

Technical Paper 001: CBD Benchmarking

Supplement to the Parramatta CBD Strategic Transport Study



To:
City of Parramatta**CC:****Project name:**
Parramatta CBD Strategic Transport Study**Project ref:**
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Technical Paper 001

Subject: CBD Benchmarking

SUMMARY

The purpose of this paper is to identify centres that are comparable to Parramatta CBD, and use the lessons learnt to help shape the future of Sydney's "Central City". A qualitative and quantitative analysis of Parramatta CBD was conducted for reference based on three growth scenarios proposed by City of Parramatta. A total of 19 global metropolitan areas were compared to Parramatta CBD and ranked based on 15 criteria around demographics and transportation. Eight CBDs were deemed as appropriate benchmarks for Parramatta CBD:

- Zuidas (a second CBD for Amsterdam), Netherlands
- Downtown Brooklyn (a third CBD for New York), United States
- Manchester City Centre, United Kingdom
- Brisbane CBD, Australia
- Downtown Portland, United States
- Downtown Vancouver, Canada
- Part Dieu (a second CBD for Lyon), France
- Perth CBD, Australia

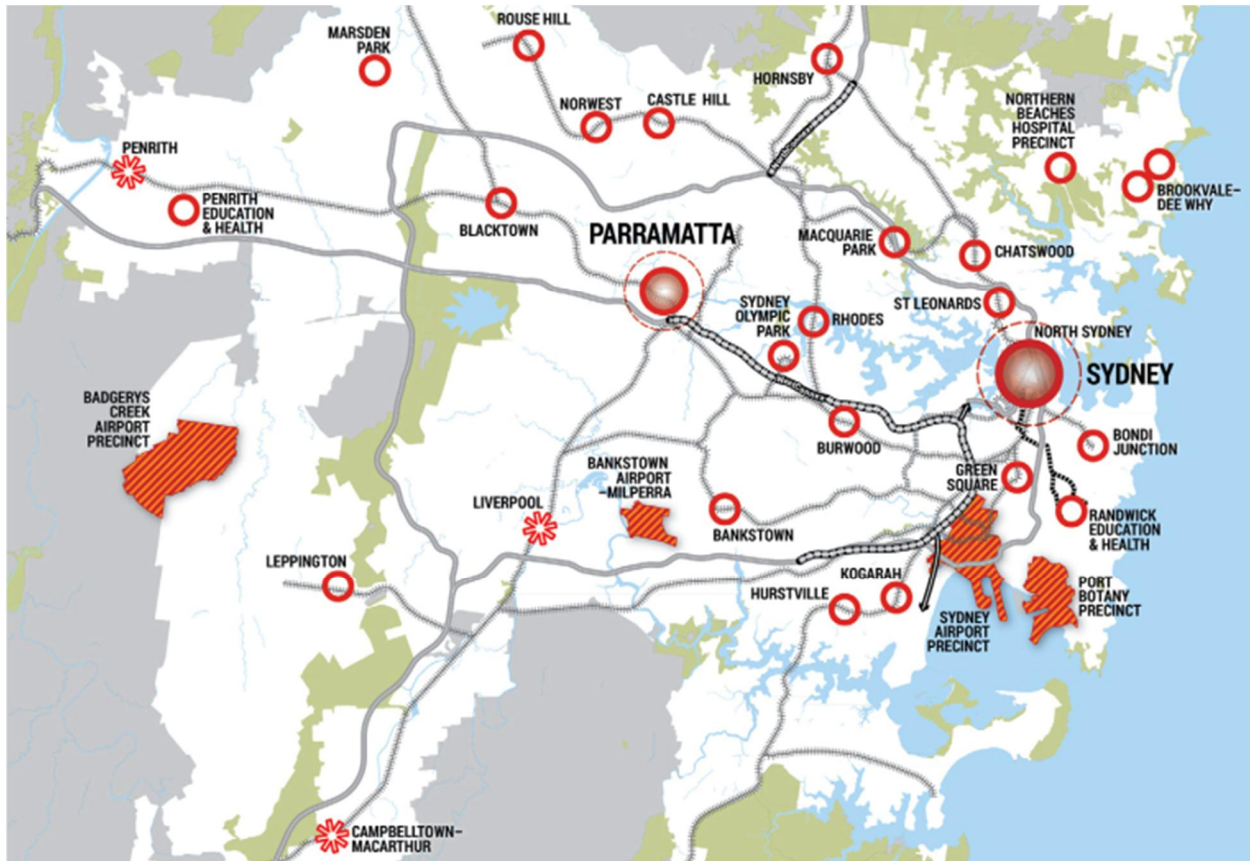
Several key lessons were drawn from this analysis. These lessons learnt will help define the transport strategy for Parramatta CBD:

- A degree of self-containment can be achieved with a balance of land uses, allowing people to live, work and play in the same area.
 - Provision of well-planned public transport is vital to embed travel behaviours early and support businesses and residents outside traditional CBDs.
 - New public transport infrastructure that can offer cost, time and convenience benefits over private vehicles can encourage a modal shift away from private vehicles.
 - Direct, connected and safe cycleways and quality end-of-trip facilities can encourage a modal shift away from private vehicles.
 - Cultural and sporting venues are key catalysts for change outside traditional CBDs.
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1. Background

Parramatta is the geographical, commercial and civic centre of Western Sydney. Parramatta is the second largest CBD in Sydney and the sixth largest in Australia, with 54,000 jobs and 21,000 residents (BTS, 2014). With a \$23 billion economy the Parramatta LGA has a broad economic base spread across health, commercial (i.e. finance, information and communications technology, and insurance) and Government sectors. Parramatta also has a strong retail and education presence and serves as the civic centre of Western Sydney, accommodating attractions such as the Pirtek Stadium, Riverside Theatres and Parramatta Park. These functions will further develop as Western Sydney's population grows. The location of Parramatta CBD is shown in **Figure 1**.

Figure 1 Location of Parramatta CBD



Source: NSW Department of Planning and Environment, A Plan for Growing Sydney, 2014

The NSW Government's visions for Parramatta have been highlighted and reinforced at various tiers of city planning. At a metropolitan scale Greater Parramatta has been identified by the NSW Government in successive metropolitan strategies as Sydney's second CBD, and more recently as the core of Sydney's 'Central City' in GSC's draft vision for the Greater Parramatta and Olympic Peninsula.

2. Overview

2.1 Scenarios

City of Parramatta (**Council**) has prepared a planning proposal with three growth scenarios to support the continued development of Parramatta CBD:

- Scenario 1 | Existing controls: an estimated 22,320 new jobs and 5,712 new dwellings.
- Scenario 2 | Medium capacity: an estimated 42,136 new jobs and 12,154 new dwellings.
- Scenario 3 | High capacity: an estimated 48,763 new jobs and 20,297 new dwellings.

2.2 Impact of growth

Table 1 summarises the impact of growth on Parramatta CBD, focusing on residential and employment population. The table also identifies existing Journey to Work (**JTW**) mode share for trips to and from Parramatta CBD.

Table 1 Parramatta CBD growth scenarios

	2016	2056	Change
Residential and employment population			
Size	171 hectares (ha)	171 ha	0 ha
Number of jobs	54,000	76,300* to 102,700**	22,300* to 48,700**
Job density	320 jobs/ha	450* to 600** jobs/ha	130* to 280** jobs/ha
Population	21,000	34,100* to 67,900**	13,100* to 46,900**
Population density	120 residents/ha	200* to 400** residents/ha	80* to 280** residents/ha
Existing JTW mode share to Parramatta CBD			
Public transport		37%	
Active transport		5%	
Car		56%	
Existing JTW mode share from Parramatta CBD			
Public transport		44%	
Active transport		12%	
Car		43%	

Source: NSW Transport Performance and Analytics and Parramatta City Council, 2016

* Based on existing controls projections ** Based on high growth projections

3. Methodology

3.1 Long list

Metropolitan areas with a population similar in size to Western Sydney (1.9 million) were identified as a potential benchmark. A total of 19 metropolitan areas were identified through this process;

- Turin, Italy;
- Valencia, Spain;
- Lyon, France;
- Munich, Germany;
- Hamburg, Germany;
- Brussels, Belgium;
- Cologne-Bonn, Germany;
- Amsterdam, The Netherlands;
- Budapest, Hungary;
- Vienna, Austria;
- Frankfurt, Germany;
- Portland, United States;
- Perth, Australia;
- Brisbane, Australia;
- Charlotte, United States;
- Vancouver, Canada;
- Birmingham, United Kingdom;
- Manchester, United Kingdom;
- Pretoria, South Africa.

Two secondary CBDs were also identified; North Sydney in Australia and Downtown Brooklyn in the United States.

15 criterion were developed to rank each city to determine their comparative qualities to the Parramatta CBD. The 15 criterion are shown in **Table 2**.

The long list is shown in **Appendix A**.

Table 2. Criteria used to assess suitability of each potential benchmark

Criteria	Parramatta CBD	Green	Yellow	Red
Metro size	8,941km ²	+/- 20% of Parramatta CBD	+/- 20%-40% of Parramatta CBD	+/- 40% of Parramatta CBD
Metro population	1.9 million	+/- 20% of Parramatta CBD	+/- 20%-40% of Parramatta CBD	+/- 40% of Parramatta CBD
CBD size	171 ha	+/- 20% of Parramatta CBD	+/- 20%-40% of Parramatta CBD	+/- 40% of Parramatta CBD
CBD population	34,098 to 67,939	Within Parramatta CBD range	+/- 20% outside Parramatta CBD range	+/- 20%-40% outside Parramatta CBD
CBD population density	199 to 397 per ha	Within Parramatta CBD range	+/- 20% outside Parramatta CBD range	+/- 20%-40% outside Parramatta CBD
CBD jobs	76,262 to 102,705	Within Parramatta CBD range	+/- 20% outside Parramatta CBD range	+/- 20%-40% outside Parramatta CBD
CBD job density	446 to 601 per ha	Within Parramatta CBD range	+/- 20% outside Parramatta CBD range	+/- 20%-40% outside Parramatta CBD
CBD population and jobs combined	110,360 to 170,644	Within Parramatta CBD range	+/- 20% outside Parramatta CBD range	+/- 20%-40% outside Parramatta CBD
CBD population and jobs density combined	645 to 998 per ha	Within Parramatta CBD range	+/- 20% outside Parramatta CBD range	+/- 20%-40% outside Parramatta CBD
% of population and employment growth being experienced	>2% growth per annum in population and employment	>2% growth per annum in population and employment	1-2% growth per annum in population and employment	<1% growth per annum in population and employment
Distance from the primary CBD	23km	+/- 20% of Parramatta CBD	+/- 20%-40% of Parramatta CBD	+/- 40% of Parramatta CBD or not applicable
Interesting ideas to facilitate growth	Not applicable	If applicable	Somewhat applicable	Not applicable
Journey to Work mode share for trips to the CBD	As per "Green" target	Public transport + active transport = minimum 60%, car = maximum 40%	Public transport + active transport = 50%-59%, car = 40-49%	Public transport + active transport = maximum 49%, car = minimum 50%
Heavy rail operates to/from the CBD	As per "Green" target	2 or more stations and at least 2 lines	1 station and at least 1 line	0 stations and 0 lines
Light rail operates to/from the CBD	As per "Green" target	2 or more stations and at least 2 lines	1 station and at least 1 line	0 stations and 0 lines
Points	Not applicable	1 point	0 points	-1 point

3.2 Short list

Using this methodology, eight CBDs were identified as appropriate benchmarks for Parramatta CBD:

- Zuidas (a second CBD for Amsterdam), Netherlands
- Downtown Brooklyn (a third CBD for New York), United States
- Manchester City Centre, United Kingdom
- Brisbane CBD, Australia
- Downtown Portland, United States
- Part Dieu (a second CBD for Lyon), France
- Perth CBD, Australia

Each of these are described in detail in **Section 4.0**.

4. Benchmarks

CASE STUDY #1: ZUIDAS, THE NETHERLANDS

City	Metro Size	Metro Pop	CBD Size	CBD Pop	CBD Pop Density	CBD Jobs	CBD Job Density	CBD Pop & Jobs	CBD Pop & Job Density	JTW Mode Share Aim for the CBD	Primary PT mode	Other PT mode/s
Parramatta	8,940km ²	1.9 million	170ha	34,100-67,900	200-400/ha	76,300-102,700	450-600/ha	110,400-170,600	640-1,000/ha	PT/AT 60%, Car 40%		
Zuidas	2,580m ²	2.3 million	210ha	55,000 by 2040	260/ha	80,000 by 2040	380/ha	135,000	650/ha	PT/AT 59%, Car 41%*	Rail	Light rail

AMSTERDAM TRANSPORT NETWORK

CYCLING

- Preferred form of transport for short trips in inner city.
- 7.5km (30 minute cycle time) is considered an acceptable cycling distance in The Netherlands.
- Amsterdam has over 400 kilometres of cycling paths.
- More than 1,500 cyclists use the busiest cycling routes in the afternoon peak two hours (4pm-6pm).
- Authorities have vowed to significantly increase availability of bike parking to address a key constraint.
- The city's compact, dense form and flat terrain make cycling an attractive choice.
- Progressive policy making has furthered cycling as an attractive option.

AMSTERDAM METRO

- 4 lines with 52 stations (33 metro and 19 light rail stations) across a 41km network.
- Daily ridership of 181,000 (2015).
- Annual ridership of 66.2 million (2015).
- A fifth line 9.5km long will open in 2018 with 8 new stations.

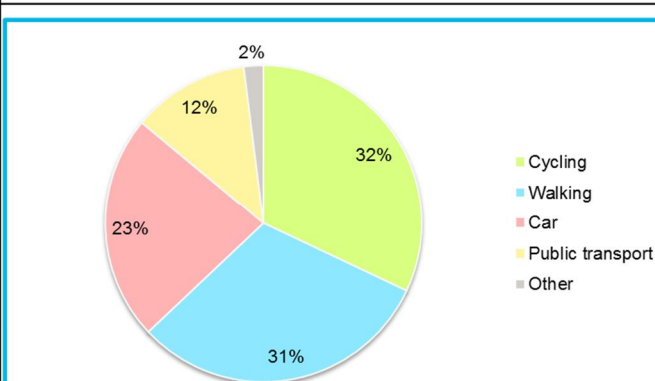
AMSTERDAM TRAM

- 15 routes with 500 stops across an 80.5km network.
- Daily ridership of 356,000 (2015).
- Annual ridership of 130 million (2015).

DUTCH RAILWAY SERVICES

- Intercity trains provide a direct connection between Amsterdam Airport Schiphol and Zuidas, a trip that takes approximately 8 minutes.
- Intercity trains also provide a direct connection between Amsterdam Airport Schiphol and the city centre, a trip that takes approximately 17 minutes.
- No metro or light rail services to/from the airport.

GREATER AMSTERDAM JTW MODE SHARE



LOCATION OF ZUIDAS



* Actual JTW mode share

ZUIDAS

OVERVIEW

- Zuidas is 6km south of Amsterdam City Centre, placing it within comfortable cycling distance.
- Established as a financial district in the 1990s, when ABN AMRO opened its new headquarters.
- 6 million people can access Zuidas within an hour.
- Served by metro (3 stations on 2 lines) & trams (7 stops on 3 lines). New metro line opens in 2018.
- 33% of trips to Zuidas are by public transport, 26% by active transport and 41% by car. Car and public transport mode share is considerably higher than that of the Amsterdam Metropolitan Area, and active transport mode share is lower.

LESSONS LEARNT

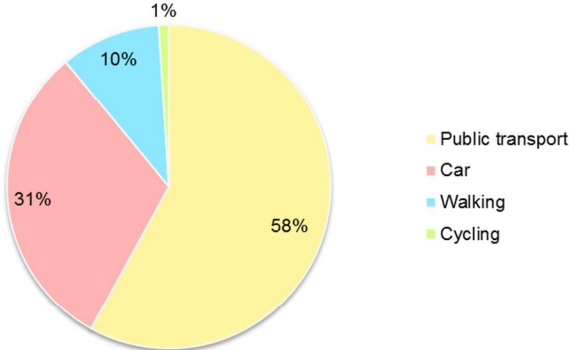
- ✓ Mixed land uses (33% residential, 33% commercial, 33% amenity) can stimulate vibrancy in a new district outside traditional CBD.
- ✓ Provision of well-planned public transport is vital to embed travel behaviours early and support business and residents in a new district outside traditional CBD.
- ✗ The location of a nearby major motorway encourages the use of private vehicles.
- ✓ As a result, in this urban environment, public transportation must be more efficient to be attractive (travel distances to key locations of the metropolitan area e.g. airport, leisure and cultural centre have to be competitive).

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CASE STUDY #2: DOWNTOWN BROOKLYN, USA

City	Metro Size	Metro Pop	CBD Size	CBD Pop	CBD Pop Density	CBD Jobs	CBD Job Density	CBD Pop & Jobs	CBD Pop & Job Density	JTW Mode Share Aim for the CBD	Primary PT mode	Other PT mode/s
Parramatta	8,940km ²	1.9 million	170ha	34,100-67,900	200-400/ha	76,300-102,700	450-600/ha	110,400-170,600	640-1,000/ha	PT/AT 60%, Car 40%		
Brooklyn	180km ²	2.6 million	120ha	15,000	130/ha	100,000	850/ha	115,000	980/ha	PT/AT 61%, Car 35%*	Rail	Bus

NEW YORK TRANSPORT NETWORK	GREATER NEW YORK JTW MODE SHARE	DOWNTOWN BROOKLYN
NEW YORK CITY SUBWAY 34 lines and 469 stations across a 376km rapid transit network. - Daily ridership of 5.6 million on weekdays (2015). - Annual ridership of 1.76 billion (2015), making it the seventh busiest rapid transit network in the world. 24 hour operation for a 24 hour city.		OVERVIEW 4km east of Lower Manhattan. - Third largest business district in New York behind Midtown Manhattan and Lower Manhattan. - Downtown Brooklyn Development Plan aimed to stimulate residential development. Plan was approved in 2005 and has generated almost \$US10 billion in private development. - Success of Brooklyn Academy of Music has helped establish a cultural district. - Opening of Barclays Center in 2012 has further stimulated interest in Downtown Brooklyn. 9 Subway stations serviced by 9 trains 51% of trips to Downtown Brooklyn are by public transport, 10% by active transport and 35% by car.
PORT AUTHORITY TRANS-HUDSON (PATH) 4 lines with 13 stations (33 metro and 19 light rail stations) across a 22km rapid transit network. - Daily ridership of 210,000 (2015). - Annual ridership of 59.1 million (2015). - Connects Newark and Jersey City with Manhattan. - PATH serves World Trade Center Transportation Hub with transfers available to NYC Subway. 24 hour operation for a 24 hour city.		LESSONS LEARNT - High public transport connectivity to neighbouring CBDs and residential neighbourhoods minimises private car usage for Journey to Work trips. - Transportation modes other than private vehicles increase in cities with low private vehicle ownership rates. - A CBD with mixed uses (residential and commercial) reduces the number of private vehicle trips to and from CBD. - Cultural and sporting developments are a key feature of change in new districts outside the traditional CBD.
STATEN ISLAND RAILWAY & LONG ISLAND RAILROAD - Staten Island Railway is a rapid transit network that comprises a 23km line with 21 stations. - Daily ridership of 28,200 on weekdays (2015). - Long Island Railroad is a commuter rail service that comprises 10 branches with 124 stations across a 1,100km network. - Daily ridership of 337,800 on weekdays (2014). - Both operate 24 hours.	LOCATION OF DOWNTOWN BROOKLYN 	REFERENCES http://web.mta.info/ http://www.panynj.gov/path/ http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_15_1YR_S0802&prodType=table http://www.streetsblog.org/2016/09/29/nyc-needs-huge-growth-in-cycling-to-reach-de-blasios-climate-goals/ http://www.nycedc.com/sites/default/files/filemanager/Services/Location_Services/Downtown_Brooklyn/CBD_1Q11_DB.pdf
CYCLING - Mayor Bill de Blasio has set a target of reducing greenhouse gas emissions by 80% by 2050. - Transport accounts for more than 25% of the city's greenhouse gas emissions, and 92% of that comes from cars and buses. - Mayor's Roadmap to 80 x 50 proposes to decrease private vehicle trips from 31 percent to 12 percent. - Cycling mode share is proposed to increase from 1 percent to 10 percent.	* Actual JTW mode share	

CASE STUDY #3: MANCHESTER CITY CENTRE, UNITED KINGDOM

City	Metro Size	Metro Pop	CBD Size	CBD Pop	CBD Pop Density	CBD Jobs	CBD Job Density	CBD Pop & Jobs	CBD Pop & Job Density	JTW Mode Share Aim for the CBD	Primary PT mode	Other PT mode/s
Parramatta	8,940km ²	1.9 million	170ha	34,100-67,900	200-400/ha	76,300-102,700	450-600/ha	110,400-170,600	640-1,000/ha	PT/AT 60%, Car 40%		
Manchester	630km ²	2.6 million	220ha	25,000	110/ha	140,000	640/ha	165,000	760/ha	PT/AT 61% Car 39%*	Light rail	Bus

MANCHESTER TRANSPORT NETWORK

NORTHERN HEAVY RAIL

- Northern provides heavy rail services in Greater Manchester.
- 16 lines with 101 stations.
- 82% increase in rail patronage over the last 10 years.
- 54% increase expected between 2011 and 2020.
- Northern also provides intercity services that connect Manchester with cities across the United Kingdom.

MANCHESTER METROLINK

- 7 lines with 93 stations across a 92km network.
- Largest light rail system in the United Kingdom.
- Annual ridership of 34.3 million.
- Currently only one line through the Manchester City Centre. Construction of a second line through the city centre is expected to be completed in 2020/2021. Will offer opportunities to improve frequencies across the network.

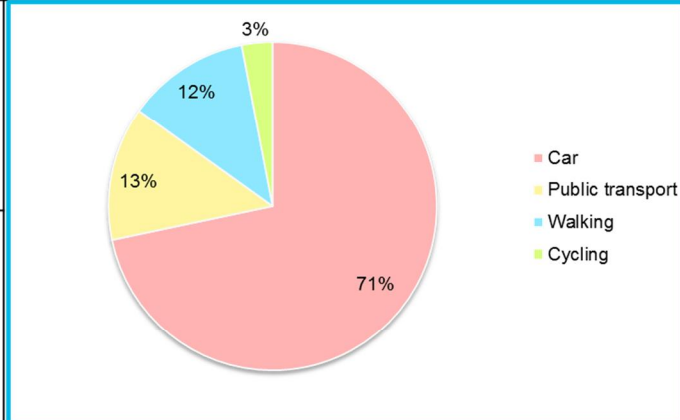
BUS

- Over 600 bus routes and 12,000 bus stops across Greater Manchester.
- Annual ridership of 225 million passengers in 2014.

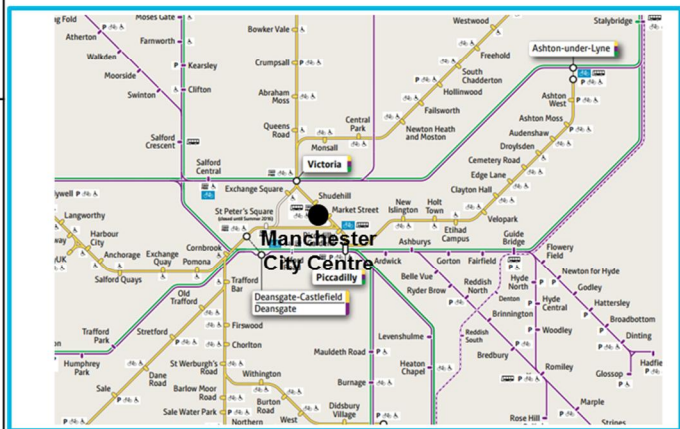
CYCLING

- Transport for Greater Manchester (TfGM) aims to increase cycling mode share (for total trips) from 2% to 10% by 2025.
- 60 kilometres of segregated cycle lanes built since 2013, with a further 45 kilometres of new or improved cycle lanes to be completed by 2018.
- Construction of Cycle Hubs at transport interchanges to facilitate seamless transfers.
- 9,000 adults have undertaken adult bike training sessions and TfGM has worked with 11 schools and colleges to promote cycling.

GREATER MANCHESTER JTW MODE SHARE



LOCATION OF MANCHESTER CITY CENTRE



* Actual JTW mode share

MANCHESTER CITY CENTRE

OVERVIEW

- 140,000 jobs and 25,000 residents in the Manchester City Centre. Solid growth expected in 10 years to 2025.
- £1.5 billion investment over next 5 years in the University of Manchester, Manchester Metropolitan University, and research and science park facilities.
- £1 billion in private investment in Spinningfields, Manchester's premier business destination which will accommodate over 15,000 jobs.
- Investment in new public spaces, museums and festivals.
- 4 railway stations in the city centre, serviced by National Rail. National Rail provides connections between Manchester City Centre, its suburbs and other cities across the United Kingdom.
- 9 light rail stops in the city centre. 7 lines converge on a single track in the city centre. Construction of a second line through the city centre will be completed in 2020/21, increasing the capacity of the network.

LESSONS LEARNT

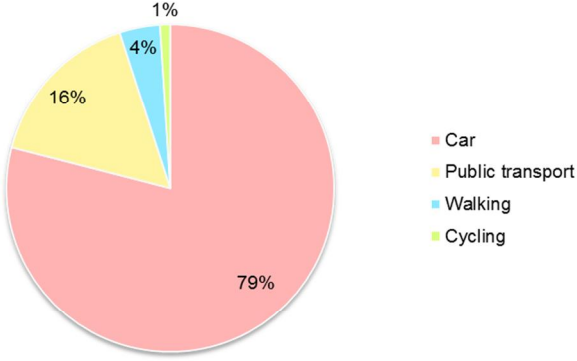
- ✓ A CBD at the geographic centre of the metropolitan area can be easy to reach from all suburbs and beyond when the right infrastructure is implemented.
- ✗ Continued investment in new public transport through the CBD is important to cater for growth so as to avoid capacity becoming a constraint on existing infrastructure.

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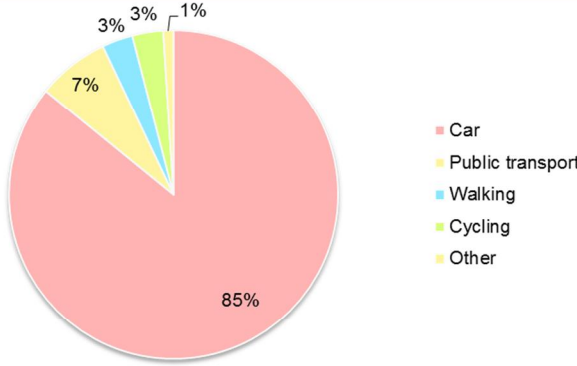
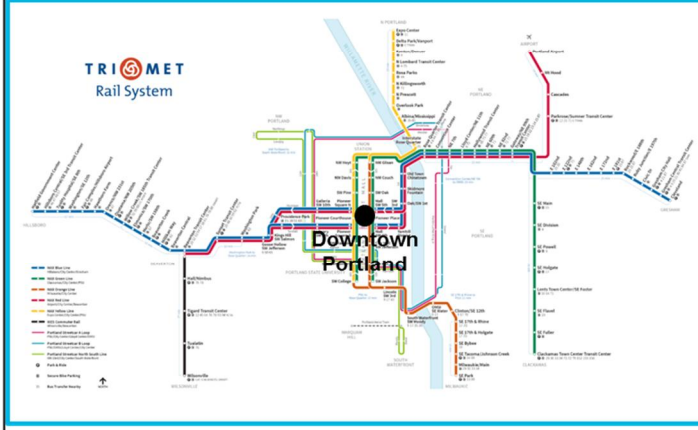
CASE STUDY #4: BRISBANE CBD, AUSTRALIA

City	Metro Size	Metro Pop	CBD Size	CBD Pop	CBD Pop Density	CBD Jobs	CBD Job Density	CBD Pop & Jobs	CBD Pop & Job Density	JTW Mode Share Aim for the CBD	Primary PT mode	Other PT mode/s
Parramatta	8,940km ²	1.9 million	170ha	34,100-67,900	200-400/ha	76,300-102,700	450-600/ha	110,400-170,600	640-1,000/ha	PT/AT 60%, Car 40%		
Brisbane	15,820km ²	2.3 million	200ha	9,400	50/ha	156,600	780/ha	165,960	830/ha	PT/AT 71%, Car 29%*	Bus	Rail

BRISBANE TRANSPORT NETWORK	GREATER BRISBANE JTW MODE SHARE	BRISBANE CBD
QUEENSLAND RAIL CITY NETWORK 13 lines and 146 stations across a 689km commuter network. - Daily ridership of 150,500. - Annual ridership of 55 million. - Several network constraints include a single river crossing and all 13 lines converging on two stations in the Brisbane CBD (Roma Street and Central, which is particularly crowded). 13 lines converging on 4 tracks through the Brisbane CBD means frequency of services in the suburb is limited. BUS 25km of grade-separated bus only corridors have been developed in Brisbane since the mid-1990s. - The busway network comprises three lines and carried over 70 million passengers in 2011 – more than the rail network. - Busways were initially planned to be converted for light rail as demand required, however success of the network and under investment in other modes means Brisbane's public transport network is highly dependent on the busway network. 1 bus every 12 seconds passed the busway network's busiest point (near Woolloongabba Station) during the peak hour. This equates to 294 buses an hour. - Maximum theoretical capacity at any point on the network is 18,228 passengers per hour per direction. FERRY - Like Parramatta, Brisbane is a river city. - Ferry operations commenced on the Brisbane River in the early 1990s as part of a conscious effort to reorient the city towards the river. - CityCat network now provides connections between the Brisbane CBD, South Bank, University of Queensland, Queensland University of Technology and popular inner city suburbs.	 LOCATION OF BRISBANE CBD  * Actual JTW mode share	OVERVIEW 3rd largest CBD in Australia behind Sydney & Melbourne CBDs. - Geographically constrained by the Brisbane River, however concerted effort to reorient the city towards the river through initiatives such as South Bank, CityCat and the Brisbane Riverwalk. - Increasingly popular place to live – Brisbane's two tallest towers have heavy residential focus. - Major sporting stadia and cultural institutions are located on the fringe of the traditional Brisbane CBD. - Council operates a CityCycle system, with limited success (possibly due to lack of segregated cycleways and strict helmet laws in Brisbane CBD). 2 train stations in Brisbane CBD serviced by 13 lines. - High public transport mode share due to progressive policies, geographic constraints and built form. LESSONS LEARNT ✓ Brisbane's reorientation towards the river has helped the city's image; moving from a "country town" to the "river city." ✓ Initiatives such as the CityCat and the Brisbane Riverwalk have improved access to the river for all. ✗ The grade-separated bus only corridors are heavily relied upon by the city, meaning it would be very disruptive to retrofit them with light rail. ✗ Lack of segregated cycleways and mandatory helmet laws result in underperformance of CityCycle. REFERENCES https://translink.com.au/ http://www.brisbaneferries.com.au/about-us-2/our-history/ https://chartingtransport.files.wordpress.com/2012/10/work-dst-mode-split-2001-2011.png https://translink.com.au/sites/default/files/assets/resources/plan-your-journey/maps/160104-train-network-map.pdf

CASE STUDY #5: DOWNTOWN PORTLAND, USA

City	Metro Size	Metro Pop	CBD Size	CBD Pop	CBD Pop Density	CBD Jobs	CBD Job Density	CBD Pop & Jobs	CBD Pop & Job Density	JTW Mode Share Aim for the CBD	Primary PT mode	Other PT mode/s
Parramatta	8,940km ²	1.9 million	170ha	34,100-67,900	200-400/ha	76,300-102,700	450-600/ha	110,400-170,600	640-1,000/ha	PT/AT 60%, Car 40%		
Portland	17,310km ²	2.4 million	270ha	25,700	100/ha	96,600	360/ha	122,300	460/ha	PT/AT 66%, Car 34%*	Light rail	Bus

PORTLAND TRANSPORT NETWORK	GREATER PORTLAND JTW MODE SHARE	DOWNTOWN PORTLAND
MAX LIGHT RAIL 5 lines with 97 stops across a 97 kilometre network. - Daily ridership of 116,800 based on average weekday boardings (2015). - Annual ridership of 37.75 million based on boardings (2015). - Approximately \$US3 billion has been invested in light rail in Portland since 2004. This equates to approximately \$US250 million per year.	 85% Car 7% Public transport 3% Walking 3% Cycling 1% Other	OVERVIEW - Strong growth in residents living in Downtown Portland is expected to continue. - Large Downtown population has aided the prioritisation of people and place over movement. - Portland Transit Mall comprises sets of public transit corridors in Downtown Portland. Pairs of one way streets operate with two lanes dedicated to public transport (light rail and buses) with a third dedicated to cars. 5 light rail lines with 14 stations and 2 streetcar lines with several stops - Active transport has 50% mode share for Journey to Work trips for Downtown Portland residents. Public transport has 16% mode share and cars 34% mode share.
PORTLAND STREETCAR - Portland Streetcar has 2 lines with 76 stops across a 12 kilometre network. - Daily ridership on Portland Streetcar is approximately 15,200 on a typical weekday (2015). - Annual ridership on Portland Streetcar is approximately 4.6 million (2015).		LESSONS LEARNT - Investment in sustainable transport has given Portland a reputation as a leading city for integrated transport and land use planning in North America. - Portland's partnership with Nike on a bike-share system is a good example of a public-private partnership for community infrastructure. - Outside Downtown Portland, the metropolitan area is still highly car dependent.
OTHER - Westside Express Service (WES) Commuter Rail has 5 stations along a single line, running 24 kilometres. - Daily ridership is approximately 2,100. 80 bus routes, 12 of which are designated as "Frequent Service," meaning they have shorter headways than other routes. 15 minute or less wait times on weekdays. - League of American Bicyclists awarded Portland with platinum status as a bicycle friendly city. - Portland launched a bike share program in mid-2016, partnering with Nike. Biketown includes 1,000 bikes and 100 stations. 100,000 rides were logged in the first two months of operation.	LOCATION OF DOWNTOWN PORTLAND  * Actual JTW mode share	REFERENCES http://trimet.org/max/ http://www.oregonmetro.gov/news/you-are-here-snapshot-how-portland-region-gets-around http://www.oregonlive.com/commuting/index.ssf/2016/08/136000_mile_s_in_biketown_bike-.html http://trimet.org/maps/img/railsystem.png

CASE STUDY #6: DOWNTOWN VANCOUVER, CANADA

City	Metro Size	Metro Pop	CBD Size	CBD Pop	CBD Pop Density	CBD Jobs	CBD Job Density	CBD Pop & Jobs	CBD Pop & Job Density	JTW Mode Share Aim for the CBD	Primary PT mode	Other PT mode/s
Parramatta	8,940km ²	1.9 million	170ha	34,100-67,900	200-400/ha	76,300-102,700	450-600/ha	110,400-170,600	640-1,000/ha	PT/AT 60%, Car 40%		
Vancouver	2,700km ²	2.5 million	370ha	54,700	150/ha	145,000	390/ha	199,700	530/ha	PT/AT 69% Car 31%*	Rail	Bus

VANCOUVER TRANSPORT NETWORK	GREATER VANCOUVER JTW MODE SHARE	DOWNTOWN VANCOUVER
SKYTRAIN 3 lines with 47 stations across a 69km network. An extension of the Millennium Line will add 6 stations to the network when it opens in December 2016. - Daily ridership of 390,600 (2014). - Annual ridership of 117.7 million (2014).		OVERVIEW - Like the Sydney CBD, Downtown Vancouver is far removed from the geographic centre of the Vancouver Metropolitan Area. 6 Skytrain stations serviced by 3 lines. - Streetcar system in planning. - Very strong population growth (14% per annum) over the past 15 years. 20% reduction in vehicles entering Downtown Vancouver during this time. 69% of all trips to Downtown Vancouver are undertaken using active or public transport modes, with the remaining 31% being by car.
BUS - All buses are wheelchair-accessible and carry bike racks. - The City of Vancouver operates a range of vehicle types including trolley buses.		LESSONS LEARNT ✓ Vancouver, like Sydney, is a sprawling metropolis with its primary CBD far removed from the geographic centre. Job growth is being encouraged across the metropolitan area to create a multi-centred city. ✓ Neighbourhoods have taken ownership of gardens, public art and traffic calming where cycling infrastructure has been built. ✓ Correlation between strong Downtown Vancouver population growth and a reduction in vehicles entering the downtown core.
OTHER - Ridesharing services such as Uber are banned. - Vancouver is served by over 300 kilometres of on and off-road cycle routes. - Neighbourhoods are encouraged to plant and maintain traffic calming measures and add public art. This gives the community a sense of pride and ownership. - The City of Vancouver is committed to installing more cycle lanes in Downtown Vancouver to further drive a shift away from cars. - A 25 kilometre green bicycle corridor (Central Valley Greenway) opened in 2009. The corridor links Downtown Vancouver with Burnaby and New Westminster. Within a month of opening, 2,000 cyclists per day were using the route. - The City of Vancouver operates a cycle-sharing system called Mobi. Mobi has 150 stations and 1,500 bikes.	LOCATION OF DOWNTOWN VANCOUVER	REFERENCES http://www.metrovancouver.org/services/regional-planning/PlanningPublications/Progress-toward-Shaping-our-Future-Baseline-Annual-Report-GOAL-5.pdf http://tripplanning.translink.ca/FILE/Apps/Info/images/skytrain_map.png

* Actual JTW mode share

CASE STUDY #7: PART DIEU, FRANCE

City	Metro Size	Metro Pop	CBD Size	CBD Pop	CBD Pop Density	CBD Jobs	CBD Job Density	CBD Pop & Jobs	CBD Pop & Job Density	JTW Mode Share Aim for the CBD	Primary PT mode	Other PT mode/s
Parramatta	8,940km ²	1.9 million	170ha	34,100-67,900	200-400/ha	76,300-102,700	450-600/ha	110,400-170,600	640-1,000/ha	PT/AT 60%, Car 40%		
Part Dieu	530km ²	1.3 million	80 ha	21,000 – 24,000	260 – 300/ha	56,000 – 96,000	680/ha	77,000 – 120,000	940-1500/ha	PT / AT 73% Car 26%	Rail	Light rail BHLS

LYON TRANSPORT NETWORK

A DENSE AND CONSISTENT NETWORK

- 4 metro lines (49 stations, 73 vehicles, 740 k trips/day),
- 5 tramway lines (84 stations, 85 vehicles, 300 k trips / day)
- 2 cable cars (13 k trips/day)
- 3 trolley bus lines
- 120 bus lines
- About 1.7 million trips every day

Experiment of a driverless bus line starting in 2016

Several projects to extend the network :

- 1 tramway line
- 1 metro extension

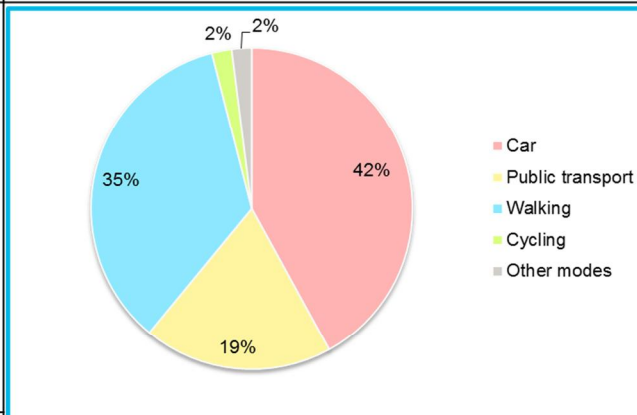
MOBILITY

- Reduction of car use by 6 points in the past 10 years
- Increase of the use of Park and Ride facilities (23 P+r offering 7,550 parking spots)
- Increase of PT use by 4 points in the past 10 years
- Saturation of the major railway station Lyon Part Dieu

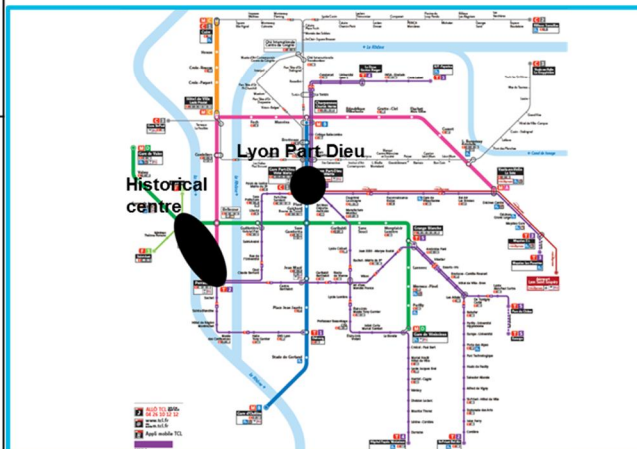
CYCLING

- Cycling is an important mode of transportation which requires investments and attention
- 655 km of cycle ways over the metropolitan area
- Bicycle parking within the car parks
- Bike share system since 2005: 350 stations and 4,000 bicycles

GREATER LYON MODE SHARE



LOCATION OF PART DIEU



* Actual JTW mode share

PART DIEU

OVERVIEW

- 3km east of the historical centre of Lyon.
 - Second largest business district in France after la Defense in Paris
 - 500,000 trips / day supported by a dense PT network
 - Part Dieu district identified as a key potential development opportunity since the 1970's
 - Mixed land use : commercial, leisure, business but also dwellings
 - Driven by the major train station Lyon Part Dieu victim of its success:
- Initially planned for 35,000 passengers/day
 → Today: 120,000 and up to 200,000 in 2030
- In 2015, in the central district of the metropolis (Lyon-Villeurbanne) 25% of trips are by public transport and 26% by car. Active modes are important: walking counts for 45% of trips, bicycle for 3% and. Mode share for public transport and active modes is higher than for greater Lyon.
- Due to the city growth around Part Dieu, during the past 40 years making it the new centre of the met. area.
- Part Dieu is still under development

LESSONS LEARNT

- ✓ The creation of Part Dieu enhanced urban development to the extent that it is now the centre of the metropolitan area
- ✓ Dense and varied public transport offer enhances demand
- ✓ Important to anticipate future needs in order to avoid saturation

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CASE STUDY #8: PERTH CBD, AUSTRALIA

City	Metro Size	Metro Pop	CBD Size	CBD Pop	CBD Pop Density	CBD Jobs	CBD Job Density	CBD Pop & Jobs	CBD Pop & Job Density	JTW Mode Share Aim for the CBD	Primary PT mode	Other PT mode/s
Parramatta	8,940km ²	1.9 million	170ha	34,100-67,900	200-400/ha	76,300-102,700	450-600/ha	110,400-170,600	640-1,000/ha	PT/AT 60%, Car 40%		
Perth	6,420km ²	2.0 million	450 ha	9,200	20/ha	128,000	290/ha	137,200	310/ha	PT/AT 52%, Car 47%*	Rail	Bus

PERTH TRANSPORT NETWORK

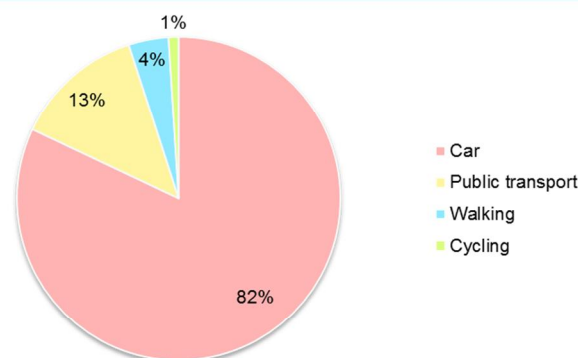
TRANSPERTH TRAINS

- 5 rail lines with 70 stations across a 181km network.
- Annual ridership of 64.2 million, almost 10 million more than Brisbane (which has 300,000 more people in its metropolitan area)
- Opening of the Mandurah Line in 2007 saw a significant mode shift to public transport along the Mandurah-Perth corridor.
- Mandurah Line now accounts for 32% all trips on the Transperth Network, despite having the least stations of any line.
- Construction has commenced on new 8.5 kilometre Forrestfield-Airport Link. The link includes 3 new stations and will provide a direct connection between Perth Airport and Perth CBD when it opens in 2020.

TRANSPERTH BUSES

- Three private companies operate bus services across 11 zones in the Perth Metropolitan Area.
- Bus services generally provide one of two functions: a feeder service between suburbs and transport interchanges, or routes directly into Perth CBD.
- The CircleRoute performs a cross-city function, connecting trip generators such as railway stations, shopping centres, universities, schools and Fremantle.
- Buses are the only public transport service between Perth CBD and Perth Airport.
- The most frequent bus services generally run every 4-15 minutes during peak periods and 15-30 minutes off peak.
- 4 bus routes within the Perth Central Transit Area (Perth CAT) are free.

GREATER PERTH JTW MODE SHARE



PERTH CBD

OVERVIEW

- 4th largest CBD in Australia behind Sydney, Melbourne and Brisbane CBDs.
- Residential population expected to grow at 4% per annum between 2011 and 2036.
- 3 railway stations serviced by 5 lines.
- 4 bus routes comprise Perth Central Area Transit System, a mostly free network of services.
- 47% of all Journey to Work trips undertaken by car, 46% of by public transport and 6% by active transport.
- Popular riverside recreational paths for cyclists
- Significant upfront investment by WA Government in urban renewal projects to stimulate private sector investment - \$440 million at Elizabeth Quay, to be followed by \$2.2 billion in private sector investment, and \$1.3 billion at Perth City Link, with \$4 billion in private sector investment underway.

LOCATION OF PERTH CBD



* Actual JTW mode share

LESSONS LEARNT

- ✓ Opening of the Mandurah Line saw a significant mode share shift towards public transport, proving that a fast and efficient rail line can encourage changes to long established travel behaviour
- ✓ Government investment in the public domain and infrastructure can be a catalyst for private investment.
- ✓ Projects such as Elizabeth Quay and Perth City Link have enabled Perth CBD to be reconnected with the Swan River and inner city neighbourhoods.
- ✗ Car remains the dominant transport mode for Journey to Work trips to Perth CBD.

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5. Lessons learnt

Several key lessons were drawn from this analysis. These lessons learnt will help define the transport strategy for Parramatta CBD:

- A degree of self-containment can be achieved with a balance of land uses, allowing people to live, work and play in the same area.
- Direct, connected and safe cycleways and quality end-of-trip facilities can encourage a modal shift away from private vehicles.
- Provision of well-planned public transport is vital to embed travel behaviours early and support businesses and residents outside traditional CBDs.
- New public transport infrastructure that can offer cost, time and convenience benefits over private vehicles can encourage a modal shift away from private vehicles.
- Investment in cultural and sporting venues is a key catalyst for change outside traditional CBDs.

Appendix A Ranking the long list

Criterion	Metro Size	Metro Population	CBD Size	CBD Population	CBD Pop Density	CBD Jobs	CBD Job Density	CBD Pop & Jobs Combined	CBD Pop & Jobs Density Combined	Evolution (rapid growth)	Distance to second CBD (if applicable)	Interesting Ideas (e.g. fast rail / transport options)	JTW Mode Share for trips to CBD	Heavy rail	Light rail	Points
Parramatta, Australia	8,941km ²	1.9 million	171 ha	34,098 to 67,939	199 to 397 per ha	76,262 to 102,705 (future)	446 to 601 per ha	110,360 to 170,644	645 to 998 per ha	Yes	23km to Sydney CBD		Target			N/A
Green	+/- <20% ²	+/- 20%	+/- 20%	Within range	Within range	Within range	Within range	Within range	Within range	>2% growth per annum in jobs and residents	+/- 20%		PT+AT = Minimum 60% Car = Maximum 40%	2 or more stations and at least 2 lines	2 or more stations and at least 2 lines	1 pt
Yellow	+/- 20%-40%	+/- 20-40%	+/- 20-40%	+/- 20%	+/- 20%	+/- 20%	+/- 20%	+/- 20%	+/- 20%	1-2% growth per annum in jobs and residents	+/- 20-40%		PT+AT = 50-59% Car = 40-49%	1 station and at least 1 line	1 station and at least 1 line	0 pt
Red	+/- >40%	+/- >40%	+/- >40%	+/- 20-40%	+/- 20-40%	+/- 20-40%	+/- 20-40%	+/- 20-40%	+/- 20-40%	<1% growth per annum in jobs and residents	+/- >40% or N/A		PT+AT = Maximum 49% Car = Minimum 50%	0 stations and 0 lines	0 stations and 0 lines	-1 pt

Criterion	Metro Size	Metro Population	CBD Size	CBD Population	CBD Pop Density	CBD Jobs	CBD Job Density	CBD Pop & Jobs Combined	CBD Pop & Jobs Density Combined	Evolution (rapid growth)	Distance to second CBD (if applicable)	Interesting Ideas (e.g. fast rail / transport options)	JTW Mode Share for trips to CBD	Heavy rail	Light rail	Points
Turin, Italy	1,127km ²	2.2 million	Cannot find information	Cannot find information	Cannot find information	Cannot find information	Cannot find information	Cannot find information	Cannot find information	N/A	N/A	N/A	N/A	N/A	N/A	-14
Valencia, Spain	Cannot find information	1.7 million	Cannot find information	Cannot find information	Cannot find information	Cannot find information	Cannot find information	Cannot find information	Cannot find information	N/A	N/A	N/A	N/A	N/A	N/A	-14
Lyon, France (Part Dieu)	534km ²	1.3 million	82 ha	21,000	256 per ha	56,000	683 per ha	77,000	939 per ha	N/A	3km	Started in the 1960s, still developing today. Has become the centre of modern Lyon with time.		Y	Y	-2
Munich, Germany	5,500km ²	2.6 million														
Hamburg, Germany	755km ²	1.8 million	142km ²	290,000	20 per ha											
Brussels, Belgium (Northern Quarter)	Cannot find information	1.8 million	50 ha	8,000	160 per ha	40,000	800	48,000	960 per ha	Cannot find information	2km	One of three major railway stations in Brussels. Provides intercity and international rail services to cities such as Amsterdam, Antwerp, Rotterdam	Cannot find information	2 metro stations and 2 lines. A separate railway station for intercity services	5 light rail stops and 5 lines	-3
Cologne-Bonn, Germany	2,922km ²	2.8 million	16.4km ²	127,000	77 per ha											
Amsterdam, Netherlands (Zuidas)	2,580km ²	2.3 million	209 ha	25,000 residents + 30,000 students by 2040	263 per ha	50,000 today, 80,000 in future	383 per ha	135,000	646 per ha	Yes	6km	New metro line due to commence operations in 2017	Public transport 33% Active transport 26% Car 41%	4 metro stations on two lines and 2 intercity stations	Several	8
Budapest, Hungary	7,626km ²	3.3 million														
Vienna, Austria		2.6 million														

Criterion	Metro Size	Metro Population	CBD Size	CBD Population	CBD Pop Density	CBD Jobs	CBD Job Density	CBD Pop & Jobs Combined	CBD Pop & Jobs Density Combined	Evolution (rapid growth)	Distance to second CBD (if applicable)	Interesting Ideas (e.g. fast rail / transport options)	JTW Mode Share for trips to CBD	Heavy rail	Light rail	Points
Frankfurt, Germany	4,305km ²	2.5 million	Vague													
Portland, United States	17,310km ²	2.4 million	268 ha	25,743	96 per ha	96,605	360 per ha	122,348	457 per ha	6% growth in residents per annum and <1% growth in jobs per annum to 2035	N/A	Portland Transit Mall comprises sets of public transit corridors. Pairs of one way streets with two of three lanes dedicated to public transit in each direction.	For residents in Downtown Portland Public transport 16% Active transport 50% Car 34%	1 station, serviced by intercity rail	5 light rail lines with 14 stations and 2 streetcar lines with stations	0
Perth, Australia	6,417.9km ²	2.0 million	448 ha	9,237	21 per ha	128,000	286 per ha	137,237	306 per ha	4% growth in residents per annum between 2011 and 2036 and 1% growth in jobs per annum between 2011 and 2031	N/A	Strong patronage growth Transperth rail network after opening of Mandurah Line in 2007. Mode share shift to public transport along whole corridor.	Public transport 46% Active transport 6% Car 47%	3 stations serviced by 5 lines	0 stations and 0 lines	-3
Brisbane, Australia	15,825km ²	2.3 million	201 ha	9,356	47 per ha	156,600	779 per ha	165,955	826 per ha	3% growth in residents per annum and 2% growth in jobs per annum between 2011 and 2031	N/A	Busway network comprises three grade-separated bus-only corridors, carrying over 70 million per annum. Busways feed into two underground bus stations in CBD.	Public transport 63% Active transport 8% Car 29%	2 stations, serviced by 9 lines	0 stations and 0 lines	0
Charlotte, United States	8,280km ²	2.4 million	526 ha	25,970	49 per ha	100,000	190 per ha	125,970	239 per ha	14% growth in residents per annum and 4% growth in jobs per annum between 2016 and 2020. Third fastest growing major city in the USA.	N/A	Highly car dependent with limited public transport infrastructure. Add qualitative comment	Cannot find information on Downtown Charlotte. Metro area is highly car dependent	0 stations and 0 lines	7 stations and 2 lines	-3
Vancouver, Canada	2,700km ²	2.5 million	375 ha	54,690	146 per ha	145,000	387 per ha	199,690	533 per ha	Retrospectively, 14% growth in residents per annum and >2% growth in jobs per annum over last 15 years. Unable to find data on population and employment projections.	N/A	Strong population growth (up 75%) and solid job growth (26%) over the last 15 years in has seen a 20% reduction in vehicles entering Downtown ESTABLISH A LINK THROUGH POLICY OR PT INFRA	Public transport and active transport 69% Car 31%	6 SkyTrain stations serviced by 3 lines	0 stations and 0 lines Streetcar system in planning.	-1
Birmingham, United Kingdom	599km ²	2.4 million	800 ha	30,000	37.5 per ha	150,000	188 per ha	180,000	225 per ha	33% growth in residents per annum. >3% growth in jobs per annum between 2011 and 2031	N/A	HSR2 will link Birmingham with London, Manchester and Leeds and be the catalyst for urban renewal around New Street Station	Public transport and active transport 60% Car 40%	5 stations serviced by 4 lines	6 stations on 1 line	-3

Criterion	Metro Size	Metro Population	CBD Size	CBD Population	CBD Pop Density	CBD Jobs	CBD Job Density	CBD Pop & Jobs Combined	CBD Pop & Jobs Density Combined	Evolution (rapid growth)	Distance to second CBD (if applicable)	Interesting Ideas (e.g. fast rail / transport options)	JTW Mode Share for trips to CBD	Heavy rail	Light rail	Points
Manchester, United Kingdom	630km ²	2.6 million	218 ha	25,000	115 per ha	140,000	642 per ha	165,000	757 per ha	16% growth in residents per annum between 2009 and 2011. Expected to continue for foreseeable future. <1% growth in jobs per annum between 2015 and 2025	N/A	1.5 billion pound investment over next 5 years in University of Manchester, Manchester Metropolitan University and new research, incubation and science park facilities. Over 1 billion pounds of private investment in Spinningfields, Manchester's premier business destination, securing over 15,000 jobs. Investment in new public spaces, museums and festivals.	Public transport and active transport up to 61% Car 39%	4 stations served by National Rail	9 stations on 8 lines	1
Pretoria, South Africa	6,298km ²	2.9 million	424 ha	Cannot find information	Cannot find information	Cannot find information	Cannot find information	Cannot find information	Cannot find information	Cannot find information	55km	40 min from Pretoria CBD to Johannesburg CBD via North-South Line. Equivalent car trip takes approximately 53 minutes without traffic	Cannot find information	4 stations served by 1 line	0 stations and 0 lines	-11
North Sydney, Australia	1,505km ²	2.4 million	116 ha	5,989	52 per ha	48,731	420 per ha	54,720	472 per ha	1.7% growth in residents per annum , <1% growth in jobs per annum between 2016 and 2026	3km	Second railway station will be delivered in 2024 as part of Sydney Metro City & Southwest.	Public transport 58% Active transport 8% Car 32% Carpark provision is four times lower than Parramatta CBD	1 station served by 1 line	0 stations and 0 lines	-4
Downtown Brooklyn, United States	183km ²	2.6 million	117 ha	15,000	128 per ha	100,000	855 per ha	115,000	983 per ha		4km	Very strong subway connections between Downtown Brooklyn, Lower Manhattan and Midtown Manhattan, making public transport a desirable mode for JTW and work-based trips. 9 lines connect all 3 centres	Public transport 51% Active transport 10% Car 35% Other 4%	9 stations served by 9 lines	0 stations and 0 lines. Light rail system in planning	1

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