

The Role of Bike Centres in the Urban Transportation Environment

Adrian Witte, M.Sc., PTP, Bunt & Associates, Vancouver, BC.

Paper prepared for presentation at the Cycling and Safety Session of the 2009 Annual Conference of the Transportation Association of Canada, British Columbia.

Abstract

Bike centres (also known as bike stations, bike depots, or cycle centres) are an established concept in many parts of the world. European examples range from little more than elaborate bicycle stacking systems adjacent to a bus stop to the familiar multi-level bicycle parking “garage” at Amsterdam’s Central Station. Other locations too have developed the concept. Asian (and some European) cities have integrated automated stacking technologies to reduce space requirements and discourage theft.

In the United States, California introduced smaller-scale bike stations in the 1990’s, initially as an alternative to carrying bicycles onto transit vehicles. Their success has spurred a rapid expansion in the development of bike stations around the country. Most examples to date have focused on extending the reach of public transport. But can a bike centre be successful away from transit?

Whilst the integration with transit is important, a number of recent applications have shown that bike centres can also provide a destination unto themselves and extend the appeal of cycling as a commuter option. As the cost of constructing vehicular parking increases, there is also significant interest from the development community as to the role these facilities could play in relieving vehicle parking requirements for redevelopment.

This paper presents the findings of a literature review of bike centre experience on four continents. It identifies the range of services provided at bike centres and describes the market segments attracted to these facilities. A classification system based on a bike centre’s primary market attractions will be developed.

For transit-oriented bike centres, opportunities that arise out of the synergies with transit and other modes of transport are explored. Less is known about commuter-oriented bike centres. As such, this paper examines some of the key transportation planning and policy needs of these facilities that can encourage their development. Overall, the paper answers the question of where bike centres fit into the urban transportation environment.

Introduction

In many cities, cycling is one of the fastest growing modes of transportation. Although the recent impetus of bicycle planning has tended to focus on developing cycling route infrastructure, bicycle parking facilities are also recognized as an integral part of increasing the role of cycling in the urban transportation environment.

Traditionally, bicycle parking has been addressed through municipal by-laws that require parking and end-of-trip facilities be provided as part of redevelopment. However in many cities around the world, more extensive bike-parking facilities are now being considered. Increasingly popular is the concept of a full service bike centre, also known as a bike station, bike depot, or cycle centre. These facilities have been applied at various scales and in various forms in Europe, Asia, Australia, and the United States. A bike centre can be described as:

A centralized location, often attended or otherwise access controlled, used primarily for secure short- and long-term bicycle parking. They usually also feature a range of bike-related services including: retail, rentals, repairs, accessory sales, food vending, shower and change facilities, and travel information. Bike centres play an integral role in promoting greater cycle use by providing attractive facilities for commuter cyclists and exploiting synergies with transit and other transportation modes.

The intent of this paper is to review international experience in the application of bike centres to understand their role in the urban transportation environment and best define their physical needs and policy frameworks that will encourage their development.

International Experience

Experience in the application of bike centres on four continents is summarized below in terms of the historic development and objectives of bike centre applications in each. Although bike centres are relatively new to the North American and Australian transportation landscapes, for some time European and Asian cities have adopted this concept in one form or another.

Europe

There are estimated to be more than 3,000 bike centres in Europe (1). For the most part, these cater to parking transit-linked bicycle trips (i.e. persons cycling to the station to park and then ride transit).

The Netherlands has historically led innovation in bicycle infrastructure development and as part of national policy requires that bicycle parking be made available at every Dutch National Railway (NS) station. Bicycle parking shelters in the Netherlands range in size, the largest providing parking for up to 4,000 bicycles. The most familiar example is the large bicycle parking garage at the Dutch National Railway station in Amsterdam.

Many of these facilities are “un-guarded” and so do not fit the classical definition of a bike centre. However, since 2000, NS policies have directed security improvements at these facilities. In fact, guarded bicycle parking facilities have been introduced to over 90 of the approximately 390 bike shelters provided at NS stations (2).

The “Make Way for the Bike” program introduced by the rail infrastructure provider ProRail and rail operator NS intends to make every rail station bicycle parking lot either fully staffed, automated with state-of-the-art self-service facilities, or a combination of the two by 2010 (2). A technology-assisted service (known as ACTS) has been introduced at a number of smaller facilities where providing attendants is not cost-effective. ACTS uses closed circuit television (CCTV) to control entry and monitor movement in the facility and an intercom system to maintain communication with the central control room.

Following the lead of the Netherlands, the German state of North Rhine-Westphalia has established since 1991 a network of bike centres that consists of over 60 “Radstations” and 18,000 bicycle parking spaces. These range in size from 50 spaces to 3,300 spaces, but tend to average around 300 spaces (3). The primary objective of these facilities is to connect with regional rail services, as a result the majority are constructed around the station environs. However a number of German cities have been expanding bicycle parking facilities through incentive programs, particularly in city centres and at transit stops.

Switzerland has also followed the lead of the Dutch and German models, creating since 1997 a network of 23 “vélo stations” and almost 7,000 bicycle parking spaces that serves over 10,000 clients annually. Primarily, these facilities are intended to serve as an interchange between transportation modes (4).

Asia

Similar to Europe, bike centres have formed part of the urban transportation landscape for some time, particularly in Japan where they provide an interchange between cycling and transit. Japanese national and local laws require bicycle parking facilities to be provided near rail stops, resulting in an estimated 8,000 bicycle parking facilities (1) ranging from single racks to fully automatic bicycle parking garages, some holding more than a thousand bicycles.

The space constraints around many Japanese rail stations has led to the advancement of bicycle parking technologies, most of which employ compact stacking below- or above-grade to minimize space requirements and automatic bicycle processing to enhance parking security, improve efficiency (most systems take approximately 10 seconds to process a bike – less than that required to lock a bike to a rack) and improve convenience for the user (removes the need to carry a lock and key).

North America

The majority of bike centre experience in North America has been in the United States. Bike centres are a relatively recent feature of the transportation environment and are generally referred to as bike stations or bike depots. By far the most widespread are the facilities developed and/or operated by the Bikestation organization, which created the first US bike centre in the mid 1990’s in California in response to the space being taken up by bikes carried onto rail services.

Most US applications follow a similar vein and provide patrons a place to park their bike before taking transit to complete their journey. Discussions with U.S. bike station operators indicated that the key to achieving sufficient numbers of cyclists (to sustain operations) is to provide access to, or be in close proximity to major transit hubs. However, there are some examples of “commuter-oriented” bike stations such as the 300-space Chicago Millennium Park bike station, understood to be the largest in the United States that have observed high levels of use.

Australia

The first Australian application of a bike centre was *Cycle2City* opened in Brisbane in 2008. One of the first primarily commuter-focused facilities in the world, this 420 space cycle centre delivers full service to its patrons including lockers, showers, wash rooms, fresh towels, ironing and laundry facilities, repairs, and accessory sales. It is also unique in that it is located below-grade having taken over part of a vehicle parkade.

The facility connects to the transportation network via a ramp and is located adjacent to the Central Business District. A second facility is being considered by Queensland Transport at the Royal Brisbane Women's Hospital, which will combine a significant employment base at the hospital (commuter demands) and a regional transit interchange at the Inner Northern Busway rapid-bus station (transit demands).

Facility Types

International experience in the application of bike centres has shown that in Europe, Asia, and North America, the primary focus has been on delivering patrons to transit. More recent applications, such as those in Chicago, Australia, and parts of Europe have provided a utilitarian focus, particularly for downtown or high activity areas. Although bike centres can serve multiple purposes, for the most part, they can be categorized by their primary function as one of two types:

- **Transit-oriented:** intended to facilitate inter-modal connectivity and extend the reach of public transport; or
- **Commuter-oriented:** serving areas with high employment and activity concentrations.

These facilities vary in a number of ways including the services they provide, their space requirements, and the market segments that they attract. These are addressed in more detail below.

Services and Space Requirements

Bike centres can be described as having three basic service components:

1. **Bicycle Parking:** the primary reason for the bike centre, bicycle parking should be safe, secure, and convenient. For most bike centres, this is the most spatially efficient component of the facility. There are a number of different parking types that can be employed. In increasing order of spatial efficiency these include:
 - Single-level bicycle lockers;
 - Single-level bicycle racks;
 - Dual or multi-level bicycle racks; and
 - Attended or valet bicycle parking.
2. **End of Trip Facilities:** refer to facilities cyclists use to clean-up following their journey such as clothing lockers, showers, washrooms, and towel and laundry services. Interestingly, very few North American bike stations provide these facilities, most likely because they cater to transit-linked trips (i.e. biking is not the final leg of the journey) and rely on destination buildings (e.g. office towers) to provide these services.
3. **Bike-Related Services:** complementary land uses and services that can improve the desirability, convenience, and revenue-generating potential of a bike centre. Complementary land uses include (not considered comprehensive):
 - Air and water;
 - Transportation information;
 - Bicycle library;
 - Internet kiosk;
 - Bicycle retail: bikes, parts, and accessories;

- Bicycle repairs;
- Bicycle rentals;
- Bicycle tours;
- Snacks/vending machines;
- Retail, e.g. café, deli, juice bar, health and fitness studio, dry-cleaner, flower or newspaper stand, sporting goods rental or retailer, bicycle courier service, etc.;
- Car-share;
- Cycling advocate offices;
- Cycling education, seminars, and workshops;
- Bicycle licensing program;
- Sports cycling displays e.g. cycling hall-of-fame, local or international team shirts, memorabilia, and promotion of local cycling events.

A review of bike stations in the United States has categorized these facilities as transit- or commuter-oriented and the floor area / bicycle parking ratio reviewed for each. **Table 5.1** shows that transit-oriented facilities require less space than commuter-oriented facilities to park the same number of bikes. This becomes logical when one considers that transit-oriented bike centres do not typically provide significant end-of-trip facilities or many ancillary services, whereas providing “full service” to patrons is a prerogative of commuter-oriented bike centres.

Table 5.1: Survey of Existing Bike Centre Floor Space

Type	Number	Floor Area (sq.ft.)		Floor Area / Spaces (sq.ft. / space)
		Minimum	Maximum	Average
Transit-Oriented	8	1,000	2,000	14
Commuter-Oriented	2	2,100	12,000	35
All	10	1,000	12,000	19

References: 5, 6, 7, 8, 9.

Market Segmentation

The categorization of commuter- and transit-oriented bike centres is based on their primary role. This is also reflected in the market segments that they attract, namely commuter or transit-linked trips respectively. Understanding these segments in more detail allows a more robust analysis to be undertaken of the anticipated demands at a given facility. Each market segment is described below in terms of their trip characteristics and catchment area.

1. Commuter Cyclists

These are users that cycle to a bike centre and then walk to a destination (e.g. work, shopping, etc.) within the surrounding catchment area. This market segment has the highest propensity of any for mode shifting from automobiles. Although this group makes up the largest market share for commuter-oriented facilities, linking these facilities to transit may still be important to ensure diversified market segmentation.

2. Transit Linked Trips: Bike-Park-and-Ride

Users that cycle to the bike centre to park and then ride transit to their destination are known as “bike-park-and-ride”. The majority of existing bike centres in Europe, Asia, and the United States serve this market share. The catchment area for this market segment represents persons living outside of a reasonable walking distance, but within a reasonable cycling distance of the bike centre.

3. Transit Linked Trips: Bike-Ride-and-Park

Users that cycle to a transit stop, carry their bike onto the transit vehicle (bus, train, ferry, etc.) and then park their bike at a bike centre at the end of their journey are known as “bike-ride-and-park”. This market share is usually much smaller than bike park-and-ride given the capacity limits and policies for taking bikes on transit. As well, demand for this segment is reduced with the availability of a bike centre or some other form of secure bicycle parking at the origin transit station.

4. Transit Linked Trips: Ride-Bike

Users that ride transit to a bike centre and pick up their bike, which is stored there permanently, to continue their journey are known as “ride-bike”. A public bicycle system (PBS) established at the destination serves a similar purpose and may remove the need to store bicycles at the bike centre for this leg of the trip. The catchment area for this segment represents destinations outside of a reasonable walking distance, but within a short cycling distance.

5. Other Users

In addition to the market shares described above, a bike centre could also see demands from:

- Special events, e.g. sporting events, festivals, etc.;
- Recreational patrons and tourists;
- Owners of high end bikes looking to reduce their in-unit requirements to store this equipment; and
- Patrons using the services provided by the bike centre such as bike rentals, repairs, retail, etc.

Policy Requirements

Just as transit- and commuter-oriented facilities vary in the services that they provide and the market segments that they attract, their policy requirements are also unique. Policies surrounding transit-oriented facilities build on the synergies between cycling, transit, and other modes of transport. In contrast, commuter-oriented facilities require a more analytical approach that considers the need for these facilities within the bicycle parking environment, the establishment of policies that support their use, and development of a coordinated strategy of deployment.

Transit-Oriented Bike Centres

These facilities can physically extend the reach of the existing transit system and in constrained networks, can relieve transit congestion by replacing the first or last leg of a transit journey. There are environmental conditions that are more conducive to the use of bicycles around transit. These include:

- **Distance** from a transit station: in particular, those patrons outside of a comfortable walking distance from their preferred transit station;
- **Transit gaps**: those areas currently not served, or with limited transit service; and
- **Relative speed**: where the travel time of the first or last leg of a transit trip (including waiting times and stop durations) is longer than the time to cycle.

Policy direction must make use of the synergies that exist with transit. For example, it is important that bike centres be integrated into transportation hubs. The increased exposure from these and other high-activity locations also has a positive impact in promoting the facility. Consideration should be given to extending, or creating, an integrated ticketing system that includes the use of bike centres.

In the Dutch and Japanese models, the services offered by secure bicycle parking are valued to the degree that they are considered essential in the success of rail transit stations. Similar policies may be adopted in other places, where transit-oriented bike stations (or other secure bicycle parking facilities) are requirements at all stations.

Similar to transit, car-sharing is highly compatible with a bike centre in broadening a person's travel choices. Integrating a car-share program with a bike centre directly addresses potential cyclist's concerns of needing a vehicle during the day for meetings, errands, etc. It is important that these synergies are exploited to enhance travel choice.

Car-share programs often offer a number of complementary benefits to their members, including reduced cost transit passes and a discount on car rentals. Given the synergy with cycling, there may be opportunities to extend these benefits to cover the bike centre through discounts, joint memberships, etc. These options should be explored through the system design and financial planning stages of a project to maximize benefits and integration between these systems.

Commuter-Oriented Bike Centres

Unlike transit-oriented bike centres, which are a support mechanism to another mode of transport, commuter-oriented bike centres are a destination unto themselves and as such their success depends on self-generated demands. The role of these facilities within the bicycle parking environment must be carefully considered and policies to support this role developed.

Considering general transportation policy, a high profile cycling project such as a bike centre represents an opportunity to revisit and enhance transportation policies to further support cycling. These may include:

- Shifting priorities towards active transportation modes, e.g. reducing traffic volumes and speeds; improving active transportation signage and way-finding.
- Introducing "impediments" to automobile transportation such as charged vehicle parking;
- Measures to improve the bicycling environment to and from the bike centre in response to anticipated increases in bicycling activity, e.g. new or improved cycle routes;
- Introducing incentives to encourage investment, sponsorship, and funding of bike centres and other bicycle infrastructure, e.g. reduced vehicle parking requirements for developers who construct these facilities (see below).

Together, well founded transportation policies and increased cycling use present a strong combination in influencing priorities for walking, bicycling, and transit. Policies specific to commuter-oriented bike centres are also required in order to guide the process of development, co-ordinate with other bicycle parking infrastructure, and encourage support and investment. One possible policy framework is described below.

Conduct an Area-Wide Bicycle Parking Study

Most municipal agencies have by-laws that direct the amount of bicycle parking to be provided by a development (or redevelopment). For short-stay bicycle parking this typically takes the form of bike racks, and for long-stay parking often a bicycle room with parking and end-of-trip facilities. The objectives of a commuter-oriented bike centre overlap with these provisions, particularly those of long-stay bicycle parking. In this way, enforcing by-law bicycle parking requirements in the catchment area of a commuter-oriented bike centre can be detrimental to its effectiveness by taking away valuable market share.

Municipal agencies should identify their overall bicycle parking needs through a Bicycle Parking Study. Similar to its vehicular counterpart, this study includes an inventory of existing supply and the identification of future short-stay and long-stay bicycle parking needs. The desire to pursue specialized facilities such as bike centres should be identified as part of this study.

Develop Complimentary Bicycle Parking Policy

Policies that support the creation and interaction of bicycle parking infrastructure needs to be developed, or existing policies revised. Specific to bike centres, this may include:

- Identifying the role, number, spacing, and general location of bike centres;
- Developing guidelines for the application of transit- and commuter-oriented bike centres, e.g. the provision of end-of-trip facilities, space requirements, etc. Where transit- and commuter-oriented facilities overlap, guidelines addressing the integration of the two are also necessary;
- Reviewing the role of long-stay bicycle parking requirements in local by-laws. In particular, whether these should be reduced (and by how much) within the catchment area of a bike centre in response to the increase in supply;
- Develop guidelines for the consistent funding, development, and operation of bike centres. This may include ensuring consistent branding, way-finding, usage policies, fee structures, or operators.

Identify Opportunities

The effective deployment of a bike centre, or a network of bike centres, is facilitated by engaging the interests of both public and private stakeholders. Local policy must reflect these prerogatives. This may start with an investigation of publicly-owned lands and facilities such as transit stations, public spaces, city-owned parkades, etc. These locations allow public agencies to deliver their desired objectives (e.g. to serve the general public, increase cycling mode share, enhance links to transit, etc.) within the parameters of their mandate.

The most obvious private sector opportunities arise in the form of retrofitting existing development or as part of redevelopment. However, the skills offered by the private sector (e.g. financial accountability, management, etc.) may also enhance the planning, development, construction, and operation of publically-driven schemes.

Encourage Opportunities

There are economic drivers that may introduce reluctance, particularly for the private sector, to move away from bicycle parking by-laws to a bike centre. By-law requirements are intended to serve a specific building or development and are often constructed as economically as possible internal to buildings or in parkades. Bike centres demand visible and accessible locations to ensure their success and although they generate some form of revenue, they can displace higher-value land uses (often retail).

Encouraging the development of bike centres is necessary to overcome these issues. This can take many forms, some examples include:

- Off-setting vehicle parking requirements if additional bicycle parking (as part of a bike centre) is created. This has received significant interest from the development community, especially considering the increasing cost of constructing underground vehicle parking;
- Offering tax credits for the retrofit of bike centres to existing development;
- Supporting density bonuses, or removing the bicycle parking component of a bike centre from a development's calculable floor area, for retrofit or new bike centres;
- Collecting contributions from future development in the "catchment area" for the creation of a bike centre in exchange for reduced long-stay bicycle parking requirements.

Conclusions

Cycling is a rapidly growing mode of transport. Bike centres add to the amenities provided for cyclists, breaking down some of the commonly cited barriers hindering increased cycling levels. Overall, bike centres encourage cycling as a more viable transportation mode.

A review of established bike centres in Europe, Asia, North America, and Australia has shown that they can generally be classified as one of two types based on the primary market segments they serve. These are either transit-oriented, serving primarily of transit-linked trips, or commuter-oriented, serving primarily commuter cyclists. These facility types vary in the services they provide, the role they play in the transportation environment, and in their policy requirements.

Transit-oriented bike centres extend the reach, and relieve capacity constraints, of the public transportation network. Policies supporting this type of facility must build on the synergies between cycling, transit, and other modes of transport.

Commuter-oriented facilities, on the other hand require a more analytical approach to consider the need for these facilities within the bicycle parking environment, the establishment of policies that support their use, and strategies to ensure their coordinated deployment.

References

1. Giuliani, R.W. and Rose, J.B. (1999) *New York City Bicycle Parking Needs*. City of New York Department of City Planning, Transportation Division.
2. NedRailways (2009) *BestPractice – Expertise in Rail (Special Edition)*. Accessed from website: http://www.nedrailways.com/pdf/special_edition-bikes.pdf. May 2009.
3. Radstation website: http://www.fahrradfreundlich.nrw.de/cipp/agfs/lib/pub/abstract/standard_lang,1/oid,3809/ticket,guest. Accessed on: May 2009.
4. Vélo Station website: <http://www.velostation.ch>. Accessed on: May 2009.
5. Bikestation website: www.bikestation.com Accessed February 2008.

6. Puget Sound Regional Council (2002). *Central Puget Sound Regional Bikestation Project*.
7. City of Fort Collins (2001). *Bike Depot Feasibility Study*.
8. Los Angeles County. *Bike-Transit Centre Implementation Plan*.
9. Livingston, H. (2005) *Millennium Park Bike Station Offers Viable Commute Option*. The American Institute of Architects.