinct from, urban space. This distinction is instrumental to considering liminal vegetative infrastructure such as hedges, brownfields, lawns, and street trees as part of urban green spaces [2].

In the past three decades, Anglo-Saxon North America and Western Europe experiences two of the largest and long-lasting migration flows in modern history, preceded only by 21st century Gulf Migration [3]. Albeit different in many ways, migration flows directed to U.S. and the richest economies in Western Europe share many common traits. Above all, the vulnerability of im/migrants during their migration journeys and once arrived at destination. North Carolina has attracted im/migrants from South and Central America since the early 2000s [4]. Foreign-born Latinx im/migrants are typically offered low-skilled jobs in the agricultural and manufacturing industry. Due to low salaries and occupational instability, along with a wide-spread tendency towards abuse in the workplace and local real-estate markets, first-generation Latinx im/migrant communities typically occupy some of the least privileged social ranks. Contractual and housing insecurity, in fact, runs high among such communities [4]. In North Carolina, the archetypical first-generation Latinx im/migrant resident is a young, unaccompanied male, with low educational background. Even though most men have a spouse and often children of their own in their home country, they typically endeavor their migration journey on their own due to individualized work contracts (a recent feature in North Carolina's immigration policy) and dangers associated with the journey itself, among other factors [4]. Most im/migrants are not first-time migrants. Many chose North Carolina after seeking employment in those U.S. states where more established Latinx immigration traditions exist, like California, Arizona, New Mexico, Texas, and Florida. In fact, the U.S. South historical region (comprehensive of states South from Virginia and West Virginia, North of Georgia, and East of Missouri) are experiencing what has come to be known as the "second wave of Hispanic migration" [4]. Low-skilled im/migrants are growing opportunities in North Carolina's rapidly expanding Research Triangle region, of which Durham is one of the main urban centers. With its booming high-tech, medical, and research sectors, the city attracts highly specialized residents from other parts of the state, country, and world. High-income im/migrants increase the demand for workers who can provide basic housing, sanitation services, construction, delivery, restoration, and security tasks [4]. However, it is to be noted that Durham's administration clearly emphasized a push towards high-income resident inflow. While low-income im/migrants contribute obvious benefits to the region's economy, they are often characterized as threats to the social order and form and relegated to a marginal social, cultural, and political corner [4].

Western Europe has represented the destination from large, trans-national migrant routes starting in North Africa, the Middle East, and (only to varying extents) Eastern Europe since at least the 1990s [5]. While migration flows of interest the entire European continent to an appreciable extent, different regions play different roles along the migration pathway. While Eastern and some Southern European countries often act as passage or anchorage destinations , historically prosperous West European economies represent arrival points for most im/migrants [6]. Considering these economies' decelerating demographic and production development, im/migrants represent valuable resources both at the local [7] and national levels [8]. However, national European governments and confederation E.U. institutions characteristically take a detached policy approach towards im/migrants, portraying them as temporary guests, estranged from citizenship and public life [9]. In cities across Europe and the U.S. alike, im/migrant residents suffer forms of segregation that resemble those historically experienced by other ethnic minorities, like Black African American citizens in the modern U.S. [10].

When investigating urban green space ecosystem service distribution patterns, accessibility represents a focal idea. Urban green space accessibility refers to "the amount of green space within a certain defined distance to where urban residents live" [11]. Whereas this study adopts Kabisch and colleagues' definition, it relaxes the "defined distance" principle. Such is because street trees are primarily studied, rather than open green space parcels, like parks or green corridors. Kabisch et al., 2016 note the difference between accessibility and availability; urban green space may be available in close proximity to urban residents' dwellings, but they may not be accessible to them. Accessing urban green spaces is a prerequisite to reap many of the ecosystem services that green spaces provide, like recreation, contact with nature, or refrigeration [11]. Even though street trees may not provide all the ecosystem services that parks, or unmanaged natural areas can offer [12], accessibility-availability differentials do not apply to them to the same extent they do on these large urban green space plots. Because functioning streets are accessible by design, the vegetation that surrounds them is too [13]. Street trees' high accessibility makes them feature heavily in urban residents' perception of green space, the extent of environmental policies, and nature in general [14][15].

Abundant literature from U.S. cities documents how low-income residents have, on average, less access to urban green space and other green infrastructure than their mid- and high-income counterparts [16][17][18]. Street trees are less frequent, tree diversity is lower, and average lifespan is shorter in residential areas were average household and rental values are lower [9] Roman et al., 2021). Such findings were recently recorded in some Western European cities, as well [11]. Extant accessibility differentials often amount to systemic segregation. Urban green space accessibility has been found to correlate significantly correlate with exclusion from other public services, like sanitation, public transport, unpolluted air, and educational facilities [2]. Extensive research confirms that in U.S. cities, these exclusion patterns often follow racial and ethnic lines [2][7][8][9]. Urban green space inaccessibility seems to overlap with a wide-spread exclusion of Black and Brown residents from public services. This phenomenon draws its roots in the historical segregation policies commonly referred to as redlining, a series of municipality-level provisions that actively discouraged infrastructural investment in areas with high Black and Brown resident densities [2][7].

Even though redlining policies were proclaimed unconstitutional following the dismantling of Jim Crow laws in the U.S. South, Durham's racial and income distributions still bear the marks of their legacy. Smithsonian Institute professor Jeremy Hoffmann and his colleagues have documented the ways historical redlining can still explain surface heat exposure and quality of life patterns in Richmond, VA, along with many other cities in the region [2]. Observing socio-economic exclusion among low-income foreign-born im/migrants in U.S. [12] and Western European [13] alike, this study wishes to investigate the key intuition that historical economic injustice behaviors, previously reserved to citizen ethnic minority, are being replicated among new disadvantaged resident groups. Urban green spaces can ensure interaction between autochthonous and new resident communities [14], thus facilitating im/migrant socio-economic integration. Additionally, green infrastructure represents a form of social capital that im/migrant communities can leverage to achieve social, economic, and political empowerment [15]. By investigating the ways services are distributed and managed around low-income im/migrant residents, this Signature Work project hopes to shed some lights on how city-level environmental policy can improve, or impair, this underprivileged class's pathway to socio-economic integration and self-determination.

II. Methods

A. Sampling strategy

Because urban green space distribution is heterogeneous in both Durham and Bergamo, this study relied on city-level stratified sampling. Durham and Bergamo present distinct demographic and architectural features. Like many other North American cities, Durham suffered from a rapid suburbanization process throughout the past century, which resulted in the development of low-density, single-family residential neighborhoods over large expansions of land (Hoffman et al., 2020; Chen, 2022). Suburban neighborhoods are characterized by blurred urban- rural boundary (Brueckner, 2000) . Cultivated crops, hedges, abandoned single-family residential lots, and natural forests all represent natural spaces. Unmanaged green space provides significant ecosystem services in suburban areas (De la Barrera et al., 2016), although their uncontrolled nature often matches them with negative NPCs, which include wild animal predation, contact with parasitic insects, zoonotic disease reservoirs, and covert criminal activity (Ma et al., 2019).

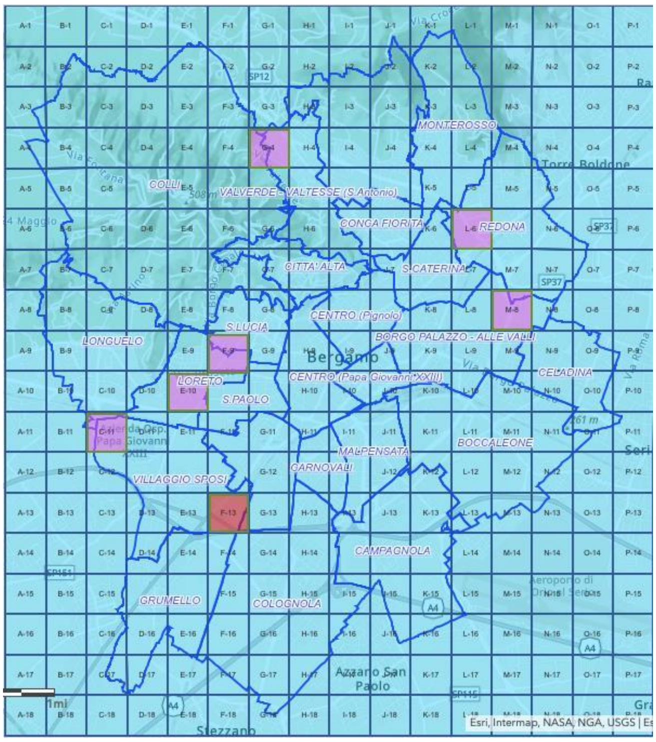

Fig. 1. Random quadrant generation in Bergamo. A total of 100 grid cells were generate. The cells falling off the city limits and those without public streets were excluded. The pink cells represented the final eligible subsample. The red cell (F-13) was excluded due to lack of walkable street segments (the cell only featured a hihgh-speed freeway).

Conversely, Bergamo's high residential density leaves little space for large green spaces. Like most post-industrial European cities (Sennett, 2011), Bergamo focuses urban green space provision in small, well managed parks, densely interspersed among multi-family residential buildings (Kabisch et al., 2016; Sennett, 2011). Both cities have a paucity of urban green spaces in their historical downtowns. While occasional trees are present, the two city centers are virtually devoid of other forms of urban green spaces. In addition to the heterogeneity of urban green space distribution, we had to do stratified sampling instead of entirely random sampling due to the spatial patterns of foreign-born resident occupancy. Foreign-born residents occupy the urban space in very different ways across the two cities . Census blocks updated to 2022 were layered on a Durham map using ArcGIS Online (Figure 1). ArcGIS Online represents an excellent instrument for geospatial analysis, especially when investigating social geographic distributions [16] and is accessible in the United States. The 2021 North Carolina American Communities Survey (ACS) census data were extracted from Social Explorer and layered over the Durham's 2022 census block map. Social Explorer is an open-source application that allows users to explore and pre-analyze fine-grain demographic data from locations in the United States across a wide archive of census records. With this data, we could see concentration of foreign-born residents across Durham in 2021.

Afterwards, a 10 x 10 m. grid was overlaid onto each neighborhood/census block. Each grid cell was assigned a unique combination of a letter and a number. Figure 1 shows an example of grid generation in Bergamo's. All the cells that did not feature a walkable street or fell outside the neighborhood/census boundaries were excluded from the sample pool. Afterwards, one random cell per neighborhood/census block was selected by randomly generating one letter and one number within the valid rage of values using a random number generator . The selected cell was used as the starting point of a 0.5 Km-long Street segment. Street segment shape was determined by randomly generating a string of numbers, each representing a direction to take at a given street intersection. Where turning right was coded as "1," any other number would mean taking an additional clockwise turn. This way, the number of turning direction options did not project a bias on segment shape. This methodology drew inspiration from Maco and McPherson, 2003's approach to generating random street segments [17]. Figure 1 showcases the six randomly generated segments on Bergamo's map. Some ground truthing was conducted before data collection on all the segments to check for their walkability and for the presence of street trees. While remote sensing data could be used to confirm the presence of vegetation , their accessibility within the right-of-way and management status, could not be inferred by NDVI and EVI maps. This study follows Pontius and Hallett's recommendation to include at least 100 trees in each community after sensibility analysis [18]. Sampling in Durham was based on the 2020 Triangle Bird Survey. The Survey's sampling resorted to 1.0 x 1.0 Km grid cells. Otherwise, sampling strategies in Durham and Bergamo were identical.

B. Tree health and management assessment

Tree health was measured using the Nature Conservancy and USDA Forest HTHC Index. HTHC approximates a variety of tree canopy metrics, including fine twig dieback, leaf discoloration, leaf defoliation, crown transparency, crown light exposure, and crown vigor. Fine Twig dieback refers to the percept of dead twigs in the canopy, expressed as an ordinal percentage with 5% intervals. Leaf discoloration approximates proportion of the canopy that has lost natural health coloring, while leaf defoliation represents the proportion of the canopy that is absent due to leaf material loss . Both leaf discoloration and defoliation are ordinal percentages with 10% intervals. Crown transparency refers to the percentage of clear sky that is visible across a tree canopy, expressed as orderly percentage with 5% intervals. Crown transparency and leaf defoliation may by conflated, because they both reflect canopy leaf loss. However, leaf defoliation refers to biomass loss on the present leaves, while crown transparency is a proxy for the leaves that are absent from the crown. Light exposure indicates the sides of the canopy that receive direct sunlight, expressed as an ordinal five-point Likert scale, with 0 as an acceptable value. All the above-mentioned variables should be considered from each of the tree sides first and then averaged across the whole tree. In conclusion, crown vigor is a composite measure of all the variables above. Aside from leaf health, crown vigor reflects broken branch presence and other visible damages. Crown vigor is a five-point Likert scale, with 1 representing maximum vigor and 5 indicating tree death. Variable indexing changes according to species, considering the way different trees express the abovementioned variables in the different ways.

One of HTHC's key shortcomings is that it only takes crown health into consideration. Because a tree's overall health is composite variable of trunk health, root health, soil health, and a host of other parameters [19], some additional variables were measured independently of HTHC. Diameter at breast height (DBH) was measured as a continuous variable for one- stemmed and multi-stemmed trees [20]. For multi-stemmed trees, I measured DBH for the five largest stems, starting from the one with largest DBH and moving clockwise. In the analysis phase, I produced an average DBH measure for the whole tree. When the trunk was not accessible, DBH was collected as an ordinal variable as an estimate of diameter, with 5-inch intervals in Durham and 5 cm. intervals in Bergamo. Unit measure differences depended on equipment availability in the United States and Italy. While the Duke Nicholas School's Clark Lab provided me with an inch DBH tape, I could only retrieve metric measurement instruments in Bergamo.

All measurements converted in metric units during the analysis phase. The presence of root decay and fungal conchs was each measured as binary variable. We noted any other additional damages, like trunk gashes, epicormic branches, trunk sprout, and resprout collected as field notes for each tree. Management practices were inferred via cues to care [21]. Cues to care (CTCs) were instrumental in assessing tree management practices' orderliness and cultural sustainability [21]. As per Nassauer's orderly frames and cultural sustainability theory, environmental interventions only succeed if they are legible to the residents who enjoy them [22]. CTCs are visual signals that contribute to environmental interventions' legibility. Therefore, taking note of CTCs allowed me to make sense of management practices and relate them to tree health conditions. Pruning was listed as a categorical variable, with specific options including flush cuts, hat racks, pruning to collar, and bark tearing was possible. Only pruning to collar represented a healthy pruning practice for the trees. Mowing, staking, mulching, the presence of protections at tree base, and gator bags (a form of irrigation) were all listed as binary variables. Because of their relevance to management practices, both land use and soil imperviousness were measured, both as categorical variables. For trees planted on impervious soil, percent impervious soil cover was also measured as an ordinal variable with 25% intervals. Irrigation was also presented as a categorical variable , with the possible values of passive irrigation, human irrigation, sprinkler, or water hose. Other values were included in the variables once new irrigation techniques were encountered in the field. Finally, ground cover was presented as a categorical variable, with possible values of impervious, shrub, tree, grass, and mixed ground cover types [23].

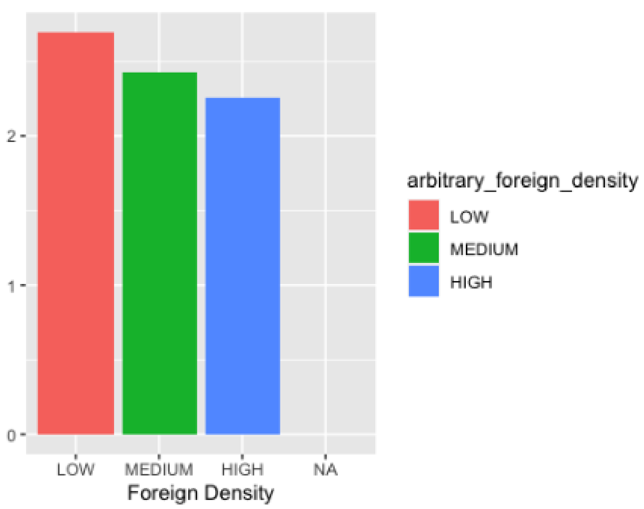

Fig. 2. Average crown vigor variation across different foreign-born resident density classes in Bergamo.

III. Results

An ordinal logit regression protocol was used to conduct a multi-factor analysis with crown vigor in the y position. Explanatory variables included foreign-born resident density, genus, species, DBH, land-use type, site type, ground cover, irrigation type , street proximity, sidewalk proximity, mulch presence, evidence of pruning, evidence of mowing, root decay, and broken branches. In this analysis, genus and species were considered together as a unique variable (i.e., scientific name), rather than separately. The month during which observations were gathered was included among the explanatory factors as an ordinal variable to introduce a temporal element into the model. The analysis exhibited residual variance and AIC values, 243.60 and 315.60, respectively. The coefficients for low and medium foreign-born resident density were 0.12 and -1.03 respectively. The species with genera with highest crown vigor appeared to be Lagerstroemia (7.63), Platanus (1.14), and Ulmus (0.49), while Fraxinus (-2.17), Gingko (-2.83), Notholithocarpus (-1.10), Pinus (-2.05), and Tilia (-2.64) exhibited a condition of relative suffering. Observations collected in late July seemed to exhibit a slightly higher crown vigor (0.20), compared to early June.

It appears that medium foreign-born resident density has a positive effect of 0.70 on crown vigor. Low foreign-born resident density exhibits a positive effect on crown vigor as well, with a coefficient of 0.21. The model has a residual deviance of 910.00 and AIC of 1030.00. Accuracy appears lower in this this cohort compared to Bergamo's. This phenomenon likely depends on the Durham cohort's larger size and higher number of categories in the Species variable. These results are consistent with those presented by the Bergamo cohort. A logistic regression fitted with Firth's method confirms the insight that crown vigor is lower where foreign-born density is low (-4.299 e+14) compared to the street segments with medium foreign- born resident density (-3.638 e+14). Both these results appear significant with significance level such as α = 0.99 (p < 2 e-16). The fitted model has an AIC value of 6, indicating higher accuracy compared to the unfitted regression. Magnolia seemed to be the only genus exhibiting lower crown vigor as an effect of foreign-born residential density. The finding that Ulmus crown vigor responds positively to increasing foreign-born resident density is consistent with findings from Bergamo, hinting to the genus' special adaptation to urban conditions.

In their 2014 study of visual tree health assessment techniques, Pontius and Hallett recommend developing a summary decline rating comprehensive of all HTHC pre-visual stress response indicators and compare the model's average z scores for each tree species. HTHC indicators were indexed into a summary decline rating model [18]. Leaf discoloration and crown defoliation were given a weight of 0.3, while foliar transparency and fine-twig dieback were assigned a weight of 0.2. Such depends on the lower accuracy exhibited by foliar transparency assessments relative to other measures and fine-twig dieback's low information density [24]. The summary rating suggests an insignificant relation between foreign-born resident density and crown vigor. On the contrary, crown vigor log odds increase in a significant way at medium foreign-born density levels. This result is significance, with α = 0.99. This result is consistent with the logit regression analysis results. HTHC indicator parameters were normalized across the entire cohort and were summarized as a z score for each specimen and indicator. z scores for each indicator were averaged for each specimen. Afterwards, average z scores were also averaged across each genus. It appears that highest average z scores values are exhibited by Amelanchier (shadbushes), Ginkgo (gingkoes), Cotinus (smoketrees), and Gymnocladus (coffetrees), while those with the lowest scores include Parrotia (ironwoods) and Tilia (lindens).

Alpha diversity was computed as a function of species abundance and sample size for the Bergamo and Durham cohorts. The Durham (α = 70) cohort was distinctively more diverse than Bergamo's (α = 18). The Durham and Bergamo combined sample's Jaccard beta diversity amounts to 0.90, indicating a high degree of diversity in species composition. The Bray-Curtis dissimilarity index (β = 0.99) and the Sørensen-Dice index (β = 0.18) confirm this finding . The two cohorts also share 8 overlapping genera, namely Lagerstroemia (crepe myrtles), Ginkgo (gingkoes), Pinus (pines), Acer (maples), Ulmus (elms), Fraxinus (ashes), Tilia (lindens), Platanus (plane trees), Magnolia (magnolias), and Carpinus (hornbeams). Common genera and species could be considered for further comparative analysis modules between the two cohorts. The only three genera unique to Bergamo are Ostrya (hophornbeams), Robinia (locusts), and Notholicarpus (tanoaks).

IV. Discussion

Bergamo is located in Italy's pre-alpine (or Piedmont) region (Ravazzi et al., 2007). The high-mountain vegetation, featured in the higher-elevation neighborhoods, consists of ancient spruce (Abes) forests and recent beech (Fagus) secondary succession forests, which formed as a consequence of spruce logging for the city dwellers (Ravazzi et al., 2007). The average temperature in summer between 1971 and 2000 is 22.8 C° (73.0 °F), while winter temperatures range from -1.1 C° (30.0 °F) to 6.6 °C (43.9 °F). Relative humidity ranges between 68 and 79 % throughout the whole year, and the annual average precipitation is 90.9 mm, with a constant range between 5.3 mm and 11.1 mm per month (Servizio Meterologico dell'Aeronautica Militare, 2015). Durham belongs in North Carolina's Piedmont megaregion (Doran and Golden, 2016). In spite of the similar names, the two regions have different climatic characteristics. Average maximum temperature in summer is around 30 °C and the minimum is around 10 °C. Average maximum in winter is around 20 °C, while the minimum is around 0 °C (Doran and Golden, 2016). Additionally, Durham showcases an average precipitation of 60-90 mm per month, except in Summer, when it can reach 150-180 mm per month (Doran and Golden, 2016). All considered, Durham, NC showcases greater seasonality than Bergamo, especially in terms of precipitation. However, neither city features temperature or extreme humidity, and dwells in the same value range for both variables.

Crown defoliation, leaf discoloration, foliar transparency, crown light exposure, fine-twig dieback, and crown vigor are all constitute pre-visual assessments of tree health [18]. The researcher's reliability in approximating a tree's health based on pre -visual responses vary due to stochastic effects at the tree and researcher level alike. In fact, pre-visual tree health assessment can be regarded as a mixed-random effect data collection protocol. In their 2014 on unintrusive street tree health assessment, Pontius and Hallett recommend relying on foliar transparency and leaf fluorescence as a pre-visual health assessment [18]. They integrated HTHC's picture labelling function with digital image processing procedures able to automatically assign foliar transparency values to pictures of street trees. Pontius et al. relied on Gap Light Analyzer to automatically compute foliar transparency values for HTHC collection [24]. These techniques would significantly improve foliar transparency measurement accuracy. In the future, studies like this should consider image processing software and machine learning modules to measure foliar transparency. Pontius and Hallett also recommend giving relative relevance to some of HTHC's indicators. For instance, because fine-twig dieback only showcases the effects of recent stress events, it should take a marginal role in assessing overall tree health relative to the other HTHC indicators [18].

It must be noted that one of this study's most important limitation is that crown vigor, the main independent variable, varies across different species according to seasonality. In fact, each species has a different live crown response to stress [18] . This consideration implies that crown vigor assessments cannot easily be compared across different tree species. Different species and cultivars have individual phenologies, which the researcher should integrate in their crown vigor assessments. Individual specimens change their outlook as a function of natural effects, such as seasonality. Seasonal effects are reflected over crown defoliation, leaf discoloration, foliar transparency, and fine-twig dieback. Because these parameters constitute the base-ground for pre-visual stress assessment, natural effects and stress-induced effects must be told apart carefully. Because of its inability to account for species phenology, crown vigor "is a coarse and subjective assessment of canopy condition" [18]. The HTHC software produces an index of all HTHC tree health indicators, hereby referred to as "HTHC health index". Personal communication with HTHC developer Dr. Hallett confirmed that, whereas the HTHC health index does account for seasonal effects on tree stress in general, it does not take species-level differences in stress response. To address this lack of species-level differentiation, Pontius and Hallett rely on an average response score for each species [18]. By averaging the scores of all the pre-visual response measures for each individual species, they obtain an overview of each of them. I modified this strategy by focusing on genus, rather than species, as shown in the results section. Whereas Pontius and Hallett's summary decline rating does offer some insights into how each genus responds to stress with higher accuracy than a traditional logit regression analysis, it does not reveal much about how each genus reacts to shared common conditions [18]. Expanding Pontius and Hallett's species-specific analysis into a year-long longitudinal investigation would produce insights about seasonality-related effects [24]. Reviewing existing literature on species- or genus-specific phenology in given regions would benefit research on stress response.

V. Conclusion

Low-income im/migrants represent one of the most marginalized groups in cities across the world. The United States and countries in the European Union are all interested with significant migration inflows, which put a pressure on real estate development and public service provision. As im/migrants enter mature urban social systems, they also find a place in existing privilege distribution schemes. In many

U.S. cities, low-income im/migrants join African American nationals in suffering public space segregation. Modern-day political discourse risks reproducing historical exclusionary policies. Redlining's legacy is, for example, still visible in the distribution, diversity, quality, and health of green spaces across Durham, NC. After all, im/migrants suffer from a sense of otherness that many political fronts across the U.S. and the European Union attribute them. Specifically, immigration has not yet found a normalized position in E.U.-level management policies, and national governance institutions appear to rely on an emergency approach that favors rapid relief over permanent solutions. Thus, im/migrants seem to have not yet found place in many Italian cities' social fabric. Bergamo's foreign-born population occupies the city's neighborhoods with lowest real-estate value and least access to public services. Albeit this occupancy pattern does not arise from intentionally segregating government provisions, it does limit low-income im/migrants in areas that feel homogenously isolated from public investment and societal attention. Urban green spaces reflect these exclusionary patterns. In both Durham and Bergamo, neighborhood foreign-born density relates in some ways to urban green space distribution, diversity, quality, or health. On average, areas with few to non- foreign-born residents seem to benefit from urban green space accessibility more than those with high foreign-born resident density. Whereas in Durham, Homeowners Associations are largely responsible for neighborhood-based urban green space care differentials, Bergamo's central governance is fully in charge of green infrastructure management across the whole city. Regardless, both policy arenas provide evidence of systemic exclusion of low-income im/migrants from ecosystem services in the city. Despite being often justified with the im/migrants' temporariness and lack of social stability, these exclusionary policy actions invariably follow socio-economic, religious, ethnic, and racial lines.

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