

Future Mobility

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http://g400.co.uk/cam/future_mobility.pdf

Future Mobility: Questions

We'll mainly focus on the following question:

- *How do we develop and implement sustainable transport options, particularly for a city with a historic core like Cambridge.*

Other questions to consider:

- *What potential is there for new kinds of multi-modal communication in our social and working lives?*
- *Will future businesses employ more tele-workers at a distance?*
- *What are the necessary conditions for high levels of safe cycling in the city?*

Our approach today

- Establishing the problem and constraints
- We'll then look at three categories of solution:
 - Past: what has and hasn't worked
 - Present: current trends
 - Future: what might be possible
- Finally, we'll look at some real proposals for transport in Cambridge and propose some new ideas based on some of the solutions covered

Historic Urban Cores

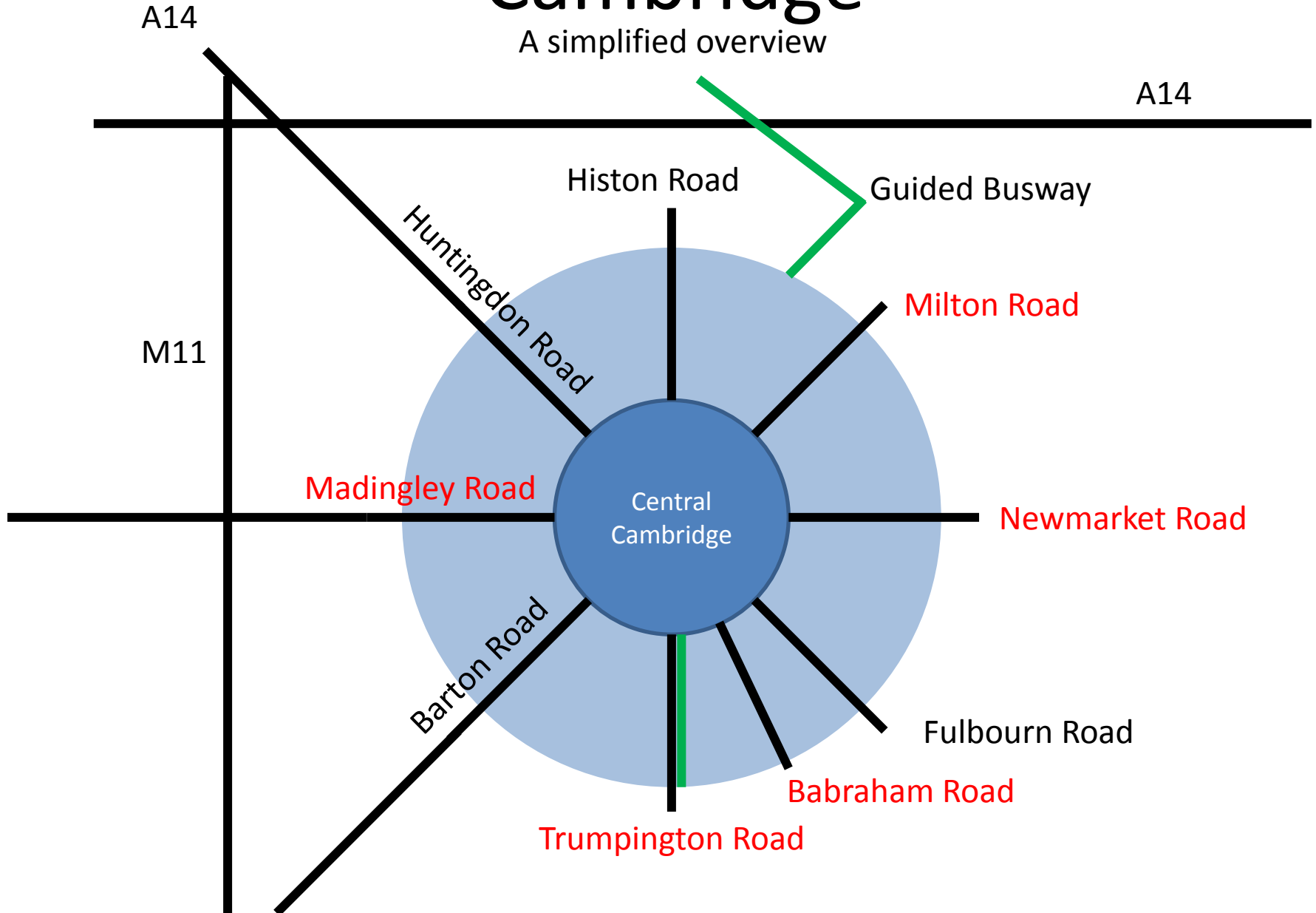
- Narrow thoroughfares
- Often little long-term planning
- Many listed and delicate buildings
- Little existing public transport provision
- Overwhelming quantity of private transport

Transport problems to solve

- We need to consider both:
 - Travel into and out of the city from nearby settlements
 - Travel within the city
- At the same time, we also need to consider both:
 - Transport between socially and economically important sites such as existing transport infrastructure, the central business districts of surrounding settlements, university sites, shopping centres, business/science parks, hospitals, etc.
 - Transport that efficiently serves the (generally) far more sparse residential areas

Cambridge

A simplified overview



Cambridge

- Cambridge has roughly twice as many jobs as residents
- Transport infrastructure in the city is a nightmare:
 - Full of listed buildings (over 1500), mostly in the city centre (pic.twitter.com/p1gftlWfE4)
 - Narrow thoroughfares
 - Nobody had the foresight to build or form a good ring road
 - The University of Cambridge ensured that a city centre station was never built
- Cambridge has a green belt, discouraging physical expansion of the city. This has lead to:
 - A population density increase
 - Significant expansion of towns and cities within commuting range but outside of the green belt
 - Entirely new towns (e.g. Cambourne, Northstowe)
 - Local property prices and rent rates are being pushed up to levels that rival London
 - In 2013 a Cambridge Union debate voted for the motion that “Cambridge is bursting at the seams”
- Lack of unitary authority slows political progress
- “City deal” is about to unlock £1bn of transport and affordable housing funding and would see the relevant councils working as a “combined authority”

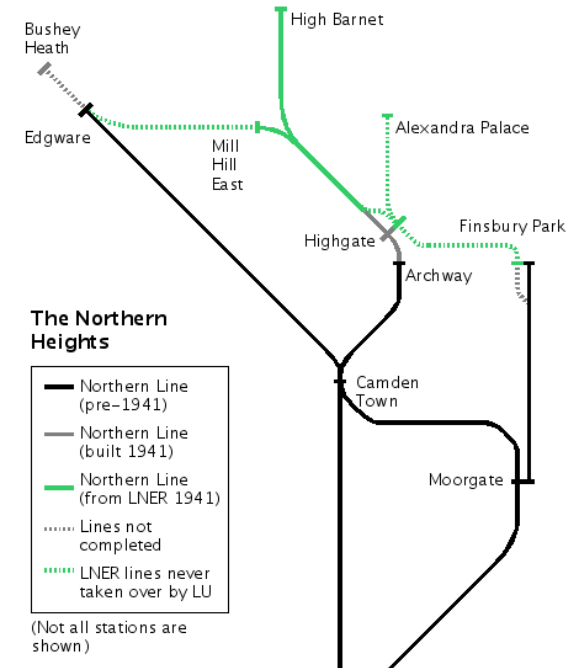
The Past

- Transport in old cities is not a new problem
- The past is our most valuable source of information about what works
- Equally interesting are unfinished projects – why were they not finished and what were their outcomes?

Unfinished London

London has a number of examples of unfinished projects

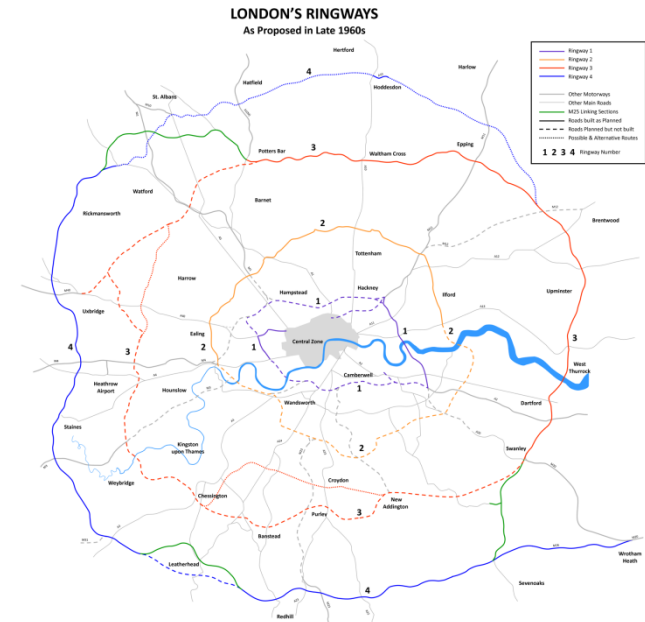
- London Underground's "New Works Programme" (1935-1961)
 - Halted by WWII
 - Reduced by post-war green belt and limited resources
 - Mixed legacy:
 - Central Line eastern extension completed, western extension cut short
 - Northern line Bushey Heath extension abandoned, some electrifications abandoned, some electrifications completed and connections completed
 - Some Metropolitan Line electrifications abandoned



Map by Rob Brewer

Unfinished London

- Greater London Council's "Ringways" (1966-1973)
 - Orbital roads proposed as far back as 1937
 - Abandoned due to multiple causes:
 - Political opposition: about 1 million Londoners would be within 200 yards of a motorway
 - Enormous cost: approximately equivalent to £22.3bn today
 - Legacy:
 - Portions of East and West sides of ring 1
 - Northern half of ring 2 (now A406/North Circular Road)
 - Combination of rings 3/4 (now M25)
 - Partially built radial routes (e.g. M1)



Map by DavidCane at en.wikipedia.org

Unfinished London

- For further information, YouTube “Unfinished London”.
 - Educational and entertaining

Trams

- Over 300 tramway operators in the UK in 1910
- The demise of trams was caused by:
 - Some tramways built in areas that could not provide sufficient passenger numbers
 - Route inflexibility (particularly for those with insufficient passengers)
 - The rise of buses
 - Infrastructure replacement costs

The Present

- What schemes are trending at the moment?
- Will today's popular schemes become a headache tomorrow?
- BRT (Bus Rapid Transit) vs LRT (Light Rail Transit) vs cycling vs cars

Road traffic restrictions

- Most private road vehicles are simply not allowed into many historic town and city centres
- Cambridge has examples of a number of road traffic restrictions:
 - Pedestrianisation
 - Rising bollards keep all but buses, taxis and bicycles out of the rest of the city centre
 - A city-wide 20mph speed limit is currently being introduced

Cycling

- Popular politically as it is environmentally friendly, uses space efficiently and is cheap for both the population and government
- Popular locally, though to what extent is this due to lack of alternatives?
 - Cars are strongly discouraged
 - City is too small for buses to be useful for most journeys
 - Milton Keynes has dedicated cycleways but other transport options were also well-designed, resulting in rates of cycle commuting well below the national average for urban areas
- Currently, cyclists cause additional danger for unavoidable traffic types (e.g. cars, pedestrians)

Park and Ride

- Park at an out-of-town car park and get on a bus
- Some people will always have to drive
- Can get costly if the parking costs money and the bus costs money
 - The more expensive it gets, the more attractive city centre parking looks
- Cambridge now has 7 Park and Ride sites!
 - Excluding a few precursors, these have only been opened from the 1990s onwards. Are they really a sustainable solution?

Guided Busways

- A form of Bus Rapid Transit (BRT)
- Buses run along a track that guides their direction (various specific implementations)
- Narrower than a road – can run along corridors and embankments/cuttings previously used by railways
- Buses can run on roads too – this allows them to continue where a busway cannot be built for some reason (e.g. historic city centre or where cost not justified by benefits)
 - Could encourage development which would make the cost of further busway justified
- Overall, a very flexible piece of infrastructure.
- As oil becomes more scarce, what will buses of the future be like? Will there be buses at all?
- Could we automate the busway?
 - The driverless Stansted Airport Track Transit System is not dissimilar.
- Buses are still subject to road-related delays and like turning up in twos or threes

Guided Busways

- Trendy in the UK at the moment
 - Luton-Dunstable (2013)
 - World's second longest guided busway
 - Fewer users than expected
 - Opened late, cost more than expected
 - Cambridge-St Ives (2011)
 - World's longest guided busway
 - More users than expected
 - Opened very late, cost far more than expected
 - Doesn't offer a great improvement on journey times, but does increase reliability
 - Many smaller sections of busway in other locations



A Guided Bus on the Cambridgeshire Guided Busway yesterday
Photo © Mark Hogan

Bus Rapid Transit

- In the UK there are an increasing number of bus systems that are non-guided but otherwise of a similar nature
- Dedicated significant infrastructure gives reassurance that a reasonable service will be maintained
- Normally quicker to build and a fraction of the cost of Light Rail Transit (LRT)
- It's likely that any further BRT we see in Cambridge will be more Guided Busway

Light Rail Transit

- More tried and tested than Bus Rapid Transit, and means something more consistent
- Automation is the future, and it's available for light rail now
- The Docklands Light Railway (DLR) is an example of a very successful automated light rail system
- Though the privatisation of National Rail has worsened the situation, railways are still seen as less profit-driven than buses.



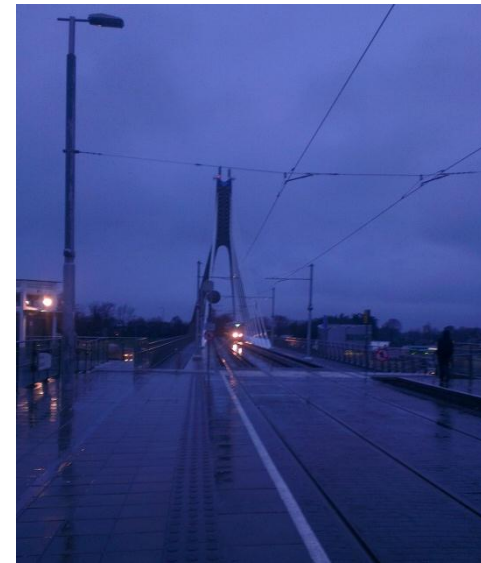
A DLR train running alongside some heavy rail
Photo © Mark Hogan

Trams

- The light rail equivalent of guided buses: can go fast on dedicated sections but can also share road space where space is limited
- Very popular in the past and now seeing a revival
- The Luas, in Dublin, is a good example of a new piece of transport infrastructure that serves a historic urban core:



A Luas Tram on the street
Photo © Mark Hogan



A Luas Tram on dedicated track
Photo © Mark Hogan

The Future

- To what extent should we try to plan for tomorrow's needs instead of just meeting today's needs?
- Should Cambridge wait for new technologies?

Segregation of cyclists

- SkyCycle is a proposed raised cycleway in London that would use the space above suburban railways
 - Over 200 entrance points
 - Over 220km of new cycle routes
 - What spaces in Cambridge could be used for a similar purpose?
- Electric bikes are increasingly common

Personal Rapid Transit

- A cool idea: on-demand point-to-point travel for small groups
 - Overcomes many inefficiencies associated with mass transit
- Very few implementations though there are larger numbers of projects at the prototype stage
 - London Heathrow Airport Terminal 5 has one of the few existing systems
- Sinclair C5 (1985) and Segway PT (2001) are single-person private road/pavement vehicles that share some thinking with PRT



A Sinclair C5 at The Centre for Computing History, Cambridge
Photo © Mark Hogan

Maglev

- Trains that magnetically levitate above their tracks
- At the moment these are typically among the world's fastest trains
- However, lower speed Maglev systems have existed and continue to exist
 - Birmingham Airport once had such a system
- Typically expensive to build but very reliable and low-maintenance
- Few implementations at the moment – if this increases, more data on cost, maintenance and reliability will be available and through economies of scale subsequent systems will become cheaper
- Under some conditions can be more power efficient than traditional trains but, again, there's limited data on this

Automated Cars

- Within the foreseeable future, cars are going to be able to drive themselves better than humans can
- With appropriate sensors, ad-hoc communication and more, things like traffic light controlled road junctions could become a thing of the past
- There's a big psychological hurdle to overcome – people won't like trusting their car
- Parking is still a problem

Other ideas

- Some new transport solutions are not relevant to the problems we're trying to solve
- Hyperloop is suitable for only large distances – it has a top speed of 760mph!
- Heavy rail is too large-scale for intra-city transport

Back to Cambridge

- So, what can we do in Cambridge?
- Lack of space for additional transport is a significant issue
- The city is too small to justify ambitious plans without also proposing development to make them viable
 - Development is happening, whether it's desired or not: Cambourne, Northstowe
- Some specific recent proposals and new ideas are on the next few slides...

Cambridge(shire) automated metro

- If we accept that we can't go through Cambridge and that going over would spoil it too, we have to go under.
- Underground rail is a more pleasant experience than underground buses at the moment.
- Cambridge itself isn't large enough to justify such a system
- Surrounding settlements have seen (and continue to see) much growth. A light rail system across Cambridgeshire with underground sections in Cambridge is a solution I have proposed.

Cambridge(shire) automated metro

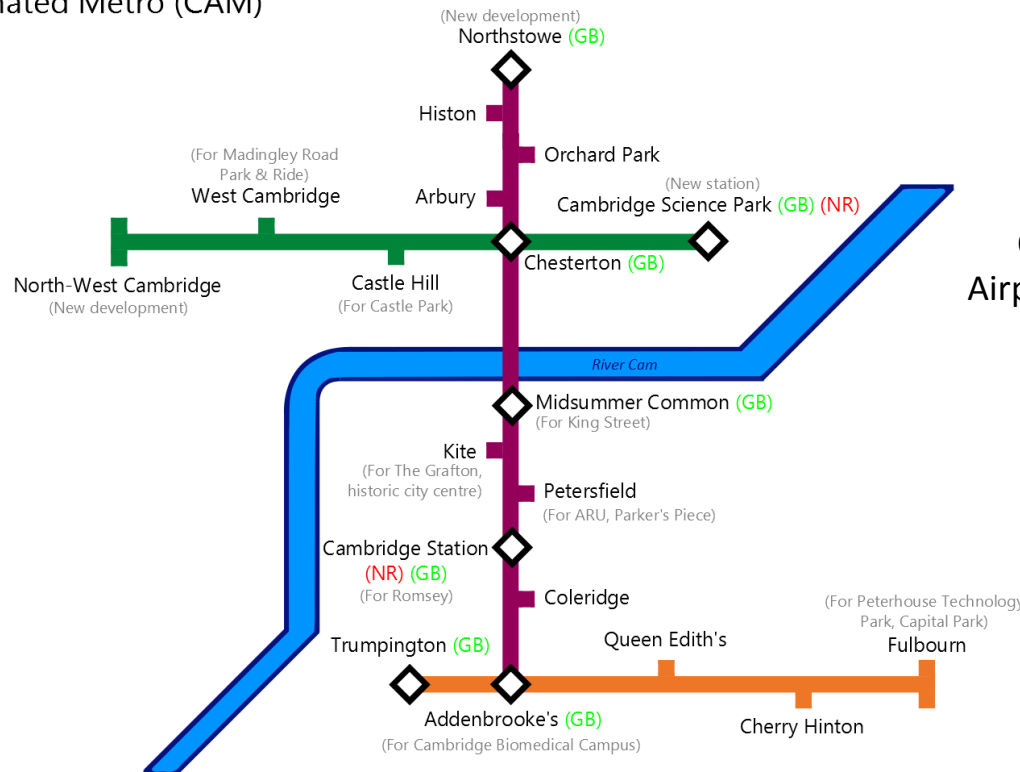
Onwards to St Ives, Huntingdon
and Peterborough?

Cambridge Automated Metro (CAM)

Deep Level Proposal



Onwards to Bar Hill,
Cambourne, St Neots
and Bedford?



Onwards to Cambridge
Airport, Newmarket and Bury
St Edmunds?

Onwards to Royston,
Letchworth and Hitchin?

Key

- Central
- North
- South

Interchanges:

- (NR) National Rail
- (GB) Guided Busway

Underground Guided Buses

- Similar to Cambridge Automated Metro, but with Guided Buses
- Ideally, buses need to be low-emission or emission-free
- Works with existing Guided Busway infrastructure
- Large buses require large tunnels

Monorail

- Like the underground proposals, a raised monorail would create new space in Cambridge through which to transport people
- Fantastic views could be provided to passengers
- Fantastic views could be ruined by the monorail
- The trend in the UK is to go under cities rather than over

Segregated Cycle Routes

- There may not be much room on the streets of Cambridge, but in some places there is enough to create a segregated cycleway
 - This is happening where it can
 - The UK's first traffic lights that let bicycles move before other traffic were recently installed in the city
- In central Cambridge, ban all vehicles except for bicycles?
 - Very little daytime traffic is allowed in central Cambridge as it is
 - This would encourage cyclists to obey any traffic lights, one-way restrictions, etc. as these would be exclusively and unambiguously for them
 - Roads can be opened to all traffic at night, to allow deliveries to stores and taxis for revellers

In conclusion...

Further Reading

- The Pirate Omnibus (“The best, the worst, and the plain bewildering from 150 years of public transport”):
<http://pirateomnibus.wordpress.com/>
- Travelling the Cambridgeshire guided busway (a neutral and regularly updated blog about the Cambridgeshire guided busway):
<http://travellingtheguidedbusway.blogspot.co.uk>
- Summary of transport in Cambridge and consequential justification if city deal:
<http://democracy.cambridge.gov.uk//documents/s14744/City%20Deal%20-%20%20Ap%201.pdf>

Further Reading

- BRT: <http://omnibuses.blogspot.co.uk/>
- LRT: http://www.lrtf.org.uk/index.php?option=com_k2&id=65&lang=en&task=download&view=item
- PRT: http://en.wikipedia.org/wiki/Personal_rapid_transit
- Cycling: <http://www.g400.co.uk/cantabits/?p=1826>
- Tunnelling under Cambridge: <http://www.cambridge-news.co.uk/News/Tunnel-vision-to-keep-city-on-the-move-31012013.htm>

Future Mobility: Q&A

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Thank you

Slides online at

http://g400.co.uk/cam/future_mobility.pdf

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