

The USA

Water management in Chicago and the Atlanta Beltline development

Green infrastructure development in the USA, as noted in [Chapter 2](#), has historically taken a water-centric approach. This is visible in the city-wide investment programmes in New York and Philadelphia, which framed their recent approaches to urban greening (Austin, 2014), but also highlights the links between landmark projects, such as the Emerald Necklace in Boston, and the influence of water management on green infrastructure planning (Fábos, 2004). Partially, this reflects the role that engineers and engineered solutions have played in landscape resource management, but may also illustrate a lack of cooperation between agencies, with the exception of some water-based projects, that has limited the effectiveness of landscape management practices (Benedict & McMahon, 2006).

Extending this view to current practice suggests that advocates in the USA now have a clearer perspective on what they consider green infrastructure to mean. Recent investment programmes focused on a rethinking of engineered solutions using green infrastructure, placing greatest emphasis on the control, management and quality of stormwater. How additional socio-economic and other ecological factors are brought into these discussions therefore varies. Furthermore, although we can argue that green infrastructure planning is becoming a more integrative process in its application, it retains a water-centric focus (Jaffe, 2010). This, in and of itself, is not a negative, as water management, especially in cities, is a crucial administrative, legislative and political issue. However, working from such a narrow perspective potentially limits the capabilities of city administrations, and the environment sector to effectively manage green infrastructure.

In spite of the perceived rigidity of green infrastructure planning in the USA, this has not limited its innovation in practice (Mell, 2014). A number of the most progressive forms of green space planning have come from the USA, including ecological greenway planning, and the rise of green roof technology and the promotion of sustainable urban drainage systems (SUDSs) in cities like Portland and Seattle (Ahern, 2013; Lerner & Allen, 2012; Rouse & Bunster-Ossa, 2013). All of which suggests that although American green infrastructure focuses mainly on water-sensitive issues, they have been able to think strategically about how these issues can be diversified.

This chapter extends this debate with an assessment of the investment programmes currently being undertaken in Chicago (Illinois) and Atlanta (Georgia). These two sites have been selected as they offer insights into how urban green space can be designed, delivered and managed. It examines how green infrastructure is

being developed in areas with different development histories, discussing whether the variation in application affects the long-term functionality of the resource base.

Chicago is discussed as it has engaged with a major programme of water-based green infrastructure that is integrating innovative responses to a number of socio-economic and political issues through landscape-based schemes. It has also been subject to fluctuating employment and economic stresses, which has impacted upon the city government's use of urban greening projects. Atlanta is presented as the city which has recently invested in a large-scale (city-wide) green infrastructure project, the *Atlanta Belt Line*, to facilitate an improved quality of life, as well as to enhance access to recreational and ecological resources. The scale of the Belt Line indicates a commitment from the city to invest in larger-scale urban greening, which can facilitate successful public-private partnerships (PPPs) for green infrastructure; a process which has not been witnessed in many cities in the USA. Both Chicago and Atlanta have taken cues from other US and Canadian cities (e.g. Boston and Toronto) to frame how they approach investment in urban greening.

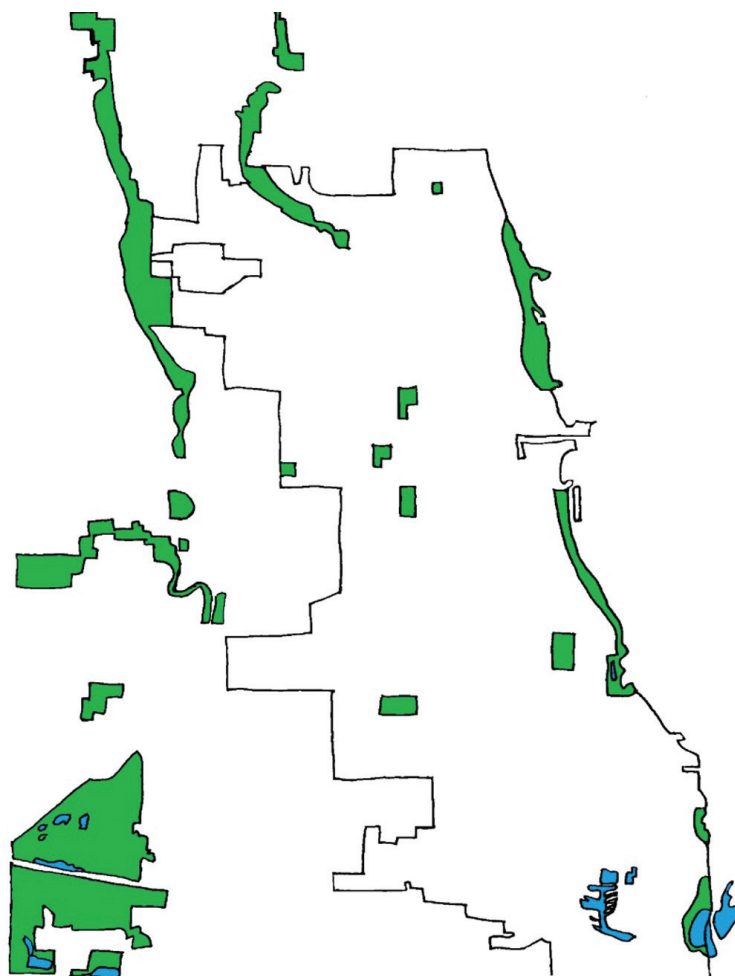


Figure 4.1 Chicago green infrastructure map.

4.1 Chicago: green infrastructure and watershed management in a high-density/high-need location

The city of Chicago is known for its weather. The misnomer that its location off Lake Michigan makes it the 'windy city' may be an urban myth, but the weather in the form of wind, rain and snow does shape how the city's administration manages its landscape. This is evident in the reporting of localised flooding by the Center for Neighborhood Technology (CNT) in Chicago, which argues that individual homes are becoming increasingly vulnerable to stormwater and snowmelt events (Center for Neighborhood Technology, n.d.). The CNT also proposed that increased vulnerability to stormwater events is aligned with socio-economic disparities, where areas of deprivation are proportionally more likely to suffer flooding. This has been exacerbated as Chicago has been subject to periods of suburbanisation and urban contraction, leaving tracts of land open for development at risk of surface water flooding (Wise, 2008). One reaction by local practitioners and government agencies has been to re-evaluate where development occurs, asking how the city can promote a more sustainable form of landscape management.

Flying into O'Hare International Airport over Lake Michigan illustrates this issue. The city's shoreline dominates its landscape, but what is also noticeable are the large number of sports fields and cemeteries that cover the northern and western sectors of the city. Large tracts of Chicago have thus been given over to active and passive activities which require green infrastructure support, yet there seems to be a smaller number of neighbourhood parks or green spaces.

To address the distribution and functionality of green infrastructure in the city, a number of projects have been implemented, with noticeable investment in 95,000 urban street trees across the city (McPherson *et al.*, 1997), the high-profile installation of a green roof on City Hall and the redevelopment of Grant Park, Millennium Park and the Maggie Daley Park complex. However, it is the city's approach to the delivery of coordinated stormwater and water quality management that have most frequently framed its approach to green infrastructure planning. The preparation of this has been identified as one of the key reasons why Chicago is seen as a national leader in the USA for investment in green infrastructure planning (Chicago Metropolitan Agency for Planning, 2014).

Like New York, Boston and Philadelphia, Chicago has a history of developing green infrastructure compared to comparably sized cities in the USA. As a consequence, Chicago is viewed by many as a forward-thinking and progressive location where cost-effective investment that addresses localised needs is discussed, ensuring that the landscape is not compromised to meet development objectives (Benedict & McMahon, 2006). It has, however, been suggested by a former Chicago planner that its successes have been relative to the lack of green infrastructure investment in other locations, and may not be as groundbreaking as they appear.

The distribution of Chicago's green infrastructure resource is, however, more spatially diverse compared to other North American cities and is framed in the east of the city by Lake Michigan: a water resource that spans over 22,300 km². One of the consequences of such a vast resource is that the corresponding terrestrial green spaces can seem insignificant in comparison. The layout of Chicago's green spaces

Figure 4.2 Millennium Park, Chicago.



Figure 4.3 Maggie Daley Park, Chicago.



suggest that a series of prominent green corridors can be seen extending from the city's core and can be identified as a key ecological network. However, the extent of these resources is only really evident when reviewed at a metro or sub-regional scale. Within the city limits there are a limited number of green infrastructure resources, which are predominately large city-scale parks, congregated along linear routes at the city limits, the shoreline or associated city-scale institutions such as the University of Chicago. At the neighbourhood level the location and functionality of green infrastructure is more variable, suggesting that access could be a significant issue in the promotion of use. Furthermore, although the network of green spaces at a metro and sub-regional scale provides a counterpoint to this, access to multi-functional spaces within the city remains somewhat restricted.

4.1.1 *Green infrastructure governance and management in the Chicago area*

Green infrastructure investment in the Chicago area (and that of the wider Chicago Wilderness area) is managed by a number of government bodies. These are aligned with the existing tiers of landscape and urban planning and illustrate how federal, state, county, metropolitan and neighbourhood governance influence green infrastructure development (Mell, 2014). The current structure in the Chicago area identifies four main tiers of government: the *federal*, linking the mandates of the US EPA and other government agencies; the *state*, the state of Illinois, as well as neighbouring Wisconsin and Indiana are key administrative and legislative leaders for the area and the Chicago Wilderness project; the *regional* with the Chicago Metropolitan Agency for Planning (SMAP) working with *local* government in the seven counties and 284 municipalities of the region. Each has a direct influence on how green infrastructure, and especially stormwater and flooding, are managed in the area. Additional agencies also hold important roles in developing strategic green infrastructure investment in Chicago; these include the Illinois Department for Natural Resources (DNR), the county-level forest preserves (e.g. Lake County Forest Preserve), as well as school and health districts.

The interaction of these agencies with the various tiers of government has generated a very fluid policy and governance environment within Chicago. While the Illinois DNR holds an overarching coordinating (and in some senses funding) role, it requires extensive support and collaboration from county and city agencies to create its strategic vision for the area. In some areas this has provided a fruitful relationship, as in the majority of areas in the Chicago Wilderness location. However, due to competing administrative and financial constraints there have been divergences in how different municipalities and county-level authorities deal with green infrastructure. For example, there are significant differences in how the administrations in Kane, DuPage and Cook County support green infrastructure. As a consequence, although Chicago has seen the publication of a range of policies and guidance documents discussing the value of green infrastructure development, there has been a more dynamic form of engagement from local planning authorities (LPAs) within some of the broader water and green space objectives proposed. However, documents such as the Biodiversity Recovery Plan (Chicago Region Biodiversity Council, 1999) for the Chicago Wilderness area, the 100-year vision for green and open space management in Lake County (Lake County Forest Preserve Department, 2014) and CMAP's GOTO 2040 Comprehensive Regional Plan for the Chicago metropolitan area (Chicago Metropolitan Agency for Planning, 2014) could all be viewed as (a) positively framing the development of green infrastructure; (b) outlining a strategic investment programme for stormwater investment; and (c) management of additional green infrastructure resources.

Assisting this process has been a federal decree from the US EPA allocating funding to state and metropolitan authorities, enabling them to invest in green infrastructure oriented stormwater management. This decree provided a catalyst for planning agencies to rethink their investment strategies, providing a platform for organisations like Chicago Wilderness to integrate ecological conservation priorities

such as ‘forest preserves’ into investment plans. Such a repositioning of approach has occurred because of the integration of environmental knowledge at the stakeholder level by agencies such as the Natural Land Institute based in Rockford (Illinois), the Lake County Forest Preserve or the City of Crystal Lake, with an alignment of engineering expertise to facilitate a more environmental direction to water management. As the Commissioner of Chicago Metropolitan Water Reclamation District (MWRD) stated, this has allowed engineers to ‘tiptoe into green infrastructure’ and meet CMAP’s proposal to diversify their approaches to environmental planning as ‘a one size process of investment in green infrastructure does not fit all’.

Furthermore, as green infrastructure has increased in visibility in policy and research there has been a corresponding uptake of its principles by environmental delivery agents. For example, following a merger of the Department of Environment (DoE) into the Department of Transport (DoT) in 2005 there has been greater emphasis placed on the role of CMAP to act as a conduit for green infrastructure advocacy. By working with the seven counties located around Chicago,¹ the relevant city administrations including the DoT and the Chicago Wilderness network have been able to promote liveability through increased water efficiency, increased investment in parks and open space, increased energy efficiency (including stormwater issues) and the generation of urban agriculture/food projects (Chicago Metropolitan Agency for Planning, 2014).

CMAPs development of a broad range of green infrastructure priorities help them to establish a forum to work more effectively with partners to assess local, community and city-scale benefits from a range of landscape projects. This has been successful because they have been able to effectively integrate the mandates of key delivery agencies, e.g. the Chicago MWRD, with the expertise of ecologists, landscape planners and engineers. As a consequence of this softening of approach, CMAP and its partners have achieved a much broader innovation towards green infrastructure and stormwater management that moves away from the existing concretisation of landscapes. Alternatively, they have approached investment through a more integrative approach to ecologically focused urban/water management, targeting investment at a landscape scale. They have also promoted a collaborative and multi-faceted integration of stakeholders which has seen the GOTO 2040 vision be supported by a cross-section of political and delivery focused agencies.

Table 4.1 Green infrastructure stakeholders in Chicago and the wider Illinois area

<i>Scale</i>	<i>Example</i>
Federal	USA Environmental Protection Agency, US Army Corps of Engineers
State	Illinois Department of Natural Resources, Illinois Environmental Protection Agency
Metropolitan/county	CMAP, Chicago MWRD, Cook County Forest Preserve
Municipality/district/ neighbourhood	Schools districts, City of Crystal Lake

4.1.2 *Green infrastructure policy and practice*

Despite its location on Lake Michigan, and unbeknownst to me until 2015, flooding dominates both planning and green infrastructure discussions in Chicago. Localised flooding, as a consequence of the city's inability to manage stormwater events, is seen by many green infrastructure practitioners as its most pressing environmental issue. Therefore, although Chicago is considered by many to be ahead of the curve in terms of investing in more efficient stormwater management, this is due to necessity, not necessarily proactive investment. The issue of stormwater is complicated by a divide in personal understandings of flooding compared to wider Chicago–Illinois narratives. Herein lays a central issue in management – who is responsible for identifying both the problems and solutions for stormwater management, and any subsequent investment in green infrastructure?

At the state level, Chicago Wilderness are the responsible agency tasked with producing guidance on water management and the conservation of biodiversity, and have focused investments, at least in part, on the enhancement of their regional-scale forest preserves. Chicago Wilderness is a regional alliance of over 300 community, public and private organisations that collaborate to enhance the connections between people, local places and the wider landscape. This extends to over 580 municipalities in the Illinois, Wisconsin and Indiana area. Since their formation they have worked strategically to address the following objectives: to restore nature to health, to protect green infrastructure, to mitigate climate change and to leave no child inside (Chicago Wilderness, n.d.).

Working at a strategic scale provides Chicago Wilderness and its affiliates with a range of delivery options to address green infrastructure issues. For example, they have been successful in working with local communities and municipalities in Cook County to preserve forest remnants in carbon storage and water management sites through their Forest Preserves programme (The Next Century Conservation Plan Commission, 2014). This programme was considered by the Commissioner of the Chicago MWRD as one of the most important, which has engaged engineers by linking the systems thinking inherent in that discipline with the wider network capabilities of green infrastructure. They have also worked with the Illinois DNR and private consultants to develop the Midlothian Creek Green Infrastructure mapping exercise, which aims to facilitate a programme of retrofitted stormwater management within a reassessment of transport-oriented mobility issues. Using a variety of SUDS, the partnership has looked to integrate major transport agencies (both rail and air) with alternative stormwater management practices to mitigate the potential flooding impacts of concretised landscapes. This plan is attempting to align the economic interests of businesses, particularly logistics companies (e.g. UPS), with greener forms of development and landscape management. It also aims to meet FEMA and MWRD stormwater requirements and has drawn down corresponding federal funding to facilitate investment. Furthermore, the Kishwaukee River Corridor Green Infrastructure Plan is planning for river corridor restoration at the landscape scale, and for urban sustainable drainage at the street/neighbourhood scale, to reduce pluvial flooding and decrease the costs to home owners and city officials in Rockford of such events.

Table 4.2 Green Infrastructure agencies and responsibilities in Chicago

Agency	Responsibility
Chicago Wilderness	Strategic planning and cooperation between legally responsible authorities (city and county government) in Illinois, Indiana and Wisconsin (545,000 acres of protected land and ten million inhabitants, 21 municipalities, federal/state/ planning agencies and 326 member organisations).
CMAP (Chicago Metropolitan Agency for Planning)	Metro planning agency working with the city and seven counties (Cook, DuPage, Kane, Kendall, Lake, McHenry and Will) to develop a strategic investment framework ' <i>GOTO 2040 Comprehensive Plan</i> ' for green infrastructure. Its key objectives are to increase water efficiency, more parks and open space, improved health and availability of local food and increased energy efficiency. The plan also proposes to preserve 250,000 acres of green space or extend/provide it to cover 400,000 acres by 2040. The plan also calls for an increase in accessibility to green space for residents from 49 per cent to 70 per cent.*
Metropolitan Water Reclamation Districts (MWRD)	Responsible for storm water management across the metropolitan area with a storage capacity of 18.25 billion gallons. They are key stakeholders in developing a range of water management projects including three reservoirs and the Deep Tunnel initiative, which promotes green infrastructure as part of the solution of hard/soft engineering (green roofs, permeable pavement, and vegetated swales at the roadsides, rain gardens and rain barrels). To do this they work with the Army Corps of Engineers, land owners and communities. They have also managed Watershed Management Ordinances (WMOs) from 2007 onwards, which aim to mitigate extreme weather events.

Note:

* Accessibility is defined by CMAP as the availability of a ten-acre site for every 1,000 people.

Each of the above projects illustrates, at least in part, how green infrastructure can be integrated in large-scale water management schemes. Moreover, Chicago Wilderness have stated that such projects (and the wider Wilderness Plan) presents an ambitious vision to increase the land cover of green infrastructure in the area by 1.5 million acres, and includes a key shift from impermeable water management practices to more permeable and greener approaches.

While Chicago Wilderness has worked extensively with stakeholders across a regionally significant spatial area, CMAP works more discreetly at a community level. The GOTO 2040 Plan (Chicago Metropolitan Agency for Planning, 2014) does, however, cover the City of Chicago and the neighbouring seven counties. They therefore have the responsibility to plan for a population of 8.6 million, which is expected to grow to 11 million by 2040, drawn from 284 communities. One of the primary objectives of the GOTO 2040 Plan is to increase the level of green infrastructure provision to all residents across the CMAP area, proposing 'a green infrastructure network that follows waterway corridors, expands existing preserves and creates new preserves in the region' (Chicago Metropolitan Agency for Planning, 2014: 43).

To ensure that green infrastructure is developed effectively, Chicago Wilderness have established a network of stakeholders to facilitate debate and delivery. One example is Strategic Water Analysis (SWAT), coordinated by Chicago Wilderness, where they have worked with the MWRD to model water catchment dynamics using a combination of green infrastructure and engineered solutions. Furthermore, CMAP have continued to work with the DoT and other agencies to address flooding at a city and sub-regional level, with the aim of increasing urban resilience. To achieve this they have engaged local technical assistance to develop watershed and comprehensive plans with local communities that identify strategies and investments for stormwater infrastructure, to support local governments in their attempts to attract funding and to offer guidance on how to direct investments in green infrastructure to support the environmental capacity of the area's river network. CMAP's role is therefore strategic in nature. However, this has enabled them to work with a range of stakeholders to influence the form that green infrastructure planning takes. It has also allowed them to link investments to the wider green space and water management issues of the wider Chicago area.

Moving from a strategic to a more urban-centred approach to green infrastructure investment, the Chicago MWRD acts as a conduit for engineers working with green space planning solutions. The MWRD work with a myriad, and often fractured, set of stakeholders to generate cost-effective and ecologically appropriate forms of water management.² Using a combination of large-scale engineered solutions, such as reservoirs, they manage 18 billion gallons of water in the region. However, following the EPA and federal decree that made it legal for funding to be allocated to green infrastructure, they have looked to more innovative solutions to address stormwater issues. Consequently, the MWRD have been able to promote green infrastructure investment in schools using SUDS, increased green space provision and urban agriculture programmes (e.g. Space to Grow). They have also worked with Chicago's DoT to instigate a permeable alleyways programme, and have been one of the lead agencies promoting Cook County's Forest Preserve programme.³ The reported benefits of these programmes are being cheaper and more cost-effective compared to hard-engineering programmes. Finally, the role of the MWRD has been as an advocate of a cultural shift in sectoral behaviour. They have worked extensively with engineers (including the US Army Corps) to negotiate a more positive dialogue between investments in ecological infrastructure and more traditional engineered solutions.

4.1.3 Stormwater/water resource management

From discussions with representatives of the Chicago Wilderness, CMAP and MWRD, it is clear that stormwater management is the main green infrastructure issue in Chicago. In 2013–14 the city developed and released the Five-Year Storm Water Plan which advocates for investment in parkways, street bioswales and low-level/-intensity green infrastructure as a reaction to localised flooding. With funds from the EPA, this was one of the first coordinated efforts to strategically plan green infrastructure across the city. Previously each district had developed their own stormwater plan, leading to a disjointed and in many cases personalised approach to management

that failed to (a) understand the value of cooperation and (b) to coordinate between areas that are essential in water management.

The scalar delivery of this programme can be identified across the wider CMAP GOTO 2040 plan area. Evidence of the shift in emphasis can be seen in a number of the business parks, schools and redevelopment of hospital complexes in the Chicago area. For example, the retrofitting of the Advocate Lutheran General Hospital Patient Tower saw an increase in water capture and retention through the creation of bioswales, rain chains and the use of extensive and semi-intensive green roofs. These investments were complemented with new gardens and publicly accessible landscapes to facilitate a sense of ‘peaceful respite for staff, patients, and family’. This was achieved through the design of ornamental rain gardens and a cascading water runnel leading to a public sculpture garden. Each of these investments are supported with signage that aims to raise people’s awareness of the links



Figure 4.4 Advocate Lutheran General Hospital Patient Tower (Park Ridge, Illinois).

between natural processes (rainfall) and landscaping functions (Conservation Design Forum, n.d.a).

A second example is the redevelopment of the AMCOL Corporate Headquarters, which led to the award of an LEED Silver Award for innovative landscape design and stormwater management systems. The site's design altered stormwater routes on-site and specifically looked at integrating permeable paving throughout the parking lot to aid the distribution of excess water through pavement/sidewalk cut-throughs into bioswales and a managed wetland/prairie system. To ensure that the site is able to adapt to the climatic variations of Illinois, native species were used which can withstand seasonal changes. In addition, the site has attempted to highlight the movement of water on-site to increase employee awareness of environmental resources, especially where it feeds into rain gardens and green roofs (Conservation Design Forum, n.d.b).



Figure 4.5 AMCOL International Corporate Headquarters (Hoffman Estates, Illinois).

Both of these developments saw landscape architects draw extensively on the use of SUDS in the form of porous pavements, bioswales and the creation of wetlands to manage the stormwater and snowmelt in largely concretised areas. The designs of both of these examples were developed to mimic environmental systems by controlling the flow of excess water generated through winter and extreme weather events and releasing it systematically into the water system through rain gardens and wetlands. This required the use of a network of native grasses, gabions and water channels to ensure a regulated flow of water could be managed that would not exceed the capacity of the local hardscaping. The analysis of these projects undertaken by the Conservation Design Forum also suggested that the cost of implementation and maintenance was significantly lower than the associated costs of repairing built landscapes. Moreover, due to the dynamic nature of the installed environmental systems the landscaping also required less maintenance following its first year of installation.

The investments noted above highlight that with innovative design, green infrastructure can be successfully integrated into urban areas. Two additional examples highlight further opportunities that can be used to promote urban greening. First, the CNT 'RainReady Homes' and 'RainReady Communities' programmes; and second, the 'Space to Grow' schools programme. All are being implemented in Chicago, and are in many cases delivering extensive benefits in locations of socio-economic inequality, where access to high-quality green infrastructure is limited.

The 'RainReady Homes' and 'RainReady Communities' programmes work with communities to assess how individual homes, and more recently, small communities (i.e. street level) can retrofit their property with small-scale green infrastructure to manage excess stormwater. The programme is coordinated by the CNT, who have undertaken an extensive process of consultation and engagement with communities to identify where and how flooding occurs. Following these initial discussions the CNT offers practical (and cost-effective) solutions to localised flooding at the scale of an individual home. This has enabled homeowners to become aware of how the impermeable surfaces of their homes and the current regime of water capture can be improved. The costs of investment in 'RainReady' practices compares favourably to those calculated through formal insurance assessments (*ex-post* flood events) and they have been shown by the CNT to be cost-effective and protect against long-term and repetitive flooding.

A key component of the 'RainReady' programme is the identification of small-scale green infrastructure that all households can utilise. Part of the CNT remit is to raise awareness and provide education of simple techniques which can be employed by non-stormwater experts. These include a multi-faceted approach to water management utilising natural and engineered ideas: tree planting and planting of native species,⁴ the creation of rain gardens, yard-level swales and retention areas, and also rain barrels, permeable paving and green roofs, as well as a checklist for home buyers to make their property RainReady (Center for Neighborhood Technology, 2015). Each of these investments is viewed by the CNT as improving the process of capture and allows homeowners to control the flow of stormwater on their property. The programme has been reported by the CNT as successfully helping homeowners to manage flooding and is now being extended to additional communities as they



Figure 4.6 Space to Grow, Schmid Elementary School, Chicago.



Figure 4.7 Space to Grow, Schmid Elementary School, Chicago.

are made aware of their influence on local water cycles. The CNT also report that with an active process of engagement, the sharing of expertise and a more strategic approach to evaluation, small-scale stormwater management can be up-scaled to the city level (Center for Neighborhood Technology, n.d.).

In contrast to the 'RainReady' programme, the 'Space to Grow' campaign has been developed to address health, well-being and stormwater issues across Chicago, and focuses investment at the community scale. The project is working with a small number of pilot schools to re-evaluate how they manage stormwater and landscape resources on site. Funded by the MWRD and the Chicago Department of Water Management (CDWM), the programme works with public bodies (e.g. Healthy Schools Campaign and Department of Water), Chicago public schools, local communities and design specialists to integrate green infrastructure into building designs, both new and retrofitted, and grounds management.

The programme's central aim was to address the continued use of impermeable surfaces found in elementary school grounds. The projects utilise a mixture of water management, on-site planting, channelization into bioswales and retention ponds and ground/low-level planters to promote an understanding of healthy living, water systems, outdoor activity and small-scale responses to flooding. The programme has received strong support from local communities, which was shown in the level of engagement from local communities through the consultation regarding the design, implementation and management of the programme. The outcome was an integrated approach to stormwater management, led by the Conservation Design Forum, who redesigned the hard surfaces of the school parking lot, yard and playing fields/courts to act as water retention basins.

Theophilus Schmid Elementary School was one of the pilot projects for the programme. Located in south Chicago in an area of moderate deprivation, Theophilus Schmid Elementary used the 'Space to Grow' programme to rethink how their school yard, car parks and wider landscape could be made ecologically resilient. The Conservation Design Forum stated the design the school aimed to adapt:

The 'green' approaches to stormwater runoff help to address recurring neighborhood flooding, combined sewer overflows, and the load on water reclamation facilities, while providing students with new opportunities for outdoor recreation and physical fitness.

(Conservation Design Forum, n.d.c)

To achieve this they redesigned the hard surfaces of the school and replaced them with pervious asphalt areas and rubber playing courts to enable greater filtration and retention of stormwater. The design integrated the construction of porous paving/gravel beds in the parking lots and the laying of a permeable rubber play surface allowing stormwater to leach into the gravel substrate. Stormwater is captured and retained on-site and released at a later, non-peak time, and subsequently transferred using bioretention rain gardens and naturalised channelling into a planted area populated with native hardy perennials. Moreover, to ensure that local children and members of the community engaged with the project the school allowed the construction of planters to be used to promote locally grown food production that could be eaten by the school's children (Conservation Design Forum, n.d.c)

Finally, the grassed playing field of the school was redesigned to act as a retention pond during heavy rain events. The design of this illustrates where the rain is coming from, as it is fed by a visible drainage channel, how it can aid the local landscape and what seasonal changes could be expected from the landscape (through the use of sign boards). All of this has been reported in feedback to the school as increasing the understanding of the power of water, how it can be managed and a greater ownership of the site by local communities.

One of the main reasons for the initial success of the programme has been the readiness of local communities to work with school districts and the City of Chicago to test the possibilities of integrated stormwater management. While the initial demonstration sites have been located in areas of moderate deprivation (which is linked directly to increased incidences of localised flooding), they are viewed as

being translatable to the wider Chicago area. The projects have also been deemed successful as they provide investments considered to be more attractive, simple to understand, localised in scale (but provide insights into larger flooding problems), have a local value for children and the community, and garner strong community support. Teachers at the school have also noted that they 'have more people coming to events and helping at the school...it brings the community together', as the investments reinforce the links between people and the schools and each other through an increased understanding of flooding and mitigation processes.

4.1.4 *Millennium Park and Maggie Daley Park*

In contrast to the localised application of the 'RainReady' and 'Space to Grow' programme, the redevelopment of the Millennium Park and Maggie Daley Park area has seen a major rethinking of how green infrastructure can be integrated into core urban areas. Covering an area of 24.5 and 20 square acres, respectively, the two sites created a high-quality and publically accessible green space in the city centre. The redeveloped play park in the Maggie Daley Park highlights how a high-quality and dynamic environment can be created that integrates the multi-functionality of green infrastructure at the centre of the design process. Although it was developed at a cost of \$60 million, the park facilitates movement and interaction with a variety of green spaces, and passive and formal play. It is also managed to a high level and has been planned to evolve over time as the greening, in the form of trees, shrubs and flowers, becomes established. The activity-led nature of this site contrasts starkly with the Lake Shore Driveway, which frames the park to the east. The park therefore has a clearly defined boundary that situates its users within the space. This unfortunately means that movement between the park and the more formal lake shore parks is limited and undermines, to some extent, the connectivity of the site to Chicago's other green infrastructure resources.

To the west of Maggie Daley Park is Millennium Park, which until the late 1990s was an underused railroad site which was underutilised to the extent that other parks, e.g. Grant Park, was built around the site. From 1997 onwards, Chicago mayor Richard M. Daley led the redevelopment of the site into a park designed by Frank Gehry. On-site construction commenced in October 1998, with the site being officially opened in July 2004 at a cost of \$475 million. It was originally estimated to cost \$150 million. In 2009 the park was awarded the Rudy Bruner Award for Urban Excellence and remains one of the city's most visited green infrastructure assets.

Part of the park's value is the variation of landscapes embedded within its design. The site has a number of formal gardens planted with a range of native species to ensure the site evolves with the city's climate. These include the Lurie Garden, which was designed to act as a sensory garden for visitors, the formal gardens of Wrigley Square and the AT&T Plaza and Cloud Gate, which blends hard surfaces, public sculpture and urban greening to promote a diverse range of formal and informal uses. The variation of spaces on-site provides visitors with a constantly evolving experience in which green infrastructure is used as both a guide and as a barrier to movement. Millennium Park is connected to the Maggie Daley Park by the BP Pedestrian Bridge, providing a key link between these two sites. Despite criticisms of

the site's cost, location and corporate sponsorship, it continues to be very well-used. Its locations next to the Art Institute of Chicago, Maggie Daley Park and the lake shoreline make it a successful example of how accessibility and multi-functionality can be integrated into the design of a park.

4.2 Atlanta Beltline: linear green infrastructure at a city scale

The city of Atlanta is the economic centre of the State of Georgia. It developed due to its strategic location as a railhead, and although the railroads are no longer the main economic driver of the city it remains home to a number of multinational corporations including Coca-Cola and Home Depot. The city has a high-density core but has also witnessed rapid suburbanisation. The city is therefore characterised by suburbanised housing and transport networks with a small number of green spaces. Environmentally it has a number of historical parks located around the city, but lacks the links to form a connective network. Furthermore, although the 1996 Summer Olympic Games led to the establishment of Centennial Park, there was little permanent green infrastructure developed.⁵

The Atlanta Beltline development proposed to harmonise the lack of connectivity between the city's green spaces and its 45 neighbourhoods. As a result, the project is approaching investment in green infrastructure in a number of innovative ways to enhance the city's landscape. The Beltline is a 22-mile long investment utilising existing remnants of the city's railroad infrastructure to form a circular greenway

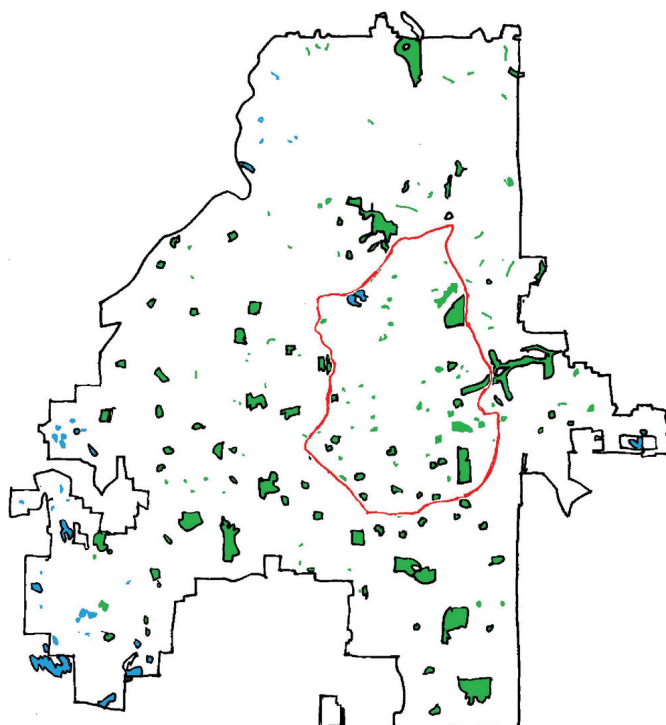


Figure 4.8 Atlanta Beltline and green infrastructure map.



Figure 4.9 Atlanta Centennial Park.

encompassing the downtown area, and is managed by Atlanta Beltline Inc., a quasi autonomous non-governmental organisation (QUANGO). The incorporated company was established in 2004/05 to act as the development manager of the project and was supported by the then mayor of Atlanta, Shirley Franklin, and a strong 'Friends of' group. The incorporated company was purposefully set up as a QUANGO to ensure it had apolitical authority to deliver the project's objectives, minimising the potential influence of the city's politicians. To date, Atlanta Beltline representatives have worked extensively with communities, businesses and the City of Atlanta to ensure the project's strategic objectives are implemented. These include:

- Create and connect 1,300 acres of the city of Atlanta's green space through an integrated approach to greenway development (an increase of 40 per cent from the existing designation).
- Create and enhance a core 22-mile trail and multi-user linear feature and a wider 33-mile network of trails with the potential to extend this to a wider metropolitan scale of 45 miles in conjunction with the Atlanta Regional Commission.
- Improve and connect 22 miles of pedestrian-friendly rail transport with the existing MARTA (Metropolitan Atlanta Rapid Transit Authority) network.
- Deliver over 5,600 units of affordable housing over the project's 25-year lifespan (as of 2015, \$8.8 million of funding has been used to fund development through Invest Atlanta).
- Create and maintain a network of spaces that promote the installation of public art, sculpture and event spaces across the Beltline network.

(Atlanta Beltline Inc., n.d.)

To achieve these goals the Atlanta Beltline Inc. proposed an ambitious 22-mile circular greenway that connects existing public open space and parks with proposed new investments in segregated paths/cyclepaths. This aims to provide access to

linear features throughout the urban and urban-fringe area of downtown Atlanta in the form of a city-scale connective network. This has been programmed in four distinctive sections, one each in the north, east, south and west of the city, linking historic green infrastructure sites such as Piedmont Park on the Eastside Trail, as well as being framed by the location and extent of the industrial rail heritage of Atlanta. The Beltline has been strategically conceptualised into ten sections to allow the project to proceed incrementally and to address location-specific environmental issues as they arise.

The dereliction of the city's rail infrastructure caused by the development of inter-state-centred development frames the spatial delivery of the Atlanta Beltline, as it left the city with a circular network of spaces which could be classified as green or semi-ecological corridors which were underused and undervalued. One of the key aims of the project was, therefore, to repurpose derelict spaces into a multi-functional greenway. These spaces were also located in relatively close proximity to both the downtown area and a large number of residential neighbourhoods. The combination of existing infrastructure and the location of property led a Georgia Tech student, Ryan Gravel, to hypothesise that an investment in a circular greenway utilising these spaces could lead to significant social, economic and ecological improvements to the city (Atlanta Beltline Inc, n.d.). The development of the Atlanta Beltline master plan was therefore the first comprehensive approach to landscape enhancement in the history of Atlanta in terms of the scale of the investment (15,000 acres), the joint focus of ecological improvements and economic development (to the scale of \$10 billion), and the level of buy-in from local businesses, politicians and communities; a process which has since been replicated in other cities in the USA⁶ and globally.

However, as the Atlanta Beltline proposes to deliver a number of objectives across a wide spatial area, they have been required to consolidate their objectives into a more holistic single development programme. To ensure the project remains deliverable it has been, and needs to be, broken down into a series of smaller projects, which each deliver the wider environmental vision of the strategy. Managing the development in sections provides the Atlanta Beltline Inc. with an investment programme which (a) they can deliver in stages, (b) enables them to work with a rolling programme of sites and (c) provides scope to engage in an ongoing process of consultation and to (d) address the restrictions of negotiating land acquisition and delayed development. This ensures that the project has a dynamism and flexibility in how it consults and delivers its strategic objectives compared to other projects. It also supports the view that the project benefits from being able to key into bigger development (and therefore funding and political) debates to deliver the 'vision'. The Atlanta Beltline Inc. also stated that having the authority to work on a number of the project sections simultaneously allows them to engage more directly, more frequently and more visibly with local communities. Thus, they are working 'in a way that is respectful to businesses and homeowners but is getting the job done' as local communities view the Beltline as their neighbours for the long term. There has also been a discussion of whether to widen the inclusivity of the process to the broader Atlanta region to enable neighbouring administrations to become linked conceptually and spatially to the Beltline through the extension of a wider 45-mile network of trails.

4.2.1 Focus and design

The design of the Atlanta Beltline was framed by the desire to reconnect the derelict and undervalued railroad spaces of the city and repurpose them as multi-functional public green spaces and accessible linear routes. This is being achieved through the development of a spatially diverse network of spaces, as different sectors of the Beltline use the industrial remnants of the city in alternative ways to facilitate activities and provide the Beltline with a dynamic landscape that links urban and urban-fringe landscapes with nature.

The differences in both form and function of the trails provide the project with a range of alternative landscaping options which are being implemented throughout the city. For example, the Eastside Trail was designed to allow mass movement by foot and by bicycle – hence its heavy use. It also links a series of parks/resources including the Historic Fourth District Park and a Tony Hawkes-supported skate park to local communities through linear connections. In contrast, the Westside Trail is being implemented to make the most of the natural environment and will not have the same level of paved infrastructure as the Eastside Trail. Alternatively, it is being developed as a natural urban corridor lined with mature/semi-mature trees, and is envisaged as a more ecologically focused resource compared to the Eastside Trail.

However, the Westside Trail also has sections which are characterised by on-street landscapes which make use of segregated walking/cycling infrastructure. This is due to the variation in landform and ownership of the trail, as some sections are located along existing highways, although they are intersected by a series of parks, e.g. Gordon-White Park. The on-street sections are in stark contrast to the predominately ecological nature of the Westside Trail. Between the design of the Eastside and Westside Trails, Atlanta Beltline Inc. have attempted to balance the overarching ideals of the project – i.e. mobility, accessibility and functionality – with an understanding of the existing infrastructure of the city. Moreover, newer sections utilise profiled ramps to allow access for partially-abled and wheelchair users onto and



Figure 4.10
Construction of the
Westside Trail.

Figure 4.11
Eastside Trail.



from the Beltline, meeting Americans with Disabilities Act (1990) regulations. One unfortunate consequence of this is that access to the Beltline will be staggered, with sections being accessible only from specific points. The design of the network also has minimum standards in terms of access and width, with the trail being a minimum of 60 feet wide for two-way movement (approximately 18 metres), which allows a multitude of users to access the site simultaneously.⁷ The differences in the design of the Beltline are highlighted by the completed Eastside Trail and the Westside Trail which is currently under construction. Both trails are located in areas of relatively high-density housing and are linked to the downtown area of Atlanta by main roads and MARTA stations.⁸

The main two-mile section of the Eastside Trail was completed in October 2012 and is located in close proximity to the affluent Virginia Heights area. The trail runs from Piedmont Park in the north to the historic Martin Luther King Jr. neighbourhood

in the south. It comprises a linear trail formed from concrete slab paving with investments in native flora and fauna framing the route. As you move along the trail you reach the renovated Historic Fourth Ward Park, which reopened in 2011, bringing 17 acres of green infrastructure back into functional use, as well as acting as a key water/stormwater management resource for the area. A number of condominium projects have been developed along the Beltline route since its inception, and house prices in the area continue to rise, illustrating some of the \$750 million investment in the quarter-mile around the Beltline.

The main green infrastructure element of the trail consists of a continually evolving landscape of native grasses, shrubs and trees. Trees Atlanta have worked with the Beltline to create the Atlanta Beltline Arboretum, investing in eight key species⁹ and spotlight trees (with associated signage), which change approximately every quarter-mile. A number of native species are used and provide the route with a constantly diversifying landscape due to species richness, as well as seasonal changes. Along the route there are corresponding information boards to educate users about the different species, their ecological properties and their value to the quality of life of people using and living around the Beltline. The Eastside Trail is also home to a number of 'Art on the Atlanta Beltline' projects, which attempt to embed further socio-cultural value into the area. Such cultural values are also evident in the programme of public exercise classes and sporting events (e.g. Eastside 10K run and weekly fitness classes) held on the site.

In contrast, the Westside Trail is more diverse in terms of its ecological composition as it has been specifically designed to make the best use of the existing landscape resource base. It has fewer concrete sections/paving and when completed will have a higher proportion of gravel and grassed sections. Although the trails retain sections that are on-street – e.g. around West End MARTA station – the route will adopt a more informal and natural aesthetic that works with the changes in topography and elevation to link pocket parks (e.g. Enota Park), large parks (e.g. Washington Park) and neighbourhood green spaces across the Westside of Atlanta.



Figure 4.12 Entrance to the Eastside Trail.

Figure 4.13 Westside Trail, White Street.



The landscaping of the Westside Trail will also retain the majority of existing trees and grasses¹⁰ and will form a green valley that directly links transit with the trail (e.g. West End and Ashby MARTA stations).

The integration of 'transit and trail' is one of the Beltline's key delivery principles and aims to promote increased activity on the network by engaging people with alternative forms of transport as Atlanta is one of the most car-dependent cities in the USA. There is also a pervasive view that the city's bus and rail network are limited in terms of their spatial distribution and frequency and that the Beltline will provide additional connections between the north-south/east-west axes of the city's 45 neighbourhoods.

4.2.2 Funding

To fund such a large and diverse project, the Atlanta Beltline Inc. was established to ensure that the project was not constrained by the politics of being a City of Atlanta project or a fully private organisation. As a QUANGO it has worked with the city and private enterprises to leverage financial support from a range of sources. The most successful mechanism used to fund the project was the innovative approach taken to property tax, developed by the former mayor, Shirley Franklin (2002–10), and continued by the current mayor, Kasim Reed. Under both administrations the city placed a 25-year freeze on the collection of new property taxes through the creation of the Atlanta Beltline Tax Allocation District,¹¹ providing additional property taxes to the Beltline project for the first 25 years of its development cycle. Being a long-term programme provides Atlanta Beltline Inc. with the financial security to deliver the implementation programme, and is less likely to be adversely influenced by changes in the city's administration.

Atlanta Beltline's status as a QUANGO has also meant that it has to think creatively about how it draws down funding from other public and private sources. For example, transport funding can be obtained from the City of Atlanta or from an

\$18 million federal grant, but can only be spent on transport infrastructure and cannot support construction of the trail itself.

Furthermore, since 2007 \$400 million of public investment has been made in the Beltline which has attracted an additional \$2.4 billion from PPPs. One of the main reasons given for this is the economic returns associated with the project. For example, since the Eastside Trail was completed there has been an additional \$750 million of private investment in the local area, as it becomes economically viable to build apartments and open businesses in the area. Over the lifespan of the project the Atlanta Beltline Inc. predict that it will encourage a further \$20 billion in commercial and property uplift for the city.

The prospect of such returns has enabled the Beltline to develop one of the most effective forms of PPP in the USA, which has seen them engage the main multinational corporations in Atlanta – Coca-Cola, CNN, UPS and Home Depot – to provide financial support for the project. Such high-profile commercial buy-in has positioned the Beltline as a civic/philanthropic investment, enabling it to promote itself more extensively. Subsequently, there has been a willingness to collaborate with or fund the project because businesses gain positive publicity from being associated with the project. A further benefit of this process has been the creation of a form of corporate peer-pressure led by these organisations. If organisations in Atlanta want to gain access or influence in the city's business community then there is a pervasive view that corporate philanthropy in the form of financial support for the Beltline is needed. Buy-in to the project has since extended to company foundations, such as the Arthur Blank Foundation, which is supported by Home Depot, who have made significant donations to the project, as have employee foundations.

The adaptive nature of the Beltline's funding has enabled them to incorporate sponsorship and philanthropic donations with public funding from property tax, and regional and federal financing, e.g. from start-up funding from the Path Foundation. The redevelopment of the Historic Fourth Ward Park is one example of this. The City of Atlanta allocated \$40 million to address combined surface water/sewage problems in the Fourth Ward district and intended to provide more traditional engineered solutions. As an alternative, the Atlanta Beltline, along with architects HDR Inc., proposed SUDS-based solutions of retention and the creation of a wetland lake to meet these needs. This has now been developed and is working effectively to manage stormwater in the area and has saved the city \$15 million, as the project only cost \$25 million. One of the most impressive aspects of this has been the Atlanta Beltline's understanding that a single funding model is insufficient to meet the needs of (a) such a spatially diverse project and (b) its long-term vision.

4.2.3 Collaboration, partnership and engagement

The breadth of the investment portfolio for the Beltline has led them to develop a broad approach to collaboration and partnership. While their status as a QUANGO provides scope to work with various partners, they are still required to approach consultation at a number of scales to ensure buy-in and cooperation from regional, city and local partners. Over its first nine years the Atlanta Beltline has been successful in developing long-term partnerships with communities and professional

engineering, ecology, arboreal, planning and community engagement specialists. They have also successfully managed relationships with key regional funding and management agencies including the Path Foundation, Trust for Public Land, Trees Atlanta and MARTA (Metropolitan Atlanta Regional Transport Authority). However, the process has not been completely straightforward, with conflicts arising with some partners as they try to embed competing objectives into the development process. One of the key successes of Beltline officers has therefore been to find a balance between alternative investment goals to ensure that the overarching vision for the project is delivered. In some locations, such as the Eastside Trail, this is clearly visible as businesses, local residents and planner/green space practitioners have worked in collaboration to frame the trail's delivery. However, on the Westside Trail this has been more dynamic as competing real-estate objectives, designs and local safety concerns have led to delays in implementation.

The Atlanta Beltline has thus been able to create an innovative and unique development framework for civic and professional engagement that has since been used by other cities to improve their consultation and participation processes. This was developed at the outset of the master planning process and has been used throughout the implementation of the programme to ensure that community, business and political support is maintained throughout the lifetime of the project. The consultation framework developed aimed to ensure that: the activities of the Atlanta Beltline are consistently in the public eye; the development proposals are discussed in local media, political circles and within communities; the objectives (and the reasons for them) are transparent; and the financial support is understood by all. The framework is also used to show that the company are not the City and thus that they are not imbued with the same level of mistrust or antagonism. This has been needed as the Beltline has attempted to coordinate its engagement uniformly across the city's 45 different communities to ensure that each area receives the same level of information, detail and dialogue. This has also been used to engage with a range of service providers, infrastructure agencies (e.g. transport) and other interested partners/land owners. All of which has been proposed as a mechanism to ensure that the project retains a level of transparency to its public and private stakeholders to ensure longer-term support.

4.2.4 Activities

To ensure that local communities and businesses develop a sense of ownership of each section of project, the Atlanta Beltline Inc. have developed a programme of activities that promote both active and passive uses of the site. They have developed a programme of weekday and weekend exercise classes that utilise the project's trails and parks, promoting outdoor fitness. These smaller-scale activities are supplemented by formal activities such as running events, for example the Eastside 10k run. As well as promoting fitness, the Beltline also hosts cycling tours, a lantern parade, community play days and environmental volunteering programmes. Although these activities vary in their focus, they aim to use the project's green infrastructure resources as a conduit to improved health, well-being and social interaction, and the design of the Beltline has also been created to reflect these differing uses. Sections of the Eastside Trail have been designed to promote effective movement between



Figure 4.14
Signboard on the
Westside Trail.

parks, while on the Westside Trail the natural/ecological nature of the investment helps people to spend time in nature; both of which aim to create a bond between people and the Beltline to ensure long-term use and ownership.

This is supported through the environmental outreach programme developed for the Beltline. Along a number of its sections there are educational signboards and information about the flora and fauna used in the project. These highlight the value of different species and illustrate how different ecological habitats can enhance the biodiversity of the area, as well as its aesthetic qualities. The planting of specimen trees by Trees Atlanta to create the Beltline Arboretum shows the value of native species in urban habitats, for climate mitigation and to improve the quality of place. The outcome of this process has been an extensive interaction with the Beltline by local communities, visitors and businesses (who can rent spaces for corporate events). Furthermore, in its first year of opening the Eastside Trail received over 1.2 million visitors, which the Atlanta Beltline Inc. expect to be replicated across the other sections of the project once they are complete.

4.2.5 Barriers and constraints

Although the development of the Beltline has been relatively rapid, a number of issues have been identified as slowing the pace of investment. These relate to the views of the city and the residents of the neighbourhoods located adjacent to the Beltline, the lack of awareness of how the utilities within the city are laid (and where they are), the impacts of the 2008 economic recession and scepticism over whether the Beltline will actually improve the economic viability of the city, and a pervasive view that it simply will not be delivered.

A number of these issues are longstanding and relate to historical problems with the delivery of infrastructure across the city. As noted previously, the location of the MARTA subway system is spatially limited but has periodically been subject to expansion discussions. However, the delivery of new stations has not occurred, weakening local support for large-scale infrastructure projects. The nature of the Beltline development is starting to address such scepticism, but there remains reluctance in some

lower-income communities to support the project. This has been exacerbated by a changing understanding of the demographic composition of the city, especially in those areas located next to the Beltline. For example, on the Westside Trail, investment in the Beltline is being reflected in increased house prices, changing community structures and concerns between the longstanding communities and newer members who aspire for the development of different community assets.

The changing demographics of some of the Westside neighbourhoods have also seen the acquisition of land for the project becoming more expensive. This in turn is slowing investment as developers and individuals continue to acquire parcels of land with the view of benefiting financially in the long term from its proximity to the Beltline. In the nine years since it was formally started the project has taken ownership of 40 per cent of the land needed to implement the programme. The remaining 60 per cent remains in private ownership, which has had some impact on the delivery timeframe. The housing market crash of 2008 (in part facilitated by Fannie Mae and Freddie Mac sub-prime mortgages) also influenced these changes. With the increased number of property foreclosures in the area some houses were being sold at auction for under \$30,000, which led to a undervaluing of the market, causing increased resentment from some residents. Furthermore, because of the manner in which properties are sold (they are not subject to the same level of property surveys/searches), new owners have seen easements on their 'property' that consent a proportion of their land to the Beltline.

Some commentators have also reported that nimbyism (not in my back yard) appears to be visible in some neighbourhoods, where residents have questioned whether the Beltline will lead to increased instances of crime. The rationale for this reflects the spatial distribution of the project and the potential for a more transient population of the site's users. However, criminal activity is taken seriously by the Atlanta Beltline (who have a security detail) and by the Atlanta Police Department, who ensure that the route remains inclusive and accessible to all.

A further issue is the location and extent to which utility infrastructure is located along the length of the Beltline. It has been reported by Atlanta Beltline Inc. that the City of Atlanta, utilities companies and transport organisations do not have a firm grasp on where service infrastructure cables/pipes are laid. This has a direct impact on the investment programme, as the Beltline delivery team have to work extensively with utilities companies to identify where construction can and cannot take place.

4.3 Summary

Green infrastructure investment in Chicago and Atlanta take very different forms, and the discussion of what they focus on presents alternative conceptualisations of how green space should be developed and managed. However, both cities are attempting to integrate innovative forms of environmental investment through an extensive approach to engagement and consultation. They have also worked extensively to integrate an understanding of the benefits of implementing scaled investment in their delivery programmes. While Chicago has looked at 'RainReady' homes and communities and the promotion of 'Spaces to Grow', they have also attempted to map and plan strategically for the wider Chicago Wilderness area. In Atlanta we see

similar processes at work with the Atlanta Beltline, where the overarching development of the 22-mile loop is being supported by officers delivering smaller sections of the project simultaneously. Both cities, though, indicate that success in green infrastructure development relies on a supportive political and financial environment with the foresight to engage with alternative softer approaches to urban development. They also illustrate how a multi-scaled approach to local, neighbourhood, city and sub-regional investment in green infrastructure can deliver a much wider set of benefits than developing single projects. Finally, green infrastructure practitioners in Chicago and Atlanta all discussed the value of effective communication. In Atlanta the process of consultation has been a key factor in engaging companies and the public with the development of the Beltline, while in Chicago the advocacy work of Chicago Wilderness and the Chicago MWRD have seen a more fluid discussion of engineered and ecological solutions being discussed. Chicago and Atlanta are by no means perfect examples of how to invest in green infrastructure; they do, however, highlight that with flexibility in approach, scale and objectives, urban greening and retrofitting of green spaces can have a significant impact on local landscapes.

Notes

- 1 These counties are: Cook, DuPage, Kane, Kendall, Lake, McHenry and Will.
- 2 Chicago now employs a key stakeholder who developed the New York Green Infrastructure Plan to adapt successful stormwater projects in Chicago.
- 3 Cook County's Forest Preserve covers 11 per cent of the county's land but captures up to 80 per cent of urban stormwater of the Chicago area.
- 4 The CNT have identified 14 species of tree native to the Midwest that they promote the planting of to increase the benefits to wildlife and that are tolerant of most soils; these include serviceberry (*Amelanchier* spp.), hackberry (*Celtis occidentalis*) and blackhaw (*Viburnum prunifolium*).
- 5 The investment in the Atlanta Olympic Park is in stark contrast to [Chapter 5](#)'s discussion of the London Olympic Park, which viewed landscape and green infrastructure as one of the key delivery legacies.
- 6 The Atlanta Beltline has also been used as a best practice example for investment in green infrastructure, with visitors from across the USA and other nations visiting to learn from the project. The Atlanta Beltline Inc. do acknowledge their own use of stormwater management from other cities, such as Portland and Chicago, illustrating the transferability of a number of development options.
- 7 The width of the Beltline ranges from 40ft to 200ft.
- 8 The Eastside Trail is characterised by apartment buildings and redeveloped warehouse buildings; the Westside Trail is located in an area of largely single-dwelling homes.
- 9 These are: the prairie (native plants including back-eyed susan, coneflower and butterfly weed), Blackgum (*Nyssa*), oaks (*Quercus*), sassafras collection, magnolia, longleaf pines, viburnums and witch hazel.
- 10 Although some removal may be required to allow construction to occur, ecological off-setting and replacement of resources are programmed into the development should this happen.
- 11 As property values increased, homeowners would normally pay a proportionally higher level of tax to fund public services. Reed's administration froze the level of tax in the early 2000s and stated that any difference in the uplift in property value would not be retained by the city but would go to the Atlanta Beltline development.