High Density Cycle Parking: Options for the University of Oxford

Prepared by Catherine Pilley (Australian National University)

for

The University of Oxford Environment and Sustainability Office, July 2015

Contents

Executive Summary .......................................................................................................................... 2
Issues .............................................................................................................................................. 2
Recommendations .......................................................................................................................... 2
Introduction ..................................................................................................................................... 2
Cycle Parking issues in Oxford ....................................................................................................... 2
What is high density cycle parking? .............................................................................................. 3
Comparing existing systems ........................................................................................................... 4
How practical would a high density cycle parking system be for Oxford? ................................. 7
  Oxford Transport Strategy .......................................................................................................... 7
Opinions .......................................................................................................................................... 7
  Are cycle parking issues in Oxford serious enough to warrant the construction of an underground system? ......................................................................................................................... 7
Recommendations .......................................................................................................................... 9
References ......................................................................................................................................... 10
Acknowledgments .......................................................................................................................... 10
Executive Summary

Issues
1.1. The University faces a number of problems related to the provision of adequate cycle parking.
1.1.1. Issues of unmet cycle parking demand include: fly parking (bikes parked in inappropriate locations), inconvenience and access problems, damage to bikes, an increase risk of theft and a lack of secure parking.

1.2. An issue is how practical a high density parking system would be for the University, and whether these issues of unmet parking demand are serious enough to warrant the construction of an underground parking system, like in Nishi-Kasai Station in Edogawa, Tokyo.

Recommendations
2.1. Obtaining more data to understand the scope of the cycle parking issue is imperative. This will indicate whether parking issues are widespread or mainly concentrated in city centre.

2.2. The University should commence looking into high density parking options (Eg. Underground parking systems). However, this needs to be in association with both the City and County Councils, and in line with the County’s Transport Strategy.

Introduction
The provision of adequate cycle parking is frequently cited as an issue facing the City of Oxford. The high volume of trips by bicycle to and from the University’s functional estate, creates a high demand for cycle parking. This is especially the case during the academic term, in locations such as the Science Area, City and Colleges. Given the constrained space available in these areas, it can be difficult to meet the scale of demand through the use of conventional bike parking. Furthermore, the special and historical character of Oxford poses a barrier in relation to which solutions are feasible. Unmet demand provokes consequences, including fly-parking (bikes parked in inappropriate locations, obstructing footpaths and entrances), inconvenience and access problems, damage to bikes and an increased risk of bike theft. Subsequently, having no certainty about the availability of a secure parking location can deter people from cycling altogether.

This report will compare cycle parking solutions available on the market and recommend a suitable option for the University. Identifying systems adopted at other universities to deal with similar problems will be a valuable exercise. Recommendations will be given for further research and the data needed to implement such an innovative solution.

Cycle Parking issues in Oxford
The following issues of unmet cycle parking demand were identified:

- Fly parking (bikes parked in inappropriate locations, obstructing paths)
- Inconvenience and access problems
- Damage to bikes
- Increased risk of theft
Figure 1 - The current parking situation at Oxford Station. Although the station is currently being redeveloped and the cycle parking situation re-evaluated, the lack of adequate parking is a major issue. This photograph shows the toast-rack style bike stands at the front of the Station.

What is high density cycle parking?

High density cycle parking encompasses innovative structures, which facilitate mass bike storage. As evident in the table below, there are a number of different designs, including automated underground systems, above-ground “towers”, purpose-built bicycle parking stations, storage rooms and different types of bike stands (Eg. two-tiered racks).

Figure 2 – Two-tiered racks observed outside the new buildings of the Mathematical Institute. Throughout my stay in the UK, I also noticed these racks in place at a number of train stations (Eg. Milton Keynes).
Comparing existing systems

In preparing this report, a number of different high density cycle parking options and structures were researched. The table below aims to summarise the main features of parking systems, which might be of interest to the University.

<table>
<thead>
<tr>
<th>SYSTEM</th>
<th>DESCRIPTION</th>
<th>CONSTRUCTION COSTS</th>
</tr>
</thead>
</table>
| Underground Parking System at Nishi-Kasai Station, Edogawa (Figure 4) | - Capacity : 9400 bikes  
- Facility includes 36 underground towers, with 180 bicycles in each tower. The facility also includes a mix of other parking options – Eg. Two-tiered racks.  
- Robotic gripper holds bike and transports it vertically down into the garage.  
- Retrieval: 22 seconds  
- Cost of single use: 100 yen  
- Bike has to be inspected before use, since dimensions of racks are intended to match a standard Japanese bicycle.  
- IC tag attached to bike for system identification. | Approximately £35 million. |
| Giken Ltd Eco Cycle                           | - Provides a land-saving and compact design, which aims to “eliminate nuisance parking on footpaths“.  
- User-friendly, with voice announcements that indicate to the user when to load their bike into the system.  
- Similar system to that at Nishi-Kasai Station. | 150 million yen.                   |

Figure 3 – A bike storage area outside a graduate accommodation building in Wellington Square. Fixed butterfly wall mounted stands are currently in place, however given the size of the area, there is potential for two-tiered racks to be constructed, enhancing storage capacity.
| Biceberg – Spain | - “Bike locker” design. Based on the concept of an “iceberg”, where bikes are stored below ground, out of sight.  
- User rolls bike into a locker, which also provides space for helmet and bag storage.  
- Capacity: 93 bikes  
- Retrieval time: 30 seconds | €150 000 |
| --- | --- | --- |
| Cycle Hub concept | - “Cycle centre” concept, enabling various facilities to come together – Eg. Secure parking, repair facilities and information.  
- Aims to provide a “one stop shop”. Location encourages travel to and from the station by bike, providing a secure storage. |  |
| CyclePoint, Leeds City Station | - “Created by Abellio, with involvement from Network Rail, local authorities in Leeds, cycling organisations and the Department of Transport.”  
- Capacity: 300 bikes  
- Maintenance and repair services offered on a “bring in the morning, collect in the evening” basis.  
- Local cycling information available for tourists.  
- Fees: £1.50 per day, monthly and annual subscriptions also available.  
- Hub incorporates “Bike & Go” hire scheme |  |
| Cycle Hub at Paragon Station, Hull | - Integrated cycle hub, similar to Leeds Cycle Point.  
- Capacity: 160 bikes  
- Includes 6 ebike charging points, repair shop and hire bikes.  
- Fees: £1 per day, £5 per week, £150 per year |  |
| **Underground Cycle Carpark  
– Willem Wilmink Square Plaza in Enschede** | - Underground carpark-like structure, featuring Falco two-tiered racks.  
- Capacity: 540 bikes  
- Free to use  

- VeloComfort automated cycle stair ramps installed, so cyclists can manoeuvre their bikes up and down the stairs with ease. |
|---|---|
| **Bicycle Apple “fietsappel” – Alphen aan den Rijn, Netherlands** | - Parking structure in the shape of an apple  
- Wind-vane at the top, in the shape of a leaf.  
- Stairs and ramps throughout the structure to access bikes.  
- Aesthetically pleasing and attractive design.  
- Located at railway station  

- Capacity: 1000 bikes. However, a survey has indicated that this is not adequate and the facility is frequently “over full”. The Council removes bikes which are not correctly parked in a rack.  

- Structure: 16m in height, 27m in diameter  
- Opened August 2010  

- Free parking, but unmanned facility and security concerns  
- Long construction time – entire steel frame was constructed at a factory and then moved to the location. | €2.53 million |
How practical would a high density cycle parking system be for Oxford?

Oxford Transport Strategy
From correspondence with Martin Krafft (Infrastructure Planner at Oxfordshire County Council), high density cycle parking solutions and underground parking options are something that the Oxford Transport Strategy aspires to in the long term. However, an issue is whether Oxford has currently researched a tipping point to warrant the implementation of such options. Obtaining data on the current parking situation or engaging an independent consultant would be valuable to understand whether a tipping point has been reached on this trajectory.

Opinions
During my research, I have taken time to obtain the opinions of key professionals and stakeholders. Dr Tim Schwanen (Associate Professor at the Transport Studies Unit) critiqued the idea of whether cycle parking actually poses a barrier and deters people from cycling in Oxford. Even if bike racks were full, commuters could always attach their bike to a railing or travel to another location, despite such a situation being less than ideal.

Another local transport professional questioned the causal link between cycling levels and cycling infrastructure. Generally, places with higher cycling levels have more cycling infrastructure, than places with lower levels of cycling. However, it should be questioned whether cities with lots of cyclists provide more infrastructure because of cyclist demand. For example, Oxford had high levels of cycling long before cycle infrastructure was developed, indicating that social, economic and spatial factors play a major role in infrastructure development as well.

Are cycle parking issues in Oxford serious enough to warrant the construction of an underground system?
Given the constrained urban environment of Oxford city centre, high density cycle parking solutions are likely to play a significant role in the future, given their potential to provide a practical parking system and improve visual amenity. However, whether such a solution is necessary now is questionable, with more research needed to warrant and validate construction. A cost-benefit analysis would need to be considered and financial and technical barriers evaluated. Constructing an underground system could be perceived as radical, given that major excavation would be required, potentially affecting city aesthetics. It would need to be determined whether parking would be provided free of charge or a business model developed.

During my research, contact was made with George Uematsu at Edogowa-ku City to understand more about the technical and operational side of the bike parking towers. The underground bike parking facility at Nishi-Kasai Station was constructed in 1999 and is the largest in Japan, with a capacity of 9400 bikes. A brochure from George about the design of the “Cycle Tree” system, suggested that 1 bike could be accommodated per 0.2sqm of floor space. However, construction of the facility was expensive at around £35 million.

George indicated that maintenance occurs three times per year, with these dates advertised in advance to users. If a power outage occurs, users are unable to remove their bike from the facility and are given a replacement bike to borrow. Bikes also have to be inspected before the facility is used for the first time. The size of bikes must be “Height below 122cm, width below 60cm, length below 185cm, weight below 30kg”. Subsequently, bikes that have extremely wide tires or tricycles
are prohibited. Staff members are not required to operate the facility, although are needed to inspect the bicycles of first time users. If an emergency break down occurs, technical support is obtained from a professional maintenance company.

Giken Ltd also designs a similar underground cycle parking system, known as the “Eco-cycle” (http://www.giken.com/en/developments/eco_cycle/). From the design specifications, the system seems to operate in a similar way to the underground towers at Nishi-Kasai Station. The design concept describes the development as facilitating “culture aboveground, function underground”. The compact design is “land-saving” and an “aesthetic urban development”, allowing space above ground to be utilised as gardens and offers a “user-friendly and high-security system”.

![Figure 4 - The underground bike parking “towers” in place at Nishi-Kasai Station in Edogawa, Tokyo.](http://www.jfe-eng.co.jp/en/products/comfortable/multi/mul01.html)

Despite the underground parking systems having enormous potential to address unmet cycle parking demand in Oxford, an underground construction could be considered radical, especially given the historical and cultural significance of the city. As a result, a ground based system could be more appropriate, cost-effective and easier to maintain. The JFE Higashi-Kanagawa Dormitory, is such a system (http://www.jfe-eng.co.jp/en/products/comfortable/multi/mul01.html). The system operates in a similar way to the underground towers, in that an IC tag is required to be attached to the bicycle. The “mechanical aboveground” Cycle Tree facility has a capacity of 100 bicycles and is located in close proximity to Higashi-Kanagawa Station.

![Figure 5 – The JFE Higashi-Kanagawa Dormitory bicycle parking system.](http://www.jfe-eng.co.jp/en/products/comfortable/multi/mul01.html)
Recommendations

**Recommendation 1:** Obtaining more data to understand the scope of the cycle parking issue is imperative. Eg. Whether parking issues are widespread or mainly concentrated in the city centre.

**Action:** Undertaking an exercise to determine the number of cycles parked at different locations, during different times of the day and year, would be valuable. Rather than engaging in a field exercise counting bicycles, a remotely operated webcam network could be established, allowing the number of parked bicycles to be determined. Webcams could be installed in major parking areas, taking a photograph at regular intervals and uploading it to a server. Software could subsequently be used to detect and monitor the number of parked cycles. Although expensive, such a technique would provide valuable data, allowing different concentrations of parked cycles to be detected.

**Justification:** Obtaining more data would be beneficial when analysing which areas have been cluttered or overburdened by bikes. This data would also assist in determining optimal facility placement when implementing a high density parking solution.

**Recommendation 2:** The University should begin looking into high density parking options (Eg. Underground parking solutions). However, this needs to be in association with both the City and County Councils, and in line with the Oxford Transport Strategy.

**Action:** Start researching potential suppliers, to understand why schemes were implemented in other localities (Eg. Edogawa in Japan). Research should be conducted now, but should be focused with a long term vision in mind. A consultant could be engaged to provide a feasibility study.

**Justification:** Although this report will provide initial guidance in comparing high density parking options, corresponding with suppliers and visiting locations where such systems have been implemented is invaluable and essential research.
References


http://www.biceberg.es/INGLES/m_empresa.htm
http://www.cyclepoint.org/leedscyclepoint.html
http://hullcyclehub.co.uk/

Acknowledgments
This report was made as part of the IARU Sustainability Fellowship. During the program, I spent 6 weeks working at the University of Oxford Estate Services, with the Environmental and Sustainability Team. I feel very privileged to have been given such an amazing opportunity to live and work in Oxford, while gaining experience from attending meetings, events and working on variety of different projects.

In particular, I would like to thank Adam Bows and Ed Wigzell (Sustainable Transport Team) for assisting and supervising me during this project. Thank you to Jennie Jack for organising my stay in Oxford. I would also like to thank ANUGreen for selecting me for this amazing opportunity.