



Europe's Vibrant New Low Car(bon) Communities

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Executive Summary 5

CASE STUDIES

Greenwich Millennium Village	8
GWL Terrein	18
Hammarby Sjöstad	30
Houten	46
Sihlcity	60
Stellwerk 60	70
Västra Hamnen	82
Vauban	94

CONCLUSION

Comparative Analysis	107
Lessons Learned	113

BUILDING LOW CAR(BON) COMMUNITIES

Executive Summary

Moving is a time to reevaluate the stuff you own. Boxes of family photos? Coming. That ratty old couch? Not coming. But what if you could leave something even bigger behind? Like your car?

New developments are often associated with sprawl and more driving. But eight communities across Europe demonstrate there is a different model. ITDP Europe investigated these developments and found by using smart urban and transportation planning and design, they have created communities with lower car ownership rates and less driving than nearby developments of comparable sizes and age. As a result these communities have less pollution, greenhouse gas emissions, public health issues and other negative externalities associated with driving.

These new developments use a combination of “push” measures to discourage private car use and “pull” measures to improve the attractiveness of walking, cycling, transit and various forms of shared vehicle use. As the report demonstrates, these measures work, and could be applied in other new developments around the world, particularly in abandoned industrial sites or on other previously developed land.

The eight case study locations are summarized in Table 1.

Eventually these measures should be applied to all urban development, in order to minimize the need for driving and maximize the opportunities for healthier, more sustainable forms of transportation. Therefore ITDP presents these case studies, identifies lessons learned and compares the planning, design and travel demand management techniques used so that others might follow the lead of these eight communities.

Each case study includes background information on the origins of the development and how these best practices were incorporated at early stages of the developments’ planning processes, before describing individual measures in more detail. Quantitative data on vehicle ownership, modal split and transport-related emissions are

PRINCIPLES FOR SMART URBAN GROWTH

1. Walk: Develop neighborhoods that promote walking
2. Cycle: Prioritize bicycle networks
3. Connect: Create dense networks of streets and paths
4. Transit: Support high-quality transit
5. Mix: Plan for mixed use
6. Densify: Match density with transit capacity
7. Compact: Create compact regions with short commutes
8. Shift: Increase mobility by regulating parking and local road use

Developed by a team of urban design experts including ITDP, Gehl Architects, Nelson Nygaard, and Calthorpe Associates

then presented, based on the literature and/or surveys developed by ITDP Europe, followed by a summary of lessons learned and recommendations for further research.

It is worth noting that the most successful “car-free” and largely “parking-free” developments reviewed had well-organized grassroots support for the concept from the outset. Planners and decision makers should look for willing partners as they undertake these

Table 1: Case study locations

Development	Location	Type	Size (hectares)
Greenwich Millennium Village	London, United Kingdom	Brownfield: mixed use, car-reduced	29
GWL Terrein	Amsterdam, The Netherlands	Brownfield: residential, car-free	6
Hammarby Sjöstad	Stockholm, Sweden	Brownfield: mixed use	160
Houten	Utrecht, The Netherlands	Greenfield “cycling city” of 45,000 people	820
Sihlcity	Zurich, Switzerland	Brownfield: leisure and retail	4
Stellwerk 60	Cologne, Germany	Brownfield: residential, car-free	6
Västra Hamnen	Malmö, Sweden	Brownfield: mixed use	175
Vauban	Freiburg, Germany	Brownfield: mixed use, car-reduced	41

endeavors. And they should foster community participation to build support as the project evolves, and to ensure the endurance of the vision for the development once it is built.

The top lessons learned from these case studies closely align with the Principles for Transport in Urban Life, and are as follows:

1. Develop neighborhoods for walking and prioritize bicycling networks.

The majority of developments in the case studies provide direct, safe and comfortable walking and cycling routes, and plentiful covered cycle parking. They also use a technique called “filtered permeability” to make travel by bicycle or foot more direct than by car (Table 2), and locate bicycle parking closer to homes than car parking. This gives walking and cycling a competitive advantage over the car. Some are beginning to use bike sharing to encourage occasional bike use by visitors and residents alike.

These developments are built with pedestrians and cyclists in mind; dense networks of streets allow pedestrians and cyclists to pass, even where cars cannot (filtered permeability). This design is reinforced with low speed limits and traffic calming. By making car use less convenient than other modes, residents are subtly nudged to consider other modes.

2. Provide high-quality transit.

The transport in all of the case study areas is responsive to resident needs, and therefore has high mode share. Stops are within half a kilometer of every home, and service frequencies are at least every 15 minutes. Integration into the regional transit network and long service hours all make riding convenient while low-cost period passes keep it affordable. By optimizing conditions for walking, cycling and

transit, living car-free becomes more realistic. Many developments also provide nearby carsharing locations to help residents feel more comfortable giving up their private cars.

3. Create compact regions with short commutes and zone new developments for mixed use.

These case studies also suggest that new developments should be planned as closely as possible to existing job centers and other destinations. This makes investments in transit and cycling networks more efficient and effective. Mixed uses (housing, jobs, leisure facilities, shops, grocery stores, etc.) should be incorporated into new developments at site selection and masterplanning stage, to minimize travel distances, enabling residents to make routine trips on foot or by bicycle, with convenient public transportation offering a realistic alternative to the car.

4. Increase mobility by regulating parking and road use.

In addition to the nudges the urban design of these communities provide, many also use regulations to incentivize and in some cases mandate reduced car use, using a variety of techniques including placing stringent caps on car trip generation and CO₂ emissions and relaxing parking minimums if other criteria to reduce car demand are met. In many of the cases, parking supply has been reduced and the parking that does exist is separated spatially and fiscally from housing units. In some cases the planners have also required developers to fund or build transportation infrastructure and services (including mobility management services) as a condition of site approval. Masterplanning competitions can foster further innovation in both the built environment and transportation planning.

5. Market sustainable transportation.

Many of these developments make ongoing efforts to reinforce their founding vision and to empower residents and visitors to make sustainable travel decisions by offering tailored mobility advice, running marketing and awareness campaigns, and through promotions such as free or discounted transit passes or car-sharing membership for new residents. Ongoing measures to encourage low-emission travel behavior are important to ensure the long-term transport sustainability of residents. Planners should consider whether the developers should be asked to fund these initiatives or if there are ways to create dedicated streams of revenue (e.g. by earmarking a portion of parking fees or outdoor advertising fees/space) to fund them over time.

6. Don't forget the larger policy context.

Transportation policies at the city, regional and national levels play a key role in shaping daily travel behavior and residential locations in the longer-term. Congestion charges, citywide parking management policies, high fuel prices, and high quality transit all influence mode choice, reinforcing site-specific measures such as car-access restrictions, provision of high quality walking and cycling facilities and filtered permeability. All of the case study cities are served by national railroad systems, providing an alternative to the car for longer-distance journeys, thereby complementing measures to discourage car ownership and use in the local area.

A comparative analysis is presented in chapter ten, providing an overview of TDM measures, details of transit provision and urban design features, and a summary of key transport-related sustainability indicators: car ownership, modal split (summarized in Table 2) and transport-related emissions.

In summary, it was found that private car use accounts for less than 35% of all trips made by residents in all of the sites (Stellwerk 60 result inferred from distance-based data), a figure that is generally lower than comparable sites without integrated TDM strategies. Car ownership was found to be no more than 440 vehicles per 1,000 residents in the residential developments, and less than 200 in sites with priced, limited and spatially separated parking: GWL Terrein, Stellwerk 60 and Vauban. These sites generate less than 350 kg of car-related CO₂ per capita per annum, equivalent to savings of around two thirds compared with their reference areas. These figures demonstrate both the efficacy of TDM measures and the importance of building in the right location, close to centers of existing economic and social activity.

Further Research Needs

Further household research should be conducted to update the case studies as necessary and to add to the evidence base justifying the implementation of these policies and practices in Western Europe and in new developments around the globe. Additional quantitative research is required to assess both the demand for car-free living and the financial performance – in terms of rental and property prices – of heavily car-reduced and car-free areas. This would encourage local authorities, planners, investors and developers to be more pro-active in considering this type of development, which has been shown to reduce car dependence and transport-related CO₂ emissions significantly. Many of the lessons learned are replicable or adaptable for implementation elsewhere: the task now is to communicate the successful and transferable policies to politicians, planners and other relevant stakeholders across the world. ■

Table 2: Mode share and car ownership rates for study sites and reference areas

Location	<i>Mode share (proportion of all trips)</i>				Cars per 1,000 residents
	by car	by transit	by bicycle	on foot	
Greenwich Millennium Village	18%	49%	4%	29%	350
Greenwich District	44%	29%	1%	26%	350
GWL Terrein	6%	14%	50%	30%	190
Amsterdam West	20%	18%	32%	30%	310
Hammarby Sjöstad	21%	52%	9%	18%	210
Stockholm Reference District	35%	50%	7%	8%	n/a
City of Houten	34%	11%	28%	27%	415
City of Zeist (The Netherlands)	46%	11%	29%	14%	530
Sihlcity: visitor trips	30%	70% (transit, cycling, walking combined)			—
Letzpark: visitor trips	n/a	n/a	n/a	n/a	—
Stellwerk 60	21%*	53%*	31%*	29%*	60
Nippes District	61%*	33%*	3%*	3%*	309 ⁺
Västra Hamnen	23%	17%	31%	29%	440
City of Malmö	41%	16%	23%	20%	480
Vauban [#]	16%	19%	64% (bicycle/walking combined)		160
City of Freiburg [#]	30%	18%	28%	24%	393

* Mode share based on distance traveled

⁺ Data for the smaller Nippes Stadtteil

[#] Mode share data from 1999/2000 (prior to extension of the tram system to Vauban)

GWL TERREIN SITE FACTS

Developer: Ecoplan Foundation

Architect: Kees Christiaanse

Population: 1,400

Area: 6 ha

Density: 230 persons/ha

Residential Units: 600

Construction Began: 1995

Construction Completed: 1998

Distance from City Center: 3 km

Cars: 190 cars/1,000 residents

Parking Spaces/Residence: 0.20

Non-motorized Mode Share: 80%

Public Transport Mode Share: 14%

Households with Carsharing: 26%

CASE STUDY

GWL Terrein

AMSTERDAM, THE NETHERLANDS

Nicole Foletta, ITDP Europe

BACKGROUND

GWL Terrein is a car-free brownfield redevelopment with limited parking, carsharing provision and good transit access. Non-motorized mode share in the development is much higher than the surrounding area and car use is much lower.

GWL Terrein is located in the famously cycling-friendly city of Amsterdam. The project is in the Amsterdam West District, three kilometers from the city center at the terminus of a tram line and the very edge of the late 19th century city extensions. It makes use of a six hectare site formerly used by the municipal water utility, Gemeente Waterleidingen (GWL), from which it gets its name (Photos 1 and 2). Local residents were involved in the design and development of the project. They wanted to push forward with a new approach to development focused on car-free living, reuse of resources, conservation of energy and water, and community cohesion.

The inner area of the development is car-free and only emergency vehicles are allowed on site. The original residents were asked to sign a non-obligatory declaration of support for the car-free nature of the site. None of the 600 residential units include parking spaces, however, several on-street parking spaces are located along the edge of the development and a limited number of parking permits are available for residents.

GWL Terrein's environmental and social goals make it a unique place to live. The car-free inner area creates a cleaner, safer place for neighbors to interact and children to play. The focus on energy efficient building design and promotion of sustainable transportation helps reduce the carbon footprint of residents. Furthermore, the work of the residential umbrella organization encourages sustainable living and community involvement. It is no surprise that the development consistently receives high satisfaction ratings from residents, which is further underscored by the fact that 62% of residents have lived in the development for more than eight years (*GWL Terrein Website*). Once residents move here they don't seem to want to leave. What began as an idealistic experiment in combining high density housing with green principles appears to have produced a neighborhood its original proponents can be proud of, even ten years later.

PLANNING PROCESS

GWL Terrein occupies the former site of the Municipal Water Company. When the water company decided to move, residents of what was then the Westerpark District (now part of the Amsterdam West District) lobbied for the location to become a residential area, while companies operating nearby wanted the location to be zoned for industrial purposes. The residents won out and in 1989 the Amsterdam city council decided to zone the area for housing. Local residents remained actively involved in the decision process and appealed for a car-free eco-district. This idea was also supported by politicians and the local community center.

In 1993 the basic principles for the site were described in an Urban Planning Schedule of Requirements (SPvE). The site was to be car-free and aimed to discourage car ownership and use by ensuring good public transport, a safe environment for pedestrians and selecting inhabitants who agreed with the ecological principles of the project. Environmental goals also included reduction in water

and energy consumption. In addition, it was decided that half of the dwellings would be reserved as renter-occupied, social housing. The other half would be sold, two-thirds of which would be grant-aided owner-occupied dwellings. Furthermore, local residents would have priority in applying for dwellings.

The Westerpark Urban District commissioned two architecture firms to create a conceptual plan for the development based on the Urban Planning Schedule of Requirements. In August 1993 the plan made by architect Kees Christiaanse and landscape designer Adriaan Geuze was chosen by a panel consisting of several inhabitants, representatives of the Westerpark Urban District and the project developer. This panel, along with the architect, then collaborated to create an Urban Plan for the development, which was completed in November 1993. The Environmental Advisory Bureau (BOOM) was also involved in the process to ensure that the environmental aspects of the Urban Planning Schedule of Requirements were upheld.

Given the strict environmental requirements proposed, private investors were not interested in developing the site. Ultimately five housing associations set up the Ecoplan Foundation as a joint venture to coordinate and finance the development. Future inhabitants continued to be involved in the design process. In 1994, five design teams were created, each with an architect and several inhabitants, to design various sections of the development. Construction took place in three phases, starting in 1995 and ending in 1998 (Photos 2 and 3) (*GWL Terrein website*).



Figure 1: GWL Terrein site map

KEY POLICY AND DESIGN MEASURES

From the start, GWL Terrein had a focus on reduced car usage and sustainable living. These sentiments came from local residents of the Westerpark District and were supported by the local government. Several policy and design strategies have been incorporated into the site to help actualize this ideal. These are described below.

Urban Design

As mentioned, the entire six hectare site of GWL Terrein is car-free. The development consists of 17 buildings along with the renovated pump engine building, which is now home to a café. The buildings are arranged to form a high density perimeter, while the inner areas remain open, including plenty of green public spaces, wide pathways and safe areas for children to play (Photo 4).

Street Layout and Design

Since cars are not allowed on site, no streets pass through the development. Furthermore, signs are posted at various entrance points, stating that no motorized vehicles are allowed on the site (Photo 5). In order to enforce this, the development is raised from street level so that cars do not have access to the inner area (Photo 6). However, ramped access points are located at certain entrances to the development, and sometimes motorized two-wheelers illegally enter the development. Police officers patrol the area to limit these infractions.

Van Hallstraat (Photo 7), an arterial street at the eastern border of GWL Terrein, was traffic-calmed in 1999 with on-street parking removed, speed reduced, sidewalks widened and the tram terminus rebuilt and extended (*Scheurer 2001*). Van Hallstraat also has a brick-colored cycle lane. Near the tram terminus, this cycle lane is bordered by the tram platform and two tram lanes. Beyond the tram lanes are two lanes of traffic, followed by car parking and another cycle lane at the furthest side of the street. For the rest of Van Hallstraat the cycle lane bordering GWL Terrein is protected by a tree-lined median. Beyond this median are two car lanes. At the far side of the street is a lane for car parking and another cycle path. In this way, cycle lanes are protected from moving traffic either by a row of trees, a tram platform, or a strip of parked cars.

Public Space Design

A variety of public spaces are available between the buildings, including public green spaces, children's play areas, shared gardens and mixed use pathways. This is important, since in such a high density development, it is impossible to provide each residential unit with a private yard. Beyond being a more efficient use of space, these shared spaces provide residents with more chances to interact, building their sense of community.

An artificial canal effectively divides the development into two parts. To the north is an urban square surrounded by a nine-story residential building with ground floor retail. To the south the site is more garden-oriented with open green spaces and children's play areas. The children's play areas are located away from the street and have been praised by many families as being safe places where their children can play near home. In addition, several shared garden allotments are provided; which are surrounded by a protective wall of shrubbery. Within these spaces, residents can rent a garden allotment. The gardens give residents another opportunity to interact

with neighbors and also provide residents with a sense of ownership for the public spaces.

The area does not have any dedicated cycle lanes, but rather provides wide, mixed use pathways (shared by pedestrians and cyclists). One perspective is that this mix of uses can actually improve safety because both cyclists and pedestrians are more aware of their surroundings, looking out for fellow travelers rather than assuming that paths will be segregated.

Land Use Planning and Design

The site contains a few renovated historical buildings and the GWL water tower, which acts as a landmark of the district, surrounded by blocks of high density housing, designed by five different design teams, but all with a similar color scheme to bring cohesion to the development. One elongated, 186-meter long, high-rise apartment building with nine stories runs along Waterpoortweg Street, the eastern border of the development (see Figure 1). Another elongated apartment complex runs along the north and northeastern borders of the site. This building structure helps to create enclosed areas within the development without applying gates or barriers between GWL Terrein and other neighborhoods. To the east, GWL Terrein is open and pathways connect the development to the 19th century neighborhoods. Overall 17 apartment buildings are located on-site. As many dwellings as possible have an entrance at street level and access to either a private ground floor garden, a rooftop garden or an open terrace. Incorporated into these residential buildings are ground floor commercial uses, live/work units, housing for persons with mental disabilities, senior housing and wheelchair accessible housing (Photo 8).

Most of the apartments have 3-4 rooms with an average of 3.44 rooms per home. This is higher than the average for the Westerpark District of 2.64 rooms per home. The average home value is also higher in GWL Terrein. In 2005 the average home value in GWL Terrein was 256,000€ versus 172,000€ for the Westerpark District. The larger size of residential units and higher quality housing are attractive features for families. Furthermore, 55% of residential units are owner-occupied and 45% are renter-occupied. Of the rented units, 60% are social housing.

Several other uses are also located on the site such as the Westerpark Community Center. The water company's pumping station was restored and the old engine room is now home to Café Amsterdam, a popular restaurant which attracts many visitors to the district (Photo 9). The remaining space in the historic pumping station was converted to offices and a gym. Overall, 50 businesses are located at GWL Terrein (many of them home businesses) employing 216 people (*GWL Terrein Website*). The mix of uses provides residents with shopping, entertainment and employment options within their own neighborhood. In addition, several grocery stores, shops, pharmacies and cafes are located in the surrounding neighborhoods so that residents do not have to go far to run their daily errands, which can easily be done by bicycle or walking.

Public Transportation

GWL Terrein is well served by public transportation. Tram line 10 was extended and terminates just outside the development at the Van Halstraat station (Photo 10). The tram lanes are segregated from car



1
GWL Terrein
before
redevelopment



2
GWL Terrein
after
redevelopment



3
GWL Terrein
development



4
Children
playing near
GWL Terrein's
main landmark,
the watertower



5
No motorized
vehicles are
allowed in GWL
Terrein



6

Bollards and raised curbs prevent motor vehicles from entering.



8

Many ground floor units are reserved for seniors and the disabled and have ramped access for wheelchairs.



9

Café Amsterdam



10
Tram 10 at
Van Hallstraat
Station



7
Family cycling on Van Hallstraat

Half of all trips made in GWL Terrein are by bike.

traffic lanes which helps to increase tram speeds. The tram runs at 10-minute intervals. In addition, two bus lines serve the development. Bus line 21 provides service to Central Station every 10 minutes. Bus line 60 provides service to Sloterdijk Station every 10 minutes.

A variety of transit ticket types are available for travel within the city of Amsterdam. Public transportation users can buy a one-hour ticket, or daily tickets, good for unlimited travel within Amsterdam by tram, bus or metro. Seasonal passes are also available including weekly, monthly and annual passes. The fares for these passes are zone-based and discounts are available for youth and seniors. All ticket types and passes can be loaded onto the recently implemented OV-chipkaart, a contactless smartcard that must be swiped upon entering and exiting the public transport vehicle or station. In addition, smartcard users may choose to pay based on the distance they travel. The OV-chipkaart can be used on all public transportation throughout the Netherlands, although fares may vary depending on the region. (*GVB Website*)

Parking

Parking for the development is extremely limited. None of the residential units have parking spaces on-site. 129 on-street parking spaces are located on the west side of the district, five of which are reserved for carsharing vehicles and two for persons with disabilities. The remaining 122 spaces, equating to 0.2 spaces per residential unit, are part of the city's public parking supply and are

therefore first-come-first-served. The spaces are metered, costing three Euros per hour (versus five Euros per hour for on-street parking in central Amsterdam). Residential parking permits for these spaces cost 16 Euros per month, which is much cheaper than hourly parking, however these permits are extremely limited. Only 110 parking permits, representing 18% of households, are available for GWL Terrein residents and those on the waitlist may wait up to seven years for a permit. Residents of GWL Terrein do not qualify for residential parking permits in the nearby neighborhoods, but some residents have been known to "borrow" parking permits in order to park their cars in the surrounding areas (*GWL Terrein Website*). A 480-space parking lot is located nearby which charges 3 Euros per hour for parking up to a maximum of 30 Euros per day. A variety of parking subscriptions are also available which range from 98 to 295 Euros per month (*QPark Website*).

Carsharing

Five carsharing vehicles are located in the parking spaces on the border of the development, belonging to two carsharing organizations: Greenwheels and Diks. Since one of the main goals of the development is to reduce car ownership, provision of carsharing is important to give residents access to a car without having to own one. The vehicles are very popular among residents. Over a quarter of households have a carsharing membership (*ITDP Europe 2010*). Information about the two carsharing companies can be seen in Table 1.

Table 1: Information about carsharing companies in GWL Terrein

	Diks	Greenwheels
Deposit	50 €	225 €
Monthly subscription fee	25 €	Ranges from 5–25 €
Fee per km	0.12 €	0.10 €
Hourly fee	2.75 €	2.50 €
Discounts available	None	Discount with Dutch Railway card (NS card)
Company membership option	No	Yes
Number of cars available at GWL Terrein Location	3	2

<http://www.diks.net/autodate-tekst.html>,
<http://www.greenwheels.nl>

Table 2: GWL Terrein compared to surrounding areas

	GWL Terrein	Amsterdam West	Amsterdam
Population	1,400	77,510	757,000
Area (ha)	6	990	22,000
Population density (persons/ha)	230	78	34
Number of residential units	600	NA	390,000
Cars per 1,000 residents	190	310	370
Bikes per 1,000 residents	1,300	NA	730
Car parking spaces / residential unit	0.20	NA	0.72
<i>Mode share for all trips</i>			
Car	6%	20%	28%
Public transit	14%	18%	18%
Bicycle	50%	32%	29%
Walking	30%	30%	25%

City of Amsterdam;
ITDP Europe, 2010

Development Management and Governance

The umbrella organization Koepelvereniging was created in 1996 to promote the original intentions of the development and to encourage community cohesion. The organization is funded through small fees from residents and the housing associations. Today Koepelvereniging is the one body that unifies the entire development. The organization has a website and a newsletter for residents and holds about six meetings per year to discuss community issues such as safety, maintenance and community events. The organization also employs a concierge, who is available on-site to answer questions from residents, performs minor repairs and enforces the car-free restriction (including keeping delivery vehicles from entering the development). Residents are very involved in the organization and help to plan community events, such as an annual soccer tournament held each June, followed by a community dinner (*GWL Terrein Website*). These efforts help to give residents a sense of community and enhanced focus on the environmental goals of the development.

Car-free Declaration

Initial proponents of the development had hoped to actually ban car ownership among residents, but this was not allowed. As an alternative, Ecoplan asked the initial residents of GWL Terrein to sign a non-obligatory declaration of support for the car-free nature of the site. This declaration did not require residents to live car-free, but informed them of the intention of the development. The declaration reminded residents that GWL Terrein is different from other neighborhoods. Parking in the area is difficult for a reason and sustainable forms of transportation are encouraged. Furthermore, the declaration attempted to provide residents with an enhanced feeling of community and the idea that they were involved in a unique experiment in sustainable living. However, new residents no longer go through Ecoplan. New renters are selected either by one of the five housing associations, which typically do not require a car-free declaration to be signed, or by current owners, who may freely sell their property to anyone they choose. For this reason, the umbrella organization Koepelvereniging has developed a document for new residents, explaining the goals and concepts of the project. The organization

also provides advice related to sustainability and car-free living. Therefore, while new residents are no longer asked to state that they agree with the ideals of the project, they are still made aware of the project's original intentions.

QUANTITATIVE ANALYSIS

GWL Terrein is located in one of the world's leading cycling cities. The City of Amsterdam has implemented many policies to encourage cycling and walking and to reduce car use such as improved bicycle infrastructure, extensive bicycle parking facilities, robust police enforcement to prevent bicycle theft, increased bicycle use education to increase bicycle safety, reduced speed limits to improve safety and increased parking prices to reduce car use (*Daniel van Motman, pers. comm.*). However, efforts at GWL Terrein go even further. GWL Terrein residents have a 50% bicycle mode share, compared with the already high 30% in the rest of the city, further reducing the carbon footprint of residents. A comparison of statistics for GWL Terrein, Amsterdam West and the city of Amsterdam can be seen in Table 2.

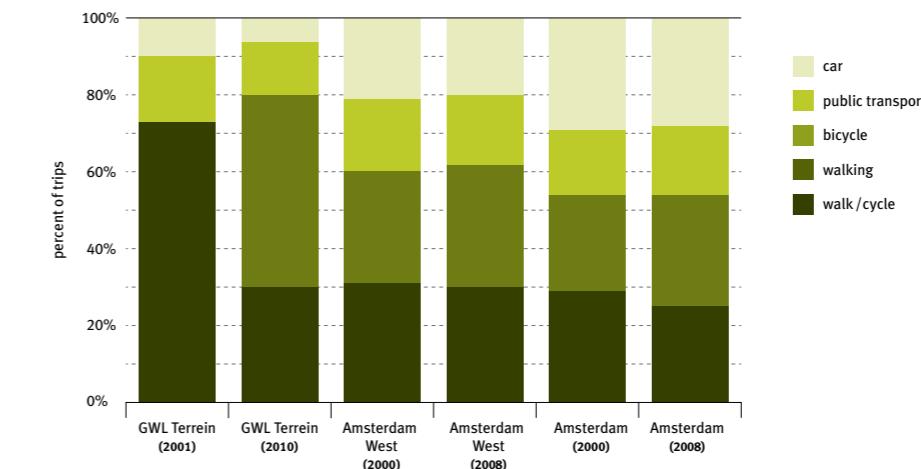
Density

GWL Terrein is about three times as dense as Amsterdam West, the district in which it is located, and more than five times as dense as the city of Amsterdam. It is even more dense than what is required for new growth, or Vinex, locations in the Netherlands (see *Vinex Locations sidebar*, p. 50). Vinex locations are required to have at least 30 homes per hectare, while GWL Terrein has 100 homes per hectare. Higher densities enable more efficient use of resources, which can contribute to reductions in carbon footprint.

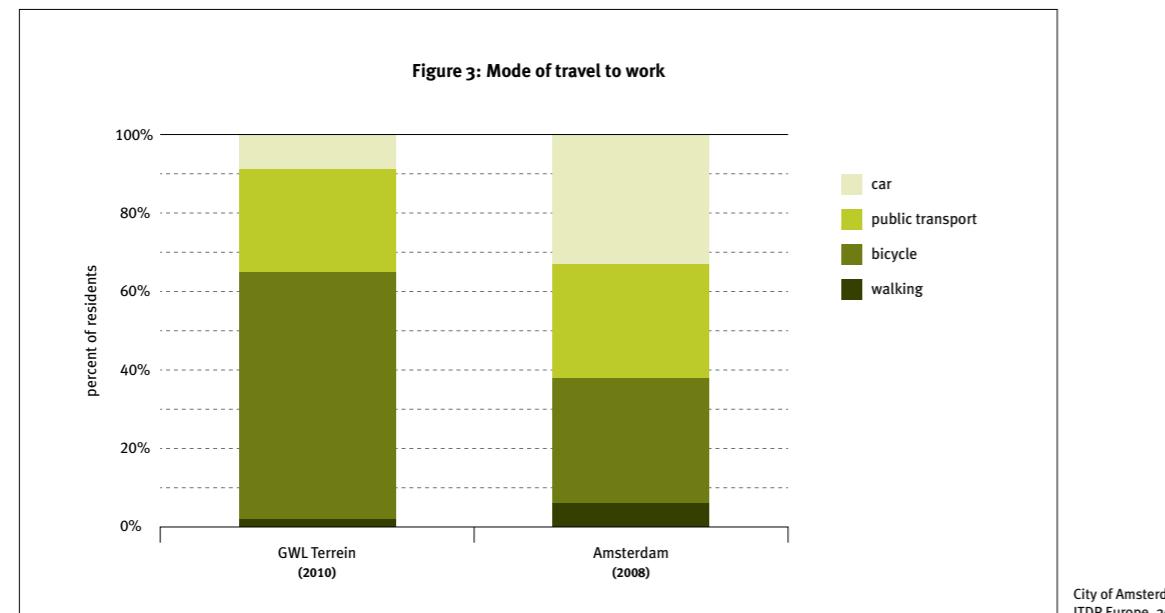
Parking

Parking at GWL Terrein is extremely limited with only 0.20 spaces per residential unit, compared to the already low 0.72 spaces in the rest of the city. Reducing the availability of parking spaces contributes to reduced car ownership rate.

Figure 2: Mode of travel for residents as compared to surrounding area



City of Amsterdam,
ITDP Europe, 2010;
Scheurer, 2001



Car and Bicycle Ownership Rates

In 2001 there were 172 cars per 1,000 residents in GWL Terrein (*Scheurer 2001*). A more recent, internet-based survey of GWL Terrein residents conducted by ITDP Europe in 2010 found that this number is slightly higher today at 190 cars per 1,000 residents (*ITDP Europe 2010*), still far less than the 310 cars per 1,000 residents in Amsterdam West and about half of the 370 cars per 1,000 residents of Amsterdam (*City of Amsterdam*). Furthermore, 15% of households surveyed gave up a car after moving to GWL Terrein. The number of bicycles owned per resident has not changed significantly. The 2001 survey found 1,346 bicycles per 1,000 residents, while the current survey found 1,300 bicycles per 1,000 residents. Indeed, nearly half of all respondents said that there were more than three bicycles owned by their household, and only 2% of respondents said that their household had no bikes (*ITDP Europe 2010*).

Mode Split

These policy and design measures have worked. The survey found that half of all trips taken by GWL Terrein residents are made by bike and 30% are made on foot, while only 6% are made by car (Figure 2). The share of bike trips in GWL Terrein (50%) is much higher than that for Amsterdam West (32%) and Amsterdam (29%). Furthermore, a far smaller share of trips are made by car in GWL Terrein (6%) than in West Amsterdam (20%) or Amsterdam (28%). The total share of non-motorized trips has increased slightly in Amsterdam West between 2000 and 2008 (from 59% to 62%). The share of non-motorized trips has not changed in the city of Amsterdam (54%) during the same time span, however 4% of trips have shifted from walking to cycling. By contrast, the share of non-motorized trips in GWL Terrein has increased 7% between 2001 and 2010 (from 73% to 80%).

It is also interesting to compare the mode split for different types of trips. In GWL Terrein 63% of residents travel to work by bike versus 32% for Amsterdam (Figure 3). Likewise, a smaller percent of GWL Terrein residents travel to work by car (9%) than Amsterdam residents (33%). 94% of GWL Terrein survey respondents said that they do their grocery shopping by bike, 85% conduct other shopping

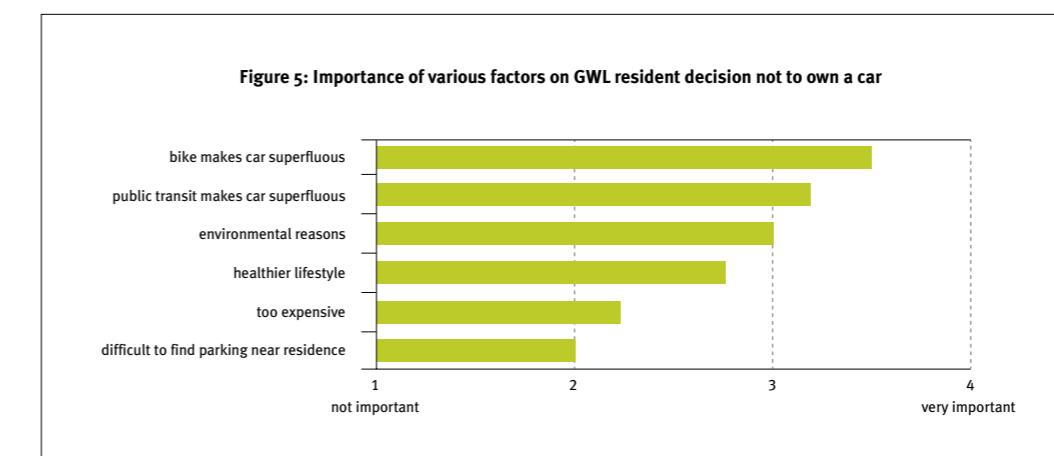
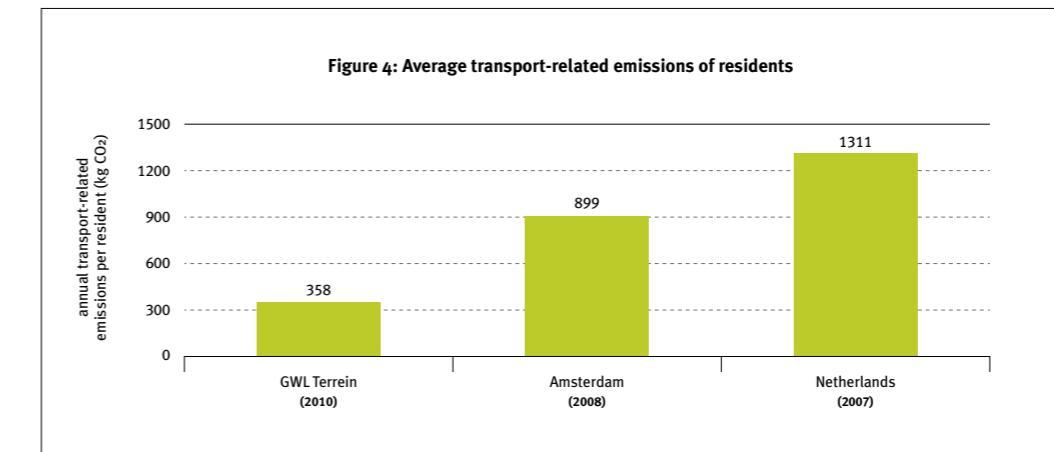
by bike, 93% run service-related errands (banking, doctor visits, etc.) by bike and 94% visit family and friends in Amsterdam by bike (*ITDP Europe 2010*). These statistics overwhelmingly show that cycling is the main mode of transport for residents of GWL Terrein.

While the mode share of public transportation is no higher among GWL Terrein residents than Amsterdam residents, GWL Terrein residents still consider it an important option and most residents use public transit at least once per week. In 2001 it was found that 39% of residents had some sort of periodic public transit pass, although the type of pass varied (*Scheurer 2001*). The 2010 survey found that this number had increased to 46% of residents (*ITDP Europe 2010*). This is even higher than for the city of Amsterdam, where 19% of residents have a periodic transit pass (*City of Amsterdam*).

Reduced travel distances also contribute to reduced carbon footprint. GWL's location gives residents easy access to the city center, where many jobs are located. Indeed, 44% of residents travel less than 5 kilometers to work, and only 12% travel 40 kilometers or more. Additionally, more than three-fourths of residents travel less than one kilometer to get to their grocery store (*ITDP Europe 2010*). Having close access to destinations such as work and grocery stores encourages travel by bike and walking and reduces kilometers driven. Therefore, it is not surprising that transport-related emissions of GWL Terrein residents are less than half that of an average Amsterdam resident and one-third that of an average resident of the Netherlands, as seen in Figure 4. These estimates are based on annual kilometers traveled by residents by private and public transportation (for the year indicated), as well as estimates of emissions rates of these vehicles.

LESSONS LEARNED

The GWL Terrein development includes many features that make it unique among neighborhoods in Amsterdam and encourage sustainable living. The context of the surrounding area and city also have a strong impact on the travel behavior of its residents. The extensive



network of bicycle paths and efficient public transportation system in the city of Amsterdam allow residents of GWL Terrein to easily travel to other parts of the city using these modes. When non-car-owners were asked to rank the importance of different factors in their decision not to own a car, residents gave higher importance ratings to pull measures such as ease of bicycle and public transport use and lower importance ratings to push measures such as expense of owning a car and limited parking (see Figure 5). Also, GWL Terrein's location close to the city center has an effect on travel distances of residents. Therefore, it would appear that a new development

project in a city with a focus on sustainable transportation, especially located near the center of the city, could have more potential for success than one located in a car-focused city or far from the city center.

Furthermore, Koepelvereniging, the residents' umbrella organization, seems to be an important catalyst for maintaining resident focus on sustainability, reduced car use and social interaction. It also gives residents a common source to turn to with questions or concerns about the development. Such an organization is recommended for other sites planning to implement a sustainability-focused community. ■

SOURCES

- Communication with Corine Marseille, Koepelvereniging organization, May 2010.
- Communication with Daniel van Motman, Department of Traffic Infrastructure and Transport, City of Amsterdam, May 2010.
- Communication with Hans Niepoth, City of Amsterdam, June 2010.
- GVB Website, <http://www.gvb.nl> (accessed June 10, 2010).
- GWL Terrein Website, <http://www.gwl-terrein.nl/?english> (accessed June 10, 2010).
- ITDP Europe (2010). Interned-based survey of GWL Terrein residents.
- QPark Website, <http://www.q-park.nl/tabid/657/qparkParkingLocatorvw1094/parkingDetail/ParkingID/613/language/nl-NL/Default.aspx> (accessed June 10, 2010).
- Scheurer, Jan (2001). *Urban Ecology, Innovations in Housing Policy and the Future of Cities: Towards Sustainability in Neighbourhood Communities*, Thesis: Murdoch University, Perth Western, Australia.

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- Figure 1: Koepelvereniging
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 - Photo 2: Peter Elenbaas
 - Photos 3, 5-10: Nicole Foletta, ITDP Europe
 - Photo 4: Giesbert Nijhuis