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Urban Transformation for Sustainable Growth and Smart Living: The Case of the Atlanta Beltline

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Abstract The Beltline project in Atlanta combines elements of urban greenway planning, parks and recreation, pedestrian and bike friendly trails, public transit, and other facilities connecting over 40 neighborhoods. This is bringing about transformative urban regeneration in those neighborhoods, with large-scale economic investments and growth in previously neglected areas and brownfields. The Beltline has generated considerable interest among urban scholars. However, most studies have focused on specific aspects of the Beltline development in detail. This study uses extensive literature review and analyzes census data while taking a comprehensive look at the following smart living perspectives: urban health and wellbeing, smart public transportation, economic development and brownfields, and managing affordable housing during neighborhood change. While the Beltline has brought about considerable growth and investment, and created city level green spaces and trails, the process has been accompanied by gentrification and displacement that has disproportionately affected the racial minorities and poor neighborhoods.

Keywords Atlanta beltline · Urban regeneration · Gentrification · Affordable housing · Trails and greenways

1 Introduction

In recent years there has been a renewed focus and increasing popularity of urban greening projects. These are envisioned to fulfil multiple objectives from transforming dilapidated neighborhoods, making inner city neighborhoods more attractive,

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bringing in investment in inner cities, encouraging economic development, promoting healthy living for residents by improving access to parks, green spaces and trails, encouraging more mixed-use development, increasing the value of inner city lands, and for promoting sustainable urban development. Some of these successful projects include The High Line in New York, the Promenade Plantée at Paris, Reading Viaduct at Philadelphia, the Bloomingdale Trail in Chicago, Los Angeles River Revitalization, The Midtown Greenway at Minneapolis, and the Madrid Rio in Spain.

Rarely has an urban planning project in the United States (U.S.) generated as much interest in recent times as the Atlanta Beltline; having a far-reaching impact on numerous quality-of-life aspects and providing extraordinary opportunities. The Atlanta Beltline is one of the largest urban greenway and redevelopment projects currently under implementation in the Atlanta metropolitan region in the State of Georgia (Fig. 1). The project visualizes transformation of 45 neighborhoods along an underutilized urban railroad stretching over 22-miles, developing a range of parks, trails, transit facilities, and attracting large-scale commercial, residential and mixed-use developments (Fig. 2). This ambitious project is estimated to have a total cost of $4.8 Billion and will be funded through a variety of public and private sources, including the Atlanta Beltline Tax Allocation District (TAD), the City of Atlanta, private investments, philanthropic contributions, county, regional, state and federal grants, and public private partnerships (www.Beltline.org). The overall purpose is to improve the quality-of-life of urban residents, improve public health outcomes by increasing walkability, create parks and greenspace, build a light-rail transit system in the longer term, and generate economic development that will revitalize Atlanta's inner-city neighborhoods.

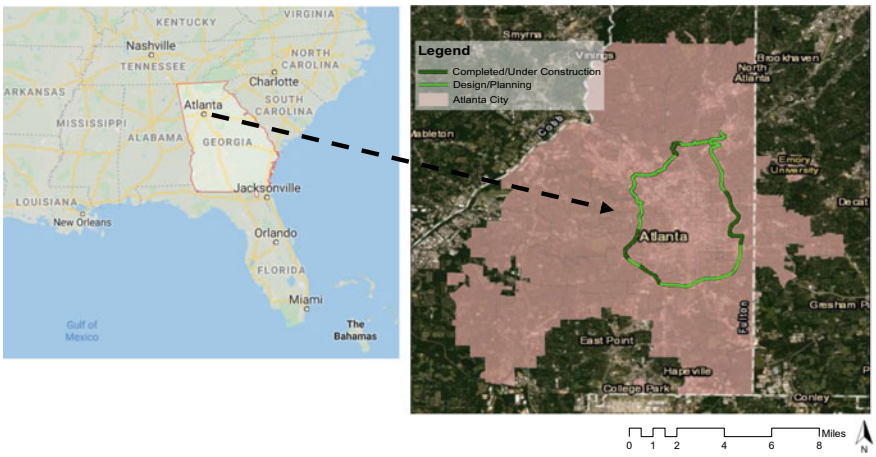

Fig. 1 Map showing city of Atlanta in Georgia (left), and the Beltline (right). *Source* Google maps 2019, ArcGIS Online 2019 (Esri, Digital globe, GeoEye, Earthstar Geographics, USDA, USGS, AeroGRID, IGN, and the GIS User community)

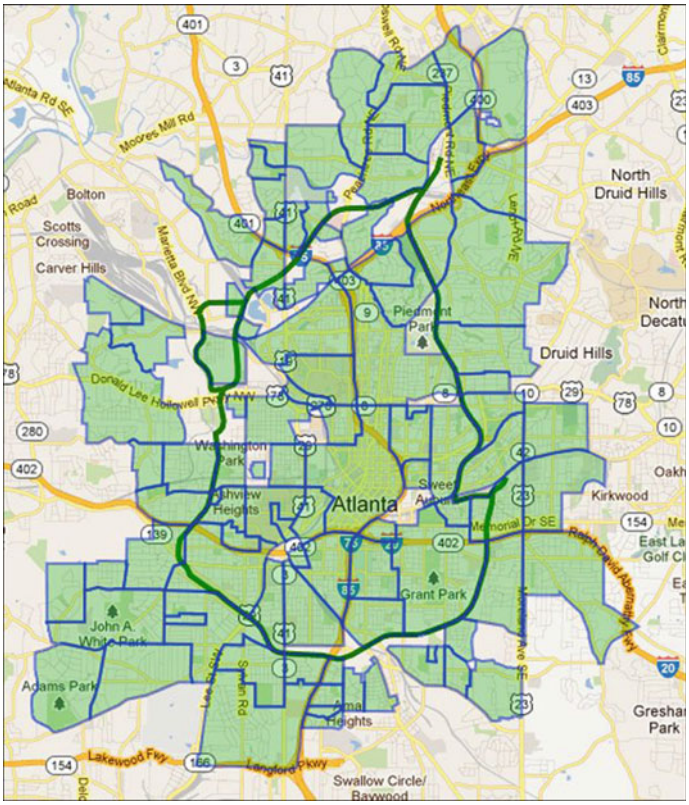

Fig. 2 Map of neighborhoods impacted by the Atlanta Beltline. *Source* Online GIS Map, Atlanta Beltline (accessed from https://beltline.org/map/?highlight=map), Google Maps 2019

The Beltline project was first envisioned in a Georgia Institute of Technology masters' thesis by Mr. Ryan Gravel, which proposed reusing the railroads to promote private market development of industrial areas, revitalize old streetcar neighborhoods surrounding the downtown, increase tax base by economic development on underutilized lands, create public amenities such as parks and trails, and create a diverse environment for communities to live together [1, 2]. In the two decades following the thesis publication and more than a decade since its construction started in 2008, several elements of the Beltline have already been built, with many of its greenways and parks being actively used by residents—including 8.7 miles of permanent trails, 412 acres of parks and greenspaces, 274 acres of remediated brownfields, and diverse affordable housing options. While the Beltline implementation is still in progress, the city is witnessing redevelopment and economic growth in several formerly depressed neighborhoods where the Beltline has been implemented or is planned. While the Beltline has been hailed for its transformative qualities and quality-of-life improvements, yet as common with many urban redevelopment projects, it has attracted its

fair share of criticism from scholars and the public over issues of lack of affordable housing, neighborhood displacement and gentrification.

There is substantial and growing literature examining its various facets. Most of the literature has examined its impact in detail on any one of the following aspects: housing, gentrification, public transportation, urban greenways, or other aspects. This book chapter undertakes a comprehensive literature-based assessment of the Atlanta Beltline project, bringing multiple aspects together in a single case study across four smart living perspectives, namely, (1) urban health and wellbeing, (2) smart public transportation, (3) economic development and brownfields clean-up, and (4) managing affordable housing during neighborhood change (see Fig. 3). Our methodology includes an extensive review of secondary literature from the fields, addressing the project from public health, urban planning, transportation, landscape, housing, and economic development perspectives. In addition, GIS analysis using census and other datasets is undertaken proving a snapshot analysis of socio-economic changes in the neighborhoods surrounding the Beltline over time.

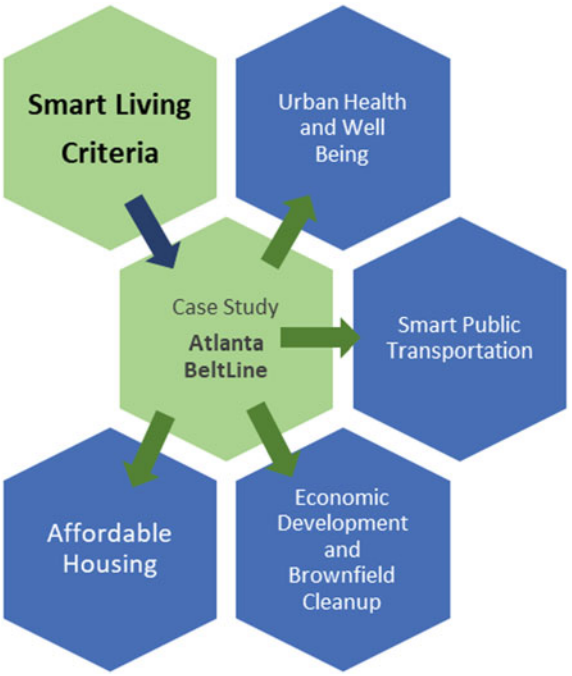

Fig. 3 Conceptualizing smart living elements for the Atlanta Beltline. *Source* Authors

2 Greenspace and Urban Health

The main objective of the Beltline has been to connect the neighborhoods along it through an extensive system of trails and parks. The Beltline is likely to increase Atlanta's greenspace by 40% and add nearly 1300 acres of new parks and gardens and about 700 acres of renovated park space over the next 25 years (www.Beltline.org). An extensive 33 miles of continuous multi-use trail system is being built to connect with over 40 parks (see Fig. 4). Many of the parks are already developed, and over 11 miles of trails have also been completed and opened to public. They not only provide environmental and recreational assets but are also catalytic for new economic development around them. Atlantans who depend on cars waste about 44 h delayed or stuck by traffic every year which can be linked to mental and physical health as well as poor air quality. Further, as per the CDC, 32.5% of adults were obese in the State of Georgia in 2018. The Beltline has the potential to improve Atlanta's health issues as a whole, including obesity. Trails can promote physical activity, improving health, and use of better-connected public transportation in the city can help improve air quality (Fig. 5).

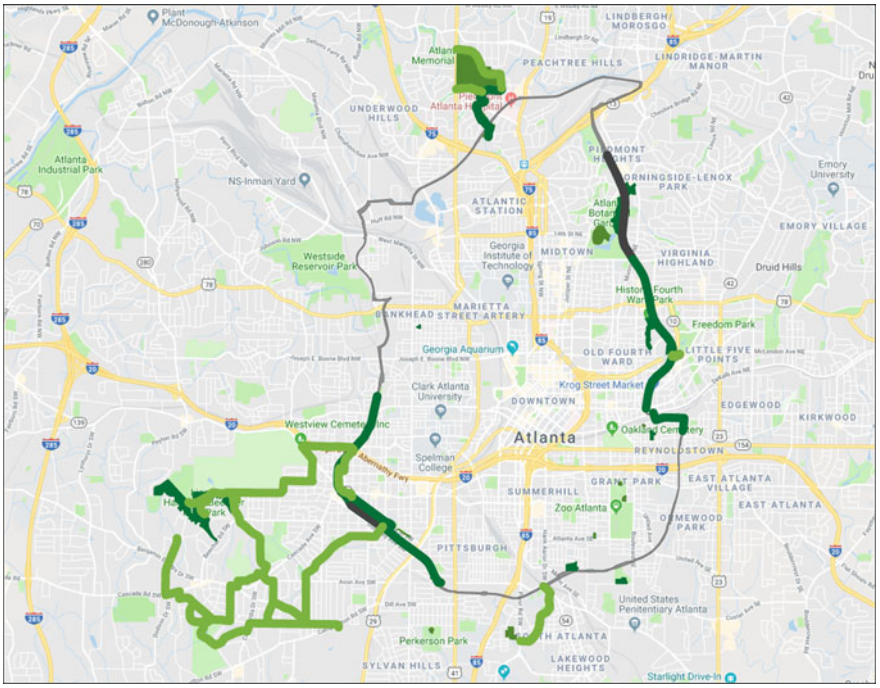

Fig. 4 Map showing inter-connected system of trails and parks in the Atlanta Beltline project. *Source* Online GIS Map, Atlanta Beltline (accessed from https://beltline.org/map/?highlight=map), Google Maps 2019

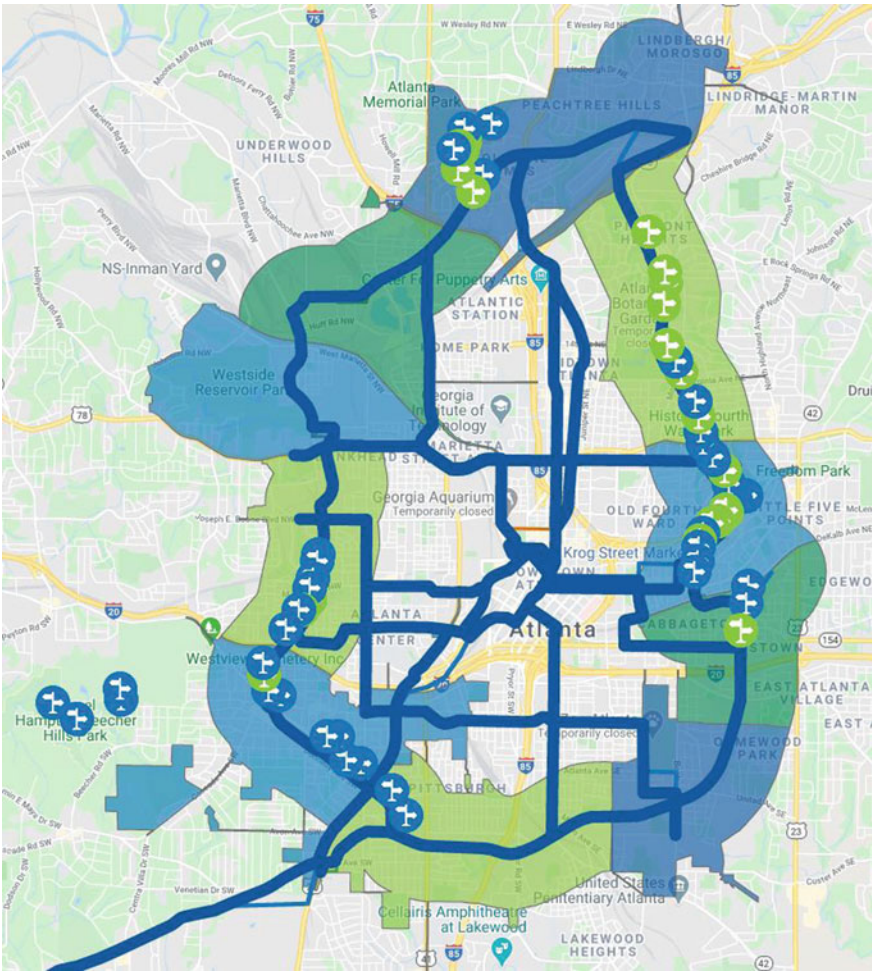

Fig. 5 Map showing subareas, streetcar network, and access points to greenways in the Atlanta BeltLine Project. *Source* Online GIS Map, Atlanta Beltline (accessed from https://beltline.org/map/?highlight=map), Google Maps 2019

The health benefits of urban greening are well recognized. The Health Impact Assessment (HIA) for the Atlanta Development Authority's Beltline Redevelopment Plan of 2005 anticipated and influenced the effect of the Beltline on health determinants. HIA can provide decision makers with recommendations to promote positive health impacts and mitigate adverse health impacts of proposed projects and policies. Key recommendations included prioritizing construction of trails and greenspace rather than residential and retail, making health an explicit goal in the project, adding public health professionals to decision-boards, increasing connectivity between the Beltline and civic spaces, and ensuring affordable housing. The

HIA was also cited while awarding an additional $7 million for brownfield clean-up and greenspace development [3, 4]. While it is anticipated that the Beltline will increase the number of park acres, it is also expected to increase the population around them. The HIA examined park locations and potential users and accessibility to determine the positive impacts and estimated that an additional 11,000 people will get park access. It suggested to increase access frequency to the trail system, increase accessibility of underserved neighborhoods, create regional creativity, and continuous transition between the transit and trail systems.

Barnes [5] surveyed members of the Beltline Health Proposal Committee (a collaborative effort between the Center for Disease Control and Prevention, Emory University, Georgia Institute of Technology, Georgia State University, the Atlanta Beltline Inc. and the Atlanta Beltline Partnership) and found that members believed that the group was a unique partnership of dedicated professionals sharing a common interest, but faced several challenges such as improving communication, resolving competing interests, and identifying a lead organization. He suggests transitioning to a Health Advisory Group, which can function as a formal organization that will review research proposals, conduct community-based participatory research, leverage funding, and disseminate key health findings.

Attitudes of residents towards Beltline urban greenway support have been studied. Palardy et al. [6] conducted a random survey sampling in the three neighborhoods (Southwest side, Northside, Eastside) and found that residents' support for greenways is not just related to their frequency of its use, but that it is based on more complex perceptions of the economic benefits it provides as well as social and psychological empowerment. They found that psychological empowerment is the strongest predictor for urban greenways. Residents are particularly sensitive to its impact on their pride and self-esteem, and recreation and tourism development have an important impact on the residents' identities. This suggests that variation in greenway design and aesthetics can reflect regional and geographic neighborhood identities and thereby become a tool for social empowerment and neighborhood cohesion. Keith and Boley [7] surveyed the same three neighborhoods and conclude that the residents were overall satisfied with the quality of the trail surface, cleanliness, and natural environment, but were especially dissatisfied with safety (both environmental and physical harm) and suggested adding more emergency call boxes on the trail.

Larson et al. [8] also examined public perceptions to greenway-related benefits in an urban context and found that while environmental benefits (such as cleaner air and water quality) are considered beneficial by people, the cultural benefits (such as economic impacts, social connectivity) or experiential benefits (such as attractive scenery, recreation) were valued and recognized more. The benefit perception also varied across different geographic and socio-demographic contexts. Greenway users were more responsive to experiential benefits regardless of location, because interaction with nature has direct heath impacts on the welfare of users. Keith et al. [9] surveyed users on the Eastside trail and found that exercising and escaping the stress of city life were top motivations, and safety and security were rated as top concerns particularly among women and racial/ethnic minorities. Authors found that many users accessed the trail by foot or bicycle and engaged in a variety of trail-based

activities. Cultural benefits linked to social interaction and community connectivity were also widely acknowledged. 32% of visitors to the Eastside Trail were minorities, which also indicated social and nature-based motivations. They suggest that planners can utilize these results to identify strategies for maximizing greenway-related benefits among diverse groups of potential trail users. The location of the greenways and the users' expectations of the benefits needs to be considered by the urban planners and park managers to maximize the utilization of these public amenities targeted for a diverse range of potential users. These greenways offer benefits ranging from stress reduction, socializing to nature-related outdoor experience, along with providing experiential and cultural benefits which as suggested by the research are the most important benefits that the trail visitors associate with. Greenways would be able to improve the urban quality-of-life of a diverse population if the planners can effectively connect the functions and benefits of the trail.

However, evidence of actual health improvements as a consequence of the Beltline seems to be lacking. Dai et al. [10] studied geographic disparities in social determinants of health around the Beltline using an Urban Health Index (UHI) approach for the years 2000 and 2010. They found that there is a gradual improvement in the overall social determinants experienced by Atlanta as shown by a narrow disparity ratio and increase of average UHI. However, they suggest that these improvements may have occurred due to gentrification, leading to displacement of disadvantaged groups, rather than due to actual amelioration of disparities. The Southwest neighborhoods that had low social determinants of health deteriorated more as compared to the Northern neighborhoods of Atlanta. Their research highlights that with revitalization efforts in a city, disparities continue to persist. Tyler [11] examined the birth outcome data and social indicator variables for the pre-Beltline (2002–07) and post-Beltline (2008–12) periods and found that overall there was an improvement trend in birth outcomes, but only a decrease in premature live births in exposed areas and fetal mortality in unexposed areas were statistically significant. Overall, they did not find significant improvements in birth outcome with proximity to the Beltline. Similarly, Fischer [12] found that exposure to traffic-related air pollution was generally the same on and off the Beltline, and there were no noticeable differences. This is contrary to the estimate of the health impact assessment that air pollution in Atlanta will decrease by 2030 due to redevelopment of residential areas and improved transit. However, since the development of transit has not yet started along the Beltline, full impacts in air quality improvements are yet to be seen.

3 Urban Transportation

Atlanta's obsession with the traffic perhaps only matches Los Angeles among comparable American Cities. Atlanta has prioritized auto-dependency and sprawl, and has had some of the worst transportation policies as compared to other cities [13]. The Atlanta Beltline will connect 45 Atlanta neighborhoods using a 22-mile loop of trails, parks, and eventually a streetcar system that will be built on existing abandoned

railroad tracks. At the core, the Atlanta Beltline is a transit project. A regional light-rail transit system is proposed to be developed in the long term, utilizing the old and defunct railroads to implement a new regional transit that would connect Atlanta's neighborhoods (Fig. 4). Ironically, these railroads of the Atlanta Beltline are symbolic of segregation of the city by race as it once served [13]. The 22-mile Beltline streetcar corridor will be part of a 50-mile integrated streetcar network. This system will also connect to the downtown and the crosstown lines as well as MARTA stations across the city (www.Beltline.org). The Beltline's Health Impact Assessment [4] recommended that transportation improvements should complement alternative travel modes (including MARTA) and pedestrian safety routes improvements in rapidly growing areas, ensure safe routes to school within the Beltline to encourage children to walk and bike to school, implement a coordinated fare and scheduled system for existing and new transit, and people-oriented priorities to address needs of pedestrians, bikers, and transit users in land use regulations. It also recommended access to the Beltline transit system, and new housing and population growth need to be focused near transit stops.

Two major efforts have advanced transit on the Atlanta Beltline: (1) City voters overwhelmingly passed a $0.05 sales tax in 2016, which will fund 16 MARTA projects, including approximately $1.2 billion in funding for Atlanta transit projects. This plan improves connectivity, accessibility, and mobility, and will also bring about significant economic development opportunities across the city–region. (2) Federal NEPA studies also support the Atlanta Streetcar System Plan (SSP) which focuses on connecting neighborhoods to key destinations and activity centers, and establishes criteria for advancing streetcar corridors by evaluating project readiness, equity, value, funding, and ridership. The SSP includes 50 miles of new streetcar routes and 12 miles of connected transit, which includes investment in other forms of public transportation to provide additional connectivity to the streetcar system.

The Atlanta Beltline project has the potential to improve connectivity for pedestrians and cyclists. Cardoni [14] examines the potential of the Beltline to strengthen integrated bike and pedestrian network connectivity using data from a smartphone app, Cycle Atlanta, and surveys. In 2012, the Atlanta bike network was 60 miles long but had little connectivity between them as they were far apart and few. The author identifies several opportunities to improve pedestrian and bike network connectivity which can have a high impact on the overall city transportation, and recommends that Atlanta should explore guidelines for future development on how streets can be redesigned with critical street connections and large bicycle network facilities in order to integrate the Beltline to the city fabric successfully. Kanchik [15] examined select features of the built environment that are related to physical activity using walkability data collected for the Atlanta Beltline. The author carried out a micro-scale analysis of pedestrian walkability features, and found that Beltline segments with a bus stop showed the highest presence of active people (26.3%), followed by segments that had broken/boarded windows/vacant buildings/homes at 21.21%. Surprisingly, streets with shady trees had the lowest presence for active people at 17.99%.

Recent blogposts on *Curbed Atlanta* give some insight into public opinion related to the Beltline. Users are also raising safety concerns over allowing the use of e-scooters. While earlier the Beltline was known for restricting motorized vehicles, now hundreds of e-scooters zoom pass pedestrians and weave in and out of traffic.[1] The city recently passed an ordinance to create a "reduced speed zone" which limits their speed to maximum 8 miles per hour during the busiest hours, weekends and holidays, and implement a "dockless vehicle etiquette" to prevent people from parking them anywhere on the trails.[2]

However, people are much more concerned that transit is taking a backseat in the Beltline development that seems to be more focused on parks and trails. They are frustrated that it might be another 20 years before light-rail tracks are laid, now that the Beltline concept is already 20 years old without any tracks being built. They feel as if 'special interest projects' have been prioritized over transit, even though transit was one of the highlights of the Beltline in the first place when people voted for the sales tax increase.[3] A march was organized in the Historic Fourth Ward, and the activist group Beltline Rail Now! (BRN) believes the rail line will be fully built by 2030.[4] Metro Atlanta's new regional transit authority called The ATL released a list of 76 projects related to expanding the transit system in the city. Building light rail transit for all of the 22-mile Beltline is included in that list, along with MARTA commuter rail lines and bus rapid transit routes in several counties. It is estimated that $15 billion is required to implement every project, but it is debatable if that will actually happen.[5] BRN members have been advocating with the Atlanta Regional Commission to speed up the rail line process, ensure that rail along the entire Beltline remains on the agenda, prioritize transit investment in areas that need connectivity and economic growth rather than affluent areas, and demand better public engagement and transparency by MARTA.[6] An online poll showed 73% support for the transit component for the Beltline, and Ryan Gravel, credited with the original Beltline

[1] "Do E-scooters disrupt Atlanta's vision for the Beltline?"' dated 8/23/19. Online resource https://www.ajc.com/news/scooters-disrupt-atlanta-vision-for-the-Beltline/8FCEZsvOUSRHgsGAbfFw6H/#.

[2] "New city program aims to crack down on Atlanta Beltline e-scooter behavior" dated 6/20/19. Online resource https://atlanta.curbed.com/2019/6/20/18692756/slow-e-scooters-8-mph-Beltline-eastside-trail.

[3] "MARTA: Atlantans don't want just any transit on Beltline—they want light rail" dated 4/10/18. Online resource https://atlanta.curbed.com/2018/4/10/17214302/marta-atlanta-Beltline-transit-rail.

[4] "Beltline march planned next month to call for implementation of transit, pronto" dated 9/23/19. Online resource https://atlanta.curbed.com/2019/9/23/20880356/atlanta-Beltline-march-rail-transit.

[5] "Ambitious project list unveiled for metro Atlanta's regional transit plan" dated 9/26/19 online resource https://atlanta.curbed.com/2019/9/26/20885049/project-list-metro-atl-board-rail-marta.

[6] "Beltline rail advocates to MARTA: We want better transparency, better public engagement" dated 7/12/18 Online resource https://atlanta.curbed.com/2018/7/12/17564106/Beltline-rail-marta-tsplost-transit-expansion.

idea in 1999 has also called for transit progress.[7] These efforts have led to over $570 million (of $2.7 billion) from MARTA to be used for 15 miles of light rail tracks,[8] which is an increase from the 7 miles of Beltline transit earlier approved but considered insufficient.[9] In-spite of these efforts, it remains to be seen how long it will take for the Beltline transit to be fully built.

4 Brownfields Clean-Up and Economic Development

The clean-up of urban brownfield sites for economic redevelopment has been a popular strategy in old industrial cities of the western world since the 1980s. The impetus behind brownfields clean-up is to create more land in inner-city areas for commercial and residential uses, as opposed to pushing urban development further into greenfield areas outside the city. While brownfield clean-up programs aimed to improve environmental conditions in unused and contaminated industrial sites and create land in inner-cities for revenue-generating urban uses, improvements in quality-of-life of urban residents through urban greening projects are widely practiced in brownfield redevelopment projects. By the 1990s, the majority of cities in North America and Europe focused on comprehensive strategies for brownfield redevelopment with funding from federal or national governments, as well as state and local governments. Examples of these successful brownfield redevelopment projects can be seen in Toronto [16], Pittsburgh [17], New York [18], Chicago [19], Atlanta [20], London [21], Berlin [22] and other major cities. Most of the brownfield redevelopment projects from these cities, on one hand, achieved overall success in transforming underused and derelict land parcels, creating more spaces for employment generation, innovative urban design, and place making ideas to create a new image and sense of place, and increasing up-scale residential and entertainment facilities. On the other hand, they faced criticism for instigating gentrification and the displacement of existing low-income and vulnerable populations. The challenge, thus, remained on how to redevelop brownfield without compromising on social sustainability indicators.

In more recent times, the concept of brownfield redevelopment is applied to create more integrated spaces having a mix of residential, affordable housing, commercial, and office areas as well as green spaces inter-connected with trails and natural areas. Such concepts are aligned with overarching sustainable goals of promoting smart

[7] "Poll: How important is a transit component for the Atlanta Beltline's future?" Dated 3/21/18. Online resource https://atlanta.curbed.com/2018/3/21/17148272/transit-atlanta-Beltlines-future-ryan-gravel.

[8] "Beltline transit advocates lobby ARC for help with trailside rail" dated 4/9/19 and 10/5/18. Online resources https://atlanta.curbed.com/2019/4/9/18301839/Beltline-transit-arc-light-rail-streetcar and https://atlanta.curbed.com/2018/10/5/17940638/Beltline-transit-advocates-more-marta-board-revised-approved.

[9] "MARTA transit plan includes 21 miles of light rail" dated 5/15/18. Online resource https://www.ajc.com/news/local-govt-politics/atlanta-transit-plan-includes-miles-light-rail/i82gtczJk7826JemL087rJ/.

living in the twenty-first century. Our case study of the Atlanta Beltline corridor is no exception to this model of brownfield redevelopment that aims to transform under-utilized land parcels and overall promote smart living at the regional scale.

The Beltline project envisioned an investment of about $20 billion over 25 years of time to bring about significant new businesses, jobs, and other economic development opportunities in the redeveloped areas. In addition to billions of dollars of investment, the Beltline is expected to create 30,000 permanent jobs and 48,000 construction jobs over the years that can further boost the local economy.[10] The purpose of the Beltline project was therefore much more than just providing amenity or a trail system, rather stimulating more holistic economic growth and development opportunities in the inner core of the city and creating more attractive mixed-use communities with better quality-of-life. Public perception studies also supported how economic and cultural benefits of greenways are valued and recognized more by residents than only the health and environmental benefits [8]. To promote economic development opportunities, redevelopment of old industrial and brownfield sites became a prime focus in the Beltline project.

Much of the area along the Atlanta Beltline project intersects with industrial lands and under-utilized brownfield parcels. Since 2005, more than $1 billion has been invested for new private developments that also involved transformation of many brownfield sites (www.Beltline.org). For this transformation, a tax increment finance district was created, implemented in the Atlanta Beltline as Tax Allocation District (TAD, see Fig. 6). TAD was expected to leverage the increase in property taxes paid by the landowners as the consequent of redevelopment and would eventually be used for covering the costs of public amenity. TAD served as an instrument to help fund its own cost by capturing the value that Atlanta Beltline will be generating over time. The investment on the renovations of infrastructures, most visibly being Gargantuan Sears and Roebuck building into Ponce City Market among others, really helped reposition Atlanta's market conditions. Through the investment on these types of infrastructures, the older areas of the city including the obsolete districts were revitalized [2].

This effort of brownfield redevelopment succeeded over time with joint efforts and collaborations between multiple stakeholders: City of Atlanta's Brownfields Program, the Environmental Protection Agency (EPA), City of Atlanta's Office of Planning, Georgia Tech, and Invest Atlanta. An environmental evaluation study of the Beltline corridor in 2005 provided an inventory of 1100 acres of land for brownfield remediation. Further comprehensive analysis of 3200 acres of brownfield sites was initiated in 2010 with brownfield planning grants provided by the EPA. Prime properties, such as the former State Farmers Market and Allene Avenue Urban Farm site, were identified for redevelopment, and land acquisition started shortly after that. In 2011, $850,000 was allocated by the City of Atlanta's Brownfields Revolving Loan Fund (RLF) to facilitate quantifying levels of pollutants and contaminants from past industrial activities along the future Eastside Trail of the Beltline and cleaning them

[10] "Atlanta Beltline Tax Allocation District Feasibility Study." EDAW. 2005.

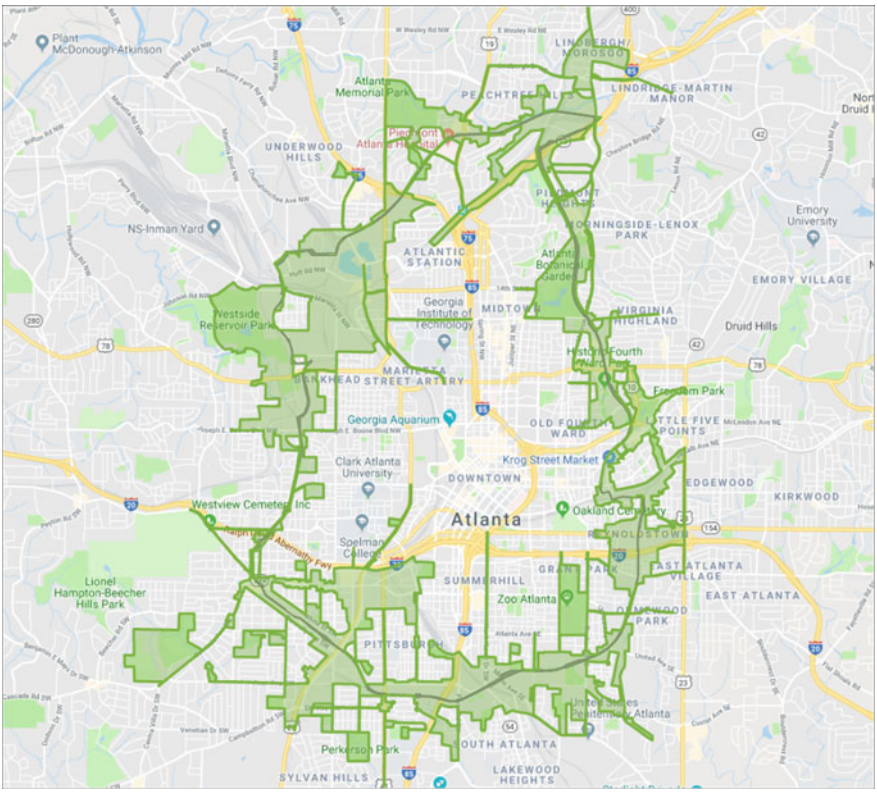

Fig. 6 Map showing tax allocation districts in the Atlanta Beltline project. *Source* Online GIS Map, Atlanta Beltline (accessed from https://beltline.org/map/?highlight=map), Google Maps 2019

up before trail construction started. Parts of the Westside Trail construction started in 2015 with similar efforts of environmental clean ups (Beltline.org).

Following many successful projects of brownfield clean-ups, trails, parks, greenways, and mixed-use development projects started to spur in the old industrial sites resulting in local economic growth and development. To access the impacts of such brownfield cleanup and economic development projects along the Atlanta Beltline, we selected the census tracts adjoining the Beltline (see Fig. 7). Socio-economic datasets for these census tracts are collected from U.S. Census Bureau for two time-periods: (1) Year 2000—before the implementation of the Beltline project, and (2) Year 2017—the most recent time period for which data is available. This time span captures more than a decade of the Beltline project implementation phase, and as a result generates some key insights on socio-economic changes that have been witnessed in neighborhoods adjoining the Beltline. We extensively mapped these datasets using ArcMap 10.6 and socialexplorer.com to assess the socio-economic

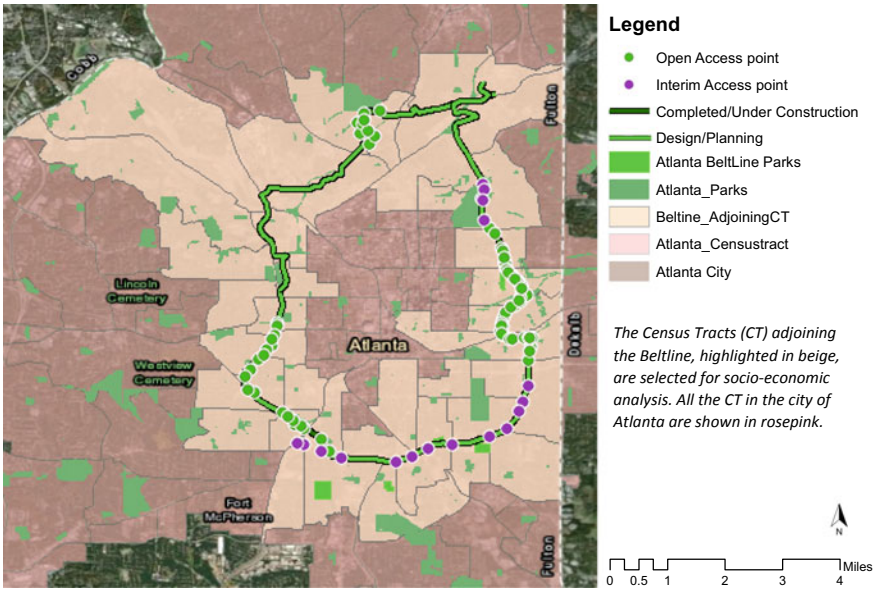

Fig. 7 Map showing the census tracts adjoining the beltline for socio-economic analysis. *Source* ESRI, Digital globe, GeoEye, Earthstar Geographics, USDA, USGS, AeroGRID, IGN, and the GIS User community (obtained from ArcGIS Online 2019)

changes over time. The economic development aspect of the Beltline project is analyzed based on changes in four indicators:(i) Income and Educational Level, (ii) Housing Market, (iii) Racial distribution, and (iv) Poverty level.

4.1 Changes in Income and Educational Level

Income and Educational level across the census tracts (CT) adjoining the Beltline witnessed different levels of variations in between 2000 and 2017. We collected data on Median Household Income and % of population with a bachelor's degree or more to analyze this. Some CT did not witness much change in these levels while some CT witnessed significant changes. We identified 10 census tracts, where there has been some significant increase in income and educational levels (see Figs. 7 and 8 and Table 1). It is also observed that these are mostly the CT where the Beltline is either completed or under construction, as well as the majority of access points to the Beltine are already open to the public in these areas. The CT where the Beltline is in the planning stage did not witness such high levels of income and educational attainment changes.

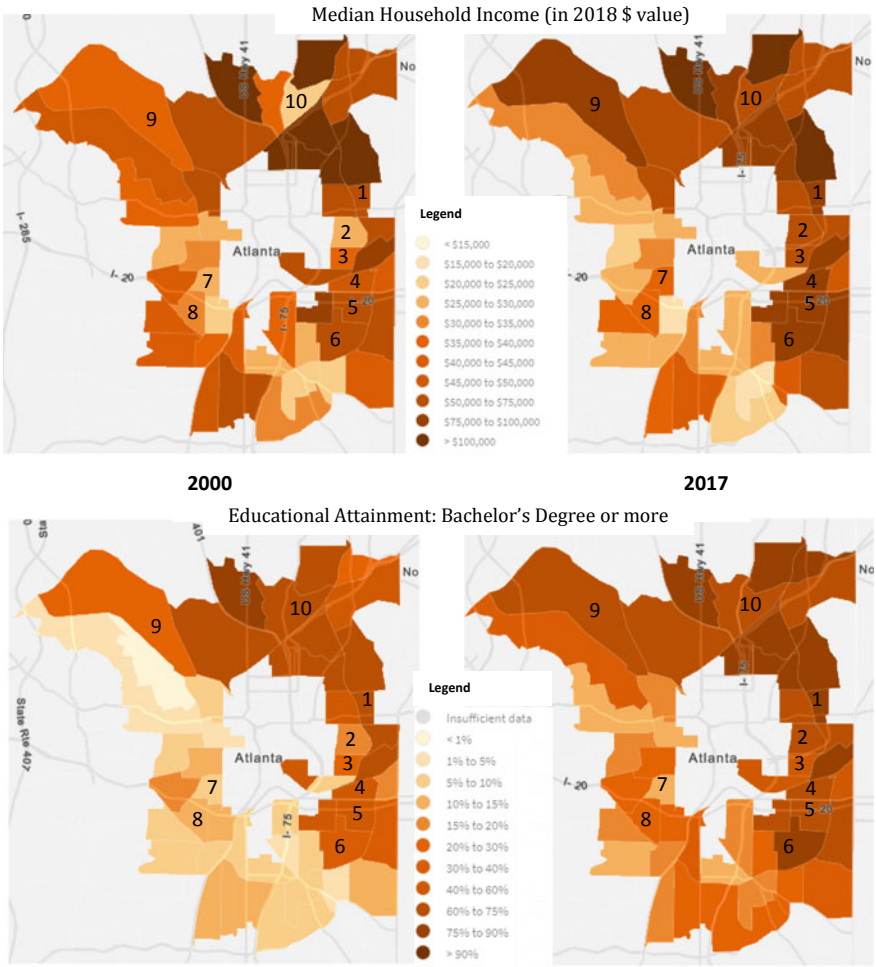

Fig. 8 Changes in income and educational levels along the Beltline. *Source* Authors, data obtained from Socialexplorer.com

4.2 Changes in Housing Market

Housing Market has drastically changed between 2000 and 2017 in those 10 CT as well, that observed a significant increase in income and educational levels. The 10 census tracts we identified mostly witnessed a drastic increase in two indicators—median housing value as well as median gross rent. Census Tract 17 specifically witnessed a 193% increase in housing values from $129,701 in 2000 to $381,068 in 2017, after all values were adjusted for inflation to 2018 $ values. Gross rent in this CT also shot up by 126% from $623 to $1411. A few of the CT that observed decline in the housing market, e.g. Census Tract 14, only witnessed moderate or

Table 1 Changes in the income and education levels

		Median HH income		Educational attainment			
		2000	2017	Gr. Rate (%)	2000 (%)	2017 (%)	Gr. Rate (%)
1	CT 14	$69,714	$88,438	26.86	69.88	77.14	10.39
2	CT 17	$27,071	$61,533	127.30	17.08	61.87	262.24
3	CT 29	$39,816	$64,650	62.37	28.34	58.09	104.98
4	CT 32	$48,684	$86,406	77.48	41.89	65.27	55.81
5	CT 50	$59,733	$81,182	35.91	44.53	68.81	54.53
6	CT 53	$59,191	$95,734	61.74	36.65	76.04	107.48
7	CT 39	$28,213	$37,056	31.34	7.31	14.10	92.89
8	CT 41	$32,856	$39,458	20.09	13.49	21.55	59.75
9	CT 88	$39,433	$97,853	148.15	22.36	63.63	184.57
10	CT 91.02	$24,963	$55,495	122.31	62.54	70.99	13.51

Sources U.S. Census Bureau Decennial Census 2000, ACS 5-year estimate 2017 (all $ values are adjusted for inflation to 2018 values)

low levels of decline. Again, the CT adjoining the completed portion of the Beltline and with more numbers of public access points, specifically the eastern completed portion of the Beltline, are the ones to observe such changes in the housing market (see Figs. 7, 9 and Table 2). Decline in Housing Market can also be observed in the western parts of the Beltline where the project is still in its design phase or has not been implemented yet.

4.3 Changes in Racial Distribution

The Beltline project runs through many of the African American majority neighborhoods that traditionally were underinvested and in poor conditions. Hence, many of these neighborhoods had a high concentration of African American population, and lower concentrations of White or other racial groups. We collected data on % of African Americans and % of White population to analyze the changes in racial makeup in these census tracts (CT). The majority of the predominantly African American neighborhoods were in the western portion of the Beltline in 2000, while the CT along the eastern portion of the Beltline also had a significant amount of African American population. Many of these started witnessing a declining share of the African American population after the creation and implementation of the Beltline project (see Fig. 10 and Table 3). This trend is also correlated with an increasing share of the White population in the same areas. Not only the share but also the absolute number of African American population has declined, and White population has increased respectively. Census Tract 17, for example, again witnessed a decline of

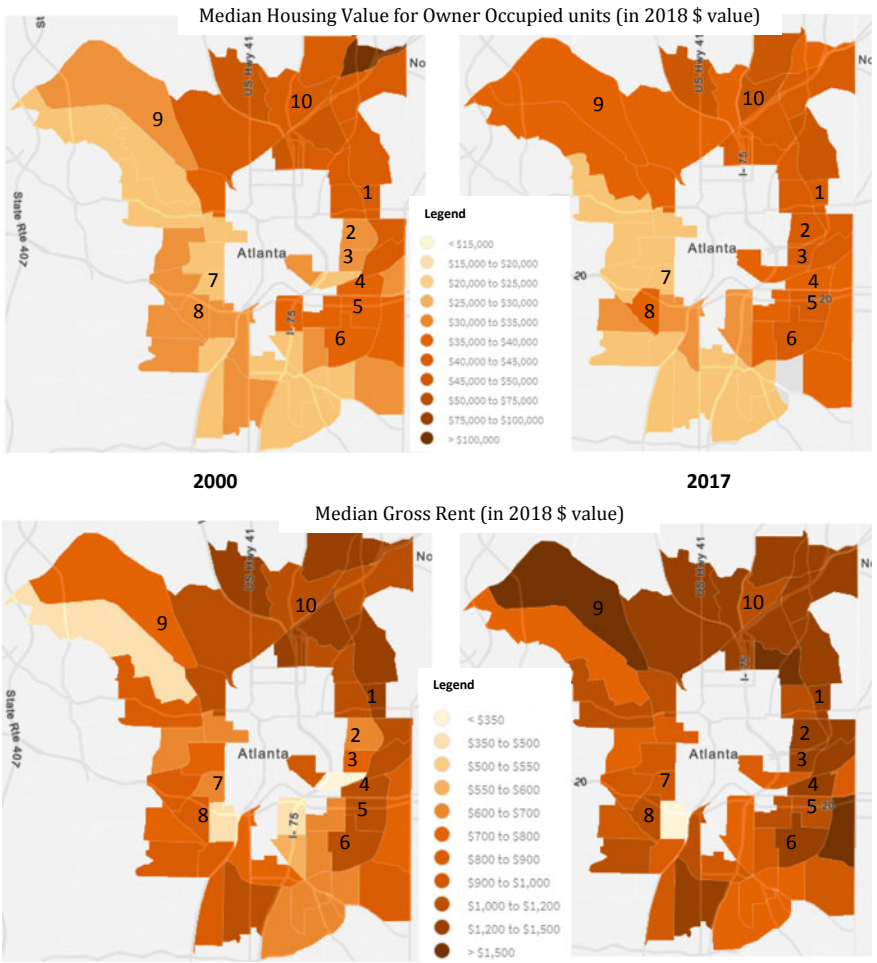

Fig. 9 Changes in housing values and rents along the Beltline. *Source* Authors, data obtained from Socialexplorer.com

African American population from 83 to 45% in between 2000 and 2017, and an increase of White population from 14 to 47% during the same time period. Census Tract 14, on the other hand, was a predominantly White neighborhood in 2000 with only 12% African American population and 84% White population. Neighborhoods such as this witnessed even higher decline of African American population in absolute numbers. This indicates a strong trend of ongoing gentrification and changing racial distribution of these areas close to the Beltline project. The western portion of the Beltline, still in its planning phase, has not yet witnessed such a dramatic change of its racial makeup.

Table 2 Changes in the housing market

		Median housing value			Median gross rent		
		2000	2017	Gr. Rate (%)	2000	2017	Gr. Rate (%)
1	CT 14	$462,506	$397,663	−14.02	$1268	$1246	−1.74
2	CT 17	$129,701	$381,068	193.80	$623	$1411	126.48
3	CT 29	$147,394	$303,011	105.58	$747	$1310	75.37
4	CT 32	$188,629	$234,275	24.20	$1073	$1333	24.23
5	CT 50	$280,896	$336,508	19.80	$1120	$1160	3.57
6	CT 53	$281,773	$329,849	17.06	$1070	$1267	18.41
7	CT 39	$87,588	$62,794	−28.31	$619	$930	50.24
8	CT 41	$115,371	$179,676	55.74	$826	$1067	29.18
9	CT 88	$123,120	$292,050	137.21	$779	$1550	98.97
10	CT 91.02	$347,720	$571,090	64.24	$1097	$1066	−2.83

Sources U.S. Census Bureau Decennial Census 2000, ACS 5-year estimate 2017 (all $ values are adjusted for inflation to 2018 values)

4.4 Changes in Poverty Levels

Consistent with the above indicators, poverty levels have also changed in many of the CT along the Beltline. We used two datasets, % of African American population living below poverty and % of White population living below poverty, to analyze the poverty trends (see Fig. 11 and Table 4). While it looks like poverty level has decreased among the Black population in many of the CT along the Beltline, it is the absolute number of African American people living below poverty that has decreased significantly. This can be indicative of gentrification trends where people living below poverty were displaced by increasing housing values and rent in these areas. The poverty level among the White population also shows some changes. However, it must be noted that the absolute number of White populations living below poverty levels are negligible compared to the African American population in these CT.

5 Neighborhood Gentrification and Affordable Housing

Strategic infrastructure investment has emerged in recent years as one of the key catalysts for urban revitalization among global cities in developed countries [23–26]. A consequence of this vitality is gentrification: the inevitable loss of affordable housing due to rising property values and rent, displacement of low income and minority resident neighborhood populations, who are supplanted by affluent, young professional newcomers who are usually white [27, 28]. Associated with gentrification-induced change is place-making that includes desirable facilities such

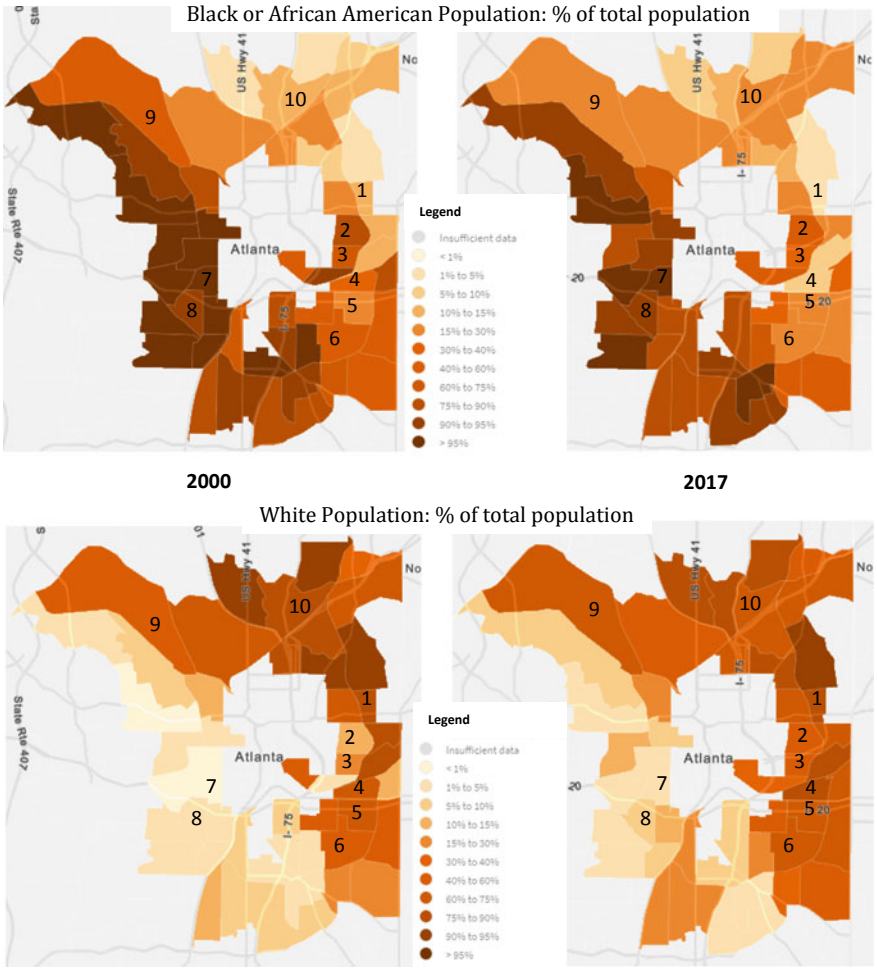

Fig. 10 Changes in racial mix of population along the Beltline. *Source* Authors, data obtained from Socialexplorer.com

as parks, urban trails, improved public transit and bike lanes—all positive attributes that enhance livability in urban areas. What confounds planners and decision makers is the outcry by longtime residents captured by Saunders (2018) in the caption "*Now that the neighborhood is nice, why do I have to move*?" [28].

This question is at the vortex of urban revitalization intensity along the Atlanta Beltline corridor. As anecdotal evidence began to emerge in the formative years of the Beltline project exhibiting some elements of traditional gentrification characteristic effects—displacement and loss of affordable housing—the city sought to develop programs and strategies to strike a balance for positive transformation [2, 4, 13]. How has this interventionist/proactive approach worked to make Atlanta a livable

Table 3 Changes in racial mix of populations

		% Black or African American population			% White population		
		2000 (%)	2017 (%)	Gr. Rate (%)	2000 (%)	2017 (%)	Gr. Rate (%)
1	CT 14	11.69	3.11	−73.40	83.66	87.55	4.65
2	CT 17	83.16	45.28	−45.55	14.01	47.44	238.62
3	CT 29	73.97	36.90	−50.11	20.48	54.80	167.58
4	CT 32	33.18	9.42	−71.61	62.02	78.01	25.78
5	CT 50	27.12	22.70	−16.30	64.29	72.63	12.97
6	CT 53	52.25	24.79	−52.56	43.40	66.68	53.64
7	CT 39	98.23	97.98	−0.25	0.33	1.15	248.48
8	CT 41	94.11	90.79	−3.53	2.03	7.24	256.65
9	CT 88	48.72	21.99	−54.86	41.49	67.70	63.17
10	CT 91.02	14.39	22.69	57.68	80.08	62.88	−21.48

Sources U.S. Census Bureau Decennial Census 2000, ACS 5-year estimate 2017

city for all its residents? This section interrogates both the strategies and evidence to date as it relates to Atlanta.

Atlanta's homeless people are mostly African-American men. However, the number of homeless single mothers and children have also elevated since the 2008 recession. Vacant properties and abandoned homes in Atlanta's worst neighborhoods have been an urgent issue, with the city spending over $5.7 million annually in services, lost property taxes, and neighborhood depreciation. The city's efforts through criminal courts to compel slumlords and absentee owners to repair and maintain the houses has proven unsuccessful, expensive, and time-consuming [13]. Beltline's Equitable Development Plan includes minimizing displacement for stabilizing neighborhoods, as well as preserving their historic and cultural character, as important guiding principles. The Beltline has been critiqued for giving too much emphasis to economic development and not having enough focus on affordable housing. Approximately 560 units of affordable housing have been supported by the Beltline. About $15–20 million of Tax Allocation District revenue funding commitment has been made for additional affordable housing construction, and 265 additional units are planned for 2017 (www.Beltline.org).

Low income communities had concerns over economic displacement but nevertheless supported the Atlanta Beltline from the beginning. The project brought in financial tools that could help counterbalance these financial pressures. The Tax Allocation District (TAD), defined with the inclusion of housing subsidies, was one of the key attempts to tackle affordability, and the legislation allocated 15% of TAD revenues towards housing affordability. This helped in funding grants for preserving affordable housing and to assist in down payments [2]. Neighborhood conservation was one of the Atlanta Beltline's core concerns as the neighborhoods were wary for

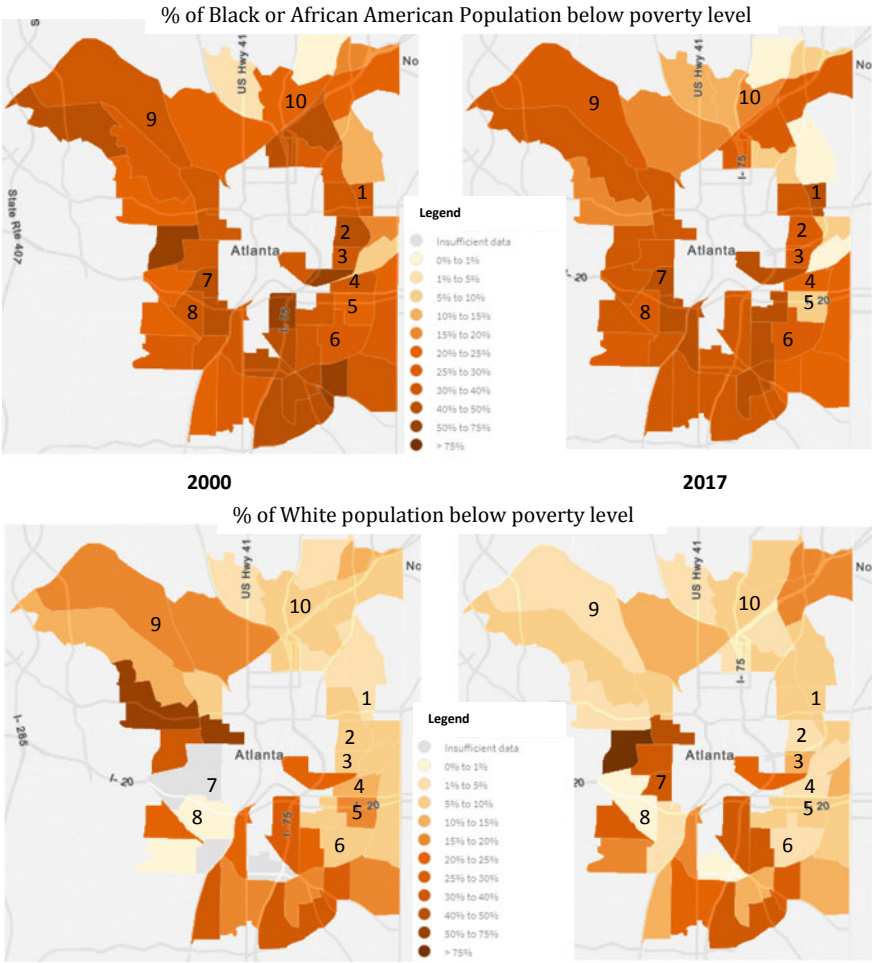

Fig. 11 Changes in poverty level along the Beltline. *Source* Authors, data obtained from Socialexplorer.com

unfavorable transformation and were highly aware about protecting themselves, not from changes themselves, but to "protect their opportunity to leverage that change in their advantage," [2]. The project's original proposal promised them that single family housing areas would be protected from high-density developments through zoning, and that neighborhood revitalization would happen through infill housing on vacant lands and commercial and cultural districts in appropriate areas [2]. The Health Impact Assessment (HIA) recommended that housing should be built to suit the needs of diverse groups of the population and encourage diversity, and to reduce the impact of increasing property tax assessment on lower income families to prevent displacement issues by establishing policies and programs [4].

Table 4 Changes in poverty levels

		Poverty level: black or African American			Poverty level: white population		
		2000 (%)	2017 (%)	Gr. Rate (%)	2000 (%)	2017 (%)	Gr. Rate (%)
1	CT 14	32.15	49.30	53.34	2.98	5.21	74.83
2	CT 17	41.34	28.11	−32.00	9.49	2.56	−73.02
3	CT 29	36.16	25.37	−29.84	6.51	10.25	57.45
4	CT 32	33.69	22.17	−34.19	14.42	3.08	−78.64
5	CT 50	24.21	5.48	−77.36	17.55	8.14	−53.62
6	CT 53	27.61	29.69	7.53	8.94	3.61	−59.62
7	CT 39	41.42	41.23	−0.46	NA	31.03	NA
8	CT 41	36.57	29.98	−18.02	0.00	0.00	na
9	CT 88	36.25	29.63	−18.26	18.83	1.99	−89.43
10	CT 91.02	21.33	15.94	−25.27	9.57	8.07	−15.67

Sources U.S. Census Bureau Decennial Census 2000, ACS 5-year estimate 2017

Redevelopment largely spurred due to the Beltline has resulted in a "reverse white flight" leading to an increase of 35,000 population over 5 years as young people started moving back to the city from the suburbs to avoid long distance driving and enjoy walkable lifestyles [13]. Much of the land with abandoned buildings and parking lots was bought by speculators with the announcement of the Beltline project. The Beltline attempted to provide affordable housing through 15% TAD funds allocation, which resulted in $8.8 million from the first bonds. Funds were used to provide housing assistance to families earning a maximum of $68,300 with good credit. Investment of over $400 million went toward high-rise apartment construction within a block of the Historic Fourth Ward Park within two years, and $775 million worth of retail and residential investments within the half mile of the Eastside Trail. An affordable housing ordinance was passed in the spring of 2016 which required for developers receiving public funds to provide 15% of new units to people making 80% of the Area Median Income (AMI) or 10% of the new units to people making 60% of the AMI. A similar inclusionary zoning mandate was introduced for all new multifamily housing in the TAD despite no public money involvement. However, Ryan Gravel and Nathaniel Smith, founders of the Partnership for Southern Equity, resigned from the Atlanta Beltline Partnership Board in September 2016 to protest lack of focus on affordable housing and equity issues, and too much focus on fund-raising [13].

In the early stage of the project, Immergluck [29] examined home sale data between 2003 and 2005 to assess the impact of the Beltline announcement on low-income neighborhoods and found substantial speculation and gentrification as the outcome of redevelopment that resulted in the displacement of low-income households due to TIF. The increase in premiums were higher for homes near lower-income,

Southside parts of the Beltline TIF district, which corresponds to the initial media coverage of the plan. The Anti-Displacement Tax Fund that was created to offset the increase in taxes for homeowners greatly underestimated the number of eligible residents and costs, as it only estimated 400 residents to be eligible for the program [30]. The authors estimated that the program cost over 20 years will increase drastically as compared to initial projection with the increase in the number of eligible homeowners and larger property value appreciation rates.

In their recent research Immergluck and Balan [31] conclude that while the Beltline will most likely be considered a success in increasing both recreation and Atlanta's property tax base, those lower-income residents who live near current Beltline projects are negatively affected economically. The Beltline is bringing in development, craft breweries, restaurants, and luxury apartments, but displacing original communities by triggering sharp increases in home values in low-income and largely African-American communities in the southwest segment. Their study found that median sale prices in some neighborhoods increased 68% from 2011 to 2015. They suggest that in the rest of the project's development, there should be more effort to provide affordable housing options accessible to lower income households and help existing residents remain in these neighborhoods. Our analyses of the changing housing market along the Beltline also support similar trends of gentrification and decrease in availability of affordable housing along the completed portions of the Eastside as well as some parts of the Westside trails (see Fig. 9). The African American communities are also adversely affected by the success of the Beltline projects, whose population has significantly decreased in many neighborhoods (see Figs. 10 and 11 and Table 4).

Understandably, public opinion on the Beltline has been split between both positive and negative. Weber et al. [32] surveyed neighborhoods along the Beltline and found that it was seen to have positive development connotations such as park development, places for outdoor recreation, property value appreciation and neighborhood business development, but it also worsened the negative connotations such as crime, traffic, property taxes, litter and vandalism. Responses varied in different neighborhoods—Northside neighborhoods responded positively to the impacts (recreational benefits) as compared to Southwest neighborhoods (economic development opportunities). Their results also indicate residents' concern over gentrification and crime associated with greenways. Hsieh et al. [33] finds that the prospect of increased property values generally resulted in residents' support for the Beltline, which was seen as a sustainable smart city initiative bringing positive impacts. However, according to the "homevoter hypothesis", public support may be adversely impacted as some people (such as parents of school-going children) might not support the tax incremental financing (TIF) mechanism. TIF would allow Atlanta to divert future increase in tax revenues towards the development of the Beltline from other important sectors such as public education system.

6 Housing Affordability

Housing affordability remains a daunting challenge for the Beltline development corridor a decade later, following implementation in 2006. Only 785 affordable units had been provided, a far cry of the 5600 affordable housing targeted[11], prompting Brian McGowan, Beltline CEO to acknowledge a "C grade performance" for the period. Significantly, Beltline brain trust, Gravel, and Paul Morris, original Beltline CEO have since resigned over the housing affordability issue [13]. A key factor for poor performance has been a rise in real estate values. According to the 2017 Georgia Tech Study, the Beltline corridor and its environs experienced a rise in property values between 17.9 and 26.6%. This finding is consistent with our own analysis noted previously (Fig. 9). The undeniable fact is that gentrification is inducing displacement, exclusion and unaffordability, particularly in traditional neighborhoods which have been overwhelmingly African American. Consequently, lack of housing options remains a hotly-contested issue along the Beltline corridor.

To counteract the challenge of housing affordability, the following measures have been either recently implemented or proposed. First, an inclusionary zoning ordinance was promulgated citywide in 2018 requiring developers of all residential rental developments consisting of ten (10) or more new dwelling units to set aside at least the following:

- 10% of their units for incomes at or below 60% of Area Median Income (AMI); or
- 15% of their units for incomes at or below 80% of AMI; or
- Pay a one-time in-lieu fee, to be paid at 15% of AMI, per unit in the sub-area that the developer has chosen to opt-out of, in-lieu of setting aside affordable units (www.Beltline.org).

Secondly, Atlanta's mayor, Keisha Bottoms, recently initiated a multi-pronged city-wide Housing Affordability Action Plan that aims, among other things, to "create/preserve 20,000 affordable homes by 2020, through minimized displacement, and leveraging $1 billion from public, private and non-profit sector" (www.Beltline.org). In addition, the non-profit, Westside Future Fund, initiated an Anti-Displacement Tax Fund, targeting predominantly African American neighborhoods on the Westside (CT 39 and 41) that are yet to experience Beltline development. This is a preemptive strategy designed to protect against speculation while seeking to preserve affordability for homeowners and renters. With a homeownership rate of only 8%, the Anti-Displacement Tax Fund seeks to freeze property taxes of qualifying homes owned by residents making the area median income or below, which may become unaffordable due to rising property values induced by speculative development along the Beltline. For renters, the Fund will purchase properties to boost availability and affordability. A recent study by researchers at Georgia Tech illustrates (see Table 5)

[11] "Atlanta's Beltline, a transformative urban redevelopment, struggles with affordability" dated 10/03/2017. Online resource https://www.curbed.com/2017/10/3/16411354/Beltline-atlanta-affordable-housing-development-high-line.

Table 5 Potential impact of westside future fund's anti-displacement tax

Neighborhood	Total residential properties	Homes eligible for fund	Percent of residential HH eligible (%)	WFF payments to eligible participants (2018–2014)	Total change in residential property taxes (2018–2024)
Ashview heights	524	140	27	$1,116,081	$3,986,969
AUC	148	20	14	$145,807	$1,390,661
English avenue	695	194	28	$876,141	$3,286,260
Vine city	682	206	30	$1,058,258	$3,291,830
Washington park	545	142	26	$1,016,126	$4,137,558
Total	2594	702	27	$4,212,414	$16,093,277

Source Adapted from Curbed[a], Property Lines

[a]"Atlanta's Beltline, a transformative urban redevelopment, struggles with affordability" dated 10/03/2017. Online resource https://www.curbed.com/2017/10/3/16411354/Beltline-atlanta-affordable-housing-development-high-line

the potential positive impact of the Anti-Displacement Tax Fund strategy.

While there is considerable development in the neighborhoods along the corridor, gentrification is leading to reduction in the affordable housing stock. It remains to be seen whether these renewed efforts will be sufficient enough to counteract development forces that have been experienced to date while delivering the promise of housing affordability. Evidence from other cities that have sponsored similar projects, for example the High Line in New York or Chicago's 606, suggests that the battle may have been lost already.

7 Conclusion

Based on a comprehensive literature-based assessment of the Atlanta Beltline project, under implemented since 2008, our study brings multiple aspects and impacts of the project together in one case study. Our assessment across four smart living perspectives, namely, urban health and wellbeing, smart public transportation, economic development and brownfields clean-up, and managing affordable housing during neighborhood change, shows that often the positive values of such large-scale and transformative urban regeneration and greenway programs are not much acknowledged. With various greenway, transportation, housing, and economic development projects already implemented, and an anticipated investment of $20 billion over 25 years of time, the Beltline has significantly spurred transformative urban regeneration in previously neglected areas and brownfields of Atlanta, GA. While considerable success of the Beltline can be asserted in form of financial investment, economic

growth, and addition of green spaces and trails; the process has nevertheless been accompanied by gentrification and displacement that disproportionately affected the racial minorities and poor neighborhoods in the recent times. It is also identified that economic, cultural, and experiential outcomes are just as important as health and transportation outcomes.

In case of the Atlanta Beltline, we observed changing priorities from planning implementation perspective, over time the planning projects focused more and more in creating recreational trails and developing urban parks while neglecting other important areas, such as the crucial light rail transit system and affordable housing projects. The inevitable consequences of such shifting priorities have been gentrification and displacement of the urban poor, specifically the minority African-American populations. Our socio-economic analyses of the selected census tracts surrounding the Beltline highlight these trends—increasing housing value and rent, decreasing African-American and increasing White populations, increasing income and educational levels, and changing poverty levels as a result of displacement of the urban poor in between 2000 and 2017. The current policies and programs within the city of Atlanta are not able to address these issues adequately, and further leading to complex social justice issues.

The story of the Atlanta Beltline, thus, resonates quintessential planning challenges witnessed in many contemporary successful projects across the United States—how to promote sustainable urban development goals that can benefit all? The economic cost-benefit analyses of the Beltline unquestionably portrays how a few specific groups of people, in this case the educated population with higher incomes who are also White in majority, benefit more from smart living ideas, such as having access to trails, greenways, parks, jobs and other economic and recreational opportunities that increasingly define the twenty-first century smart living paradigms. The quest for equitable distribution, social justice and the rights to the city, therefore, remains on. The question for future planning endeavors in smart living implementation that needs to be prioritized by policy makers is—how can the different urban sustainable development goals be balanced in these transformative urban projects?

References

1. Gravel R (1999) Belt line—Atlanta: design of infrastructure as a reflection of public policy. Master's thesis, College of Architecture, Georgia Institute of Technology
2. Gravel R (2016) Where we want to live: reclaiming infrastructure for a new generation of cities. St. Martin's Press, New York
3. Ross CL, de Nie KL, Dannenberg AL, Beck LF, Marcus MJ, Barringer J (2012) Health impact assessment of the Atlanta Beltline. Am J Prev Med 42(3):203–213
4. Ross CL, West H (2007) Atlanta Beltline health impact assessment. Georgia Institute of Technology
5. Barnes B (2011) A multi-vitamin for the built environment: exploring how a multi-sectoral and multi-institutional partnership links health and the Beltline. Unpublished thesis, School of Public Health, Georgia State University

6. Palardy NP, Boley BB, Gaither CJ (2018) Residents and urban greenways: modeling support for the Atlanta Beltline. Landscape Urban Plann 169:250–259
7. Keith SJ, Boley BB (2019) Importance-performance analysis of local resident greenway users: findings from Three Atlanta Beltline Neighborhoods. Urban Forestry Urban Greening 44:1–13
8. Larson LR, Keith SJ, Fernandez M, Hallo JC, Shafer CS, Jennings V (2016) Ecosystem services and urban greenways: what's the public's perspective? Ecosyst Serv 22:111–116
9. Keith SJ, Larson LR, Shafer CS, Hallo JC, Fernandez M (2018) Greenway use and preferences in diverse urban communities: implications for trail design and management. LandscapeUrban Plan 172:47–59
10. Dai D, Rothenberg R, Luo R, Weaver SR, Stauber CE (2017) Improvement of geographic disparities: amelioration or displacement? J Urban Health 94(3):417–428
11. Tyler A (2015) Built environment and birth outcomes: examining the exposure to the Atlanta Beltline and its effects on community health. Thesis, Georgia State University School of Public Health
12. Fischer A (2018) Quantitative analysis of traffic related air pollution along the Atlanta Beltline east side trail. Thesis, Georgia State University School of Public Health
13. Pendergrast M (2017) City on the verge: Atlanta and the fight for America's Urban future. Basic Books, New York
14. Cardoni L (2013) The Atlanta Beltline: the beginning of an integrated bike network. Unpublished Master's thesis, Georgia Institute of Technology
15. Kanchik M (2017) Geographic information systems analysis of walkability data for the Atlanta Beltline communities
16. De Sousa CA (2003) Turning brownfields into green space in the City of Toronto. Landscape Urban Plann 62(4):181–198
17. Ghosh S, Byahut S, Masilela C (2019) Metropolitan regional scale smart city approaches in a Shrinking city in the American rust belt—case of Pittsburgh, Pennsylvania. In: Smart metropolitan regional development. Springer, Singapore, pp 979–1021
18. Pearsall H (2010) From brown to green? Assessing social vulnerability to environmental gentrification in New York city. Environ Plan C: Gov Policy 28(5):872–886
19. Higgins J (2008) Evaluating the Chicago brownfields initiative: the effects of city-initiated brownfield redevelopment on surrounding communities. Northwest J Law Soc Policy 3:240
20. De Sousa CA (2004) The greening of brownfields in American cities. J Environ Plann Manage 47(4):579–600
21. Raco M (2005) A step change or a step back? The thames gateway and the re-birth of the urban development corporations. Local Economy 20(2):141–153
22. Altherr W, Blumer D, Oldörp H, Nagel P (2007) How do stakeholders and legislation influence the allocation of green space on brownfield redevelopment projects? Five case studies from Switzerland, Germany and the UK. Bus Strategy Environ 16(7):512–522
23. Bae C-HC (2002) Orenco station, Portland, Oregon: a successful transit oriented development experiment? Transp Q 56(3):9–18
24. Atkinson R (2000) Measuring gentrification and displacement in greater London. Urban Stud 37(1):149–165
25. Cervero R, Duncan M (2002) Land value impacts of rail transit services in Los Angeles county. Report prepared for national association of realtors Urban land institute. https://drcog.org/documents/TODvalueLosangeles.pdf
26. Chatman DG, Tulach NK, Kim K (2012) Evaluating the economic impacts of light rail by measuring home appreciation a first look at New Jersey's river line. Urban Stud 49(3):467–487
27. Dawkins C, Moeckel R (2016) Transit-induced gentrification: who will stay, and who will go? Hous Policy Debate 26(4–5):1–18
28. Saunders P (2018) The scales of gentrification. Planning magazine
29. Immergluck D (2009) Large redevelopment initiatives, housing values and gentrification: the case of the Atlanta Beltline. Urban Stud 46(8):1723–1745

30. Auerbach J, Barton H, Blunt T, Chaganti V, Ghai B, Meng A, Blackburn C, Zegura E, Flores P (2017) Using data science as a community advocacy tool to promote equity in urban renewal programs: an analysis of Atlanta's anti-displacement tax fund. Available at https://arxiv.org/pdf/1710.02454.pdf
31. Immergluck D, Balan T (2018) Sustainable for whom? Green urban development, environmental gentrification, and the Atlanta Beltline. Urban Geogr 39(4):546–562
32. Weber S, Boley BB, Palardy N, Gaither CJ (2017) The impact of urban greenways on residential concerns: findings from the Atlanta Beltline trail. Landscape Urban Plann 167:147–156
33. Hsieh L, Noonan D (2018) The closer the better? Examining support for a large urban redevelopment project in Atlanta. J Urban Aff 40(2):246–260

EDAW, Urban Collage, Grice & Associates, Funny, J., Hamilton, C., Budram, W., . . . Gravel Inc. (2005). Atlanta Beltline Redevelopment Plan. Atlanta: Atlanta Development Authority.