

Bus Rapid Transit



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Spectrum of Bus-Based Transit



- **High performance, high capacity BRT**
 - Major infrastructure, rapid service, intensive services
 - Up to 1 million passengers/day
 - Bogota, Guangzhou, Istanbul, ...
- **High-performance, moderate capacity BRT**
 - Major infrastructure, rapid service, strong service
 - Range 100-250,000 passengers/day
 - Brisbane, Ottawa, Beijing, Mexico City, Ahmedabad ...
- **Bus with High Level of Service (BHLS)**
 - Moderate/little infrastructure, focus on reliability and quality
 - Range 25,000-65,000 passengers/day
 - Amsterdam, Gothenburg, Paris, ...

Emergence of Bus Based Transit



- In almost every case, bus can do the job as well as rail
- BRT offers multiple investment advantages:
 - Significantly cheaper than rail-based alternatives
 - A BRT network can be implemented for the cost of a single rail-based line – more transportation impact for your money
 - The implementation time is much shorter
 - BRT can be implemented incrementally
 - Tributary lines can join BRT, reduce need for feeders, interchange
 - BRT systems can generate operating surpluses
- Barriers to entry are significantly lower:
 - Facilitates multiple operators
 - Facilitates mobilisation of private sector capital and services
- Many cities fail to assess this option properly

Need to revisit assumptions



- Things became ‘truisms’, but they are no longer true
 - BRT has become a ‘game changer’
 - Actual practice greatly exceeds the textbook ‘limits’
 - *Transit* factors are what count to the customer, not technology
- LRT, Tram and BRT are all proven high quality transit
- In many cases, the needed transportation capacity can be delivered by bus transit at lower cost, quicker
 - This is taxpayers’ money, no justification to overspend
 - Funds could be reallocated to other purposes (e.g. hospitals)
- Incorrect assumptions undermine planning process
 - Viable solutions ruled out at the option development stage
 - Not taken through to full feasibility study
 - Not taken through to full alternatives analysis

Buses can deliver needed capacity



- The major BRT systems have very high capacity
 - Bogota's Transmillenio carries 45,000 passengers per hour, per direction – more than most metro lines
 - Istanbul's Metrobus carries almost 900,000 px/day – more than Dublin Bus, DART, LUAS and Metro North combined
 - Guangzhou BRT carries >800,000 px/day
- Many BRT systems operate at light railway capacity, exceeding urban LRT/tramway capacity
 - Mexico city, Ottawa, Lagos > 200,000 px/day
- Many BHLS systems match street-tramway capacity
- Ridership on many rail systems turns out to be far short of initial planning forecasts, design capacity

BRT is more than tram on tyres



- BRT is a different mode, different characteristics
 - BRT can indeed be designed in the same style as tram ...
 - ...but then it does not exploit the characteristics of bus
- BRT is a 'service plan' availing of the infrastructure
 - Route system rather than end-to-end services
 - Routes can join/leave the running way, reducing the need for passenger transfer (and less need for big interchange stations)
 - Options for express, limited stop, and premium services
 - Non-BRT buses/routes may also use it non-stop as a 'channel'
- Business and operator factors are important
- Can be developed incrementally

Car-users will use high-quality bus



- Major ridership gains in BRT in South America, Asia, Australia
- Significant % of new riders in North American and South American BRT come from car
- Major ridership gains in European BHLS (range 20-140%)
- Some mode shift from car in European BHLS
- When of high quality, BRT has high customer perception, matching LRT (e.g. Los Angeles)
- Most research takes standard bus as the comparator
- Growing body of research that transit characteristics are what matter to the user (speed, reliability, comfort)

Bus systems can enhance land-value



- Metro, commuter rail and tram have proven impact on land-value, development, and property prices/rents
- Research on bus transit has been minimal ...
- ... but, absence of evidence is NOT evidence of absence
- In Europe, bus transit projects are below investment thresholds requiring full post-delivery appraisal
- BRT is a new mode, evidence is beginning to emerge:
 - In Cleveland, \$4.3 billion investment along the busway
 - In Pittsburgh, \$800 million investment along the busway
 - In Seoul, significant value increase in property value on BRT
 - In Curitiba, the BRT lines have shaped the city
- Some BRT/BHLS focus on improving urban-scape

BRT and land-use in Curitiba



Source : URBS, Curitiba

Global deployment of Bus-Based Systems



Region	Selected Cities with BRT (* in development)
Australia	Adelaide, Brisbane, Sydney
North America	Cleveland, Guatemala City, Los Angeles, Mexico City, Pittsburgh, Vancouver
South America	Bogota, Cali, Curitiba, Pereira, Porto Alegre, Quito, Recife, Santiago, Sao Paulo
Europe (BHLS)	Amsterdam, Cambridge, Eindhoven, Madrid, Nantes, Paris
China	Beijing, Changzhou, Dalian, Guangzhou, Hangzhou, Jinan, Kunming, Xiamen,
Asia	Ahmedabad, Amman, Bangkok, Cebu*, Delhi, Indore, Istanbul, Jakarta, Manila*, Nagoya, Pune, Seoul, Taipei
Africa	Accra*, Cape Town, Dar es Salaam*, Johannesburg, Lagos, Pretoria (Tswane)*

Actual throughput on selected BRT systems



System	DAILY Ridership
Beijing South Line	90,000
Brisbane SE Busway	150,000
Lagos, BRT-Lite	200,000
Ottawa Transitway system	200,000
Mexico Insurgentes	225,000
Guangzhou, China	800,000
Istanbul, Metrobus	895,000
Bogota, Transmillenio	> 1 million
<i>Luas – both lines</i>	<i>80,000</i>
<i>Dublin Bus – total network</i>	<i>450,000</i>

Capital costs for on selected BRT systems



System	\$ million/km
Lagos, BRT-Lite	1.7
Curitiba	2.5
Bogota, Transmillenio	3-10
Mexico City Insurgentes	4
Bangkok	4.7
Beijing South Line	5
Cleveland Healthline	10.4
<i>Dublin Luas – both lines</i>	<i>c. 35</i>
<i>Dublin Metro West (forecast)</i>	<i>c. 50</i>
<i>Dublin Metro North (forecast)</i>	<i>c. 200</i>

What is BHLS?



- **BHLS?**
 - Derives from French term 'BHNS', maybe later another name
 - Generic term for a wide range of quality bus systems
- **Is it BRT?**
 - Not exactly, a different product in the spectrum of bus priority
 - Focus more on reliability/quality than on speed/capacity
- **Holistic approach**
 - Improved operating environment – reliability, better speed
 - Higher quality vehicles with better comfort and image
 - Improved passenger facilities – stops, terminals, ...
 - Branding, marketing, 'repositioning the product'

BHLS role in Europe



- **European Context is different:**
 - Mass transit is often already well provided by metro and tram
 - Bus is rarely assigned the ‘mass transit’ role
 - Constraints of space, roadwidth and alignment in city centres
- **European cities have a different focus:**
 - Restore reliability and operational effectiveness to bus
 - Enhance image of bus, reposition the product
 - High focus on quality of vehicles and stopping places
 - In France, focus on “urbanism” – improve host environment
- **Strategic motivations for BHLS**
 - Mostly to upgrade quality and ridership of existing bus lines
 - Sometimes alternative to tram/LRT, especially if finances tight

BHLS in Europe



Country	Cities with BHLS
England	Cambridge, Crawley, Dartford, Leeds
France	Lille, Lorient, Lyon, Nantes, Paris, Rennes, Rouen, Toulouse
Germany	Essen, Hamburg, Oberhausen
Ireland	Dublin
Italy	Brescia*, Pisa, Prato
Netherlands	Alkmaar, Almere, Amsterdam, Eindhoven, Twente, Utrecht
Spain	Barcelona*, Castellón, Madrid
Sweden	Göteborg, Jönköping, Lund, Stockholm

European BHLS – Key Characteristics



City	System Identity	System Length (km)/	Nature of Running Way	Passengers per day	Peak headway	Dedicated fleet?
Amsterdam	Zuid-Tangent	41 (33)	Bus-only road, bus lanes	40,000	6	Yes
Dublin	Quality Bus Corridor	12 (8.4)	Bus-lanes	34,000	< 1.5 ⁴	No
Göteborg	TrunkBus	16.5 (7.5)	Bus-lanes	24,000	3.3	Yes
Hamburg	MetroBus	14.8 (4.0)	Bus-lanes	60,000	3.5	Yes
Helsinki	Jokeri Line	28 (6)	Bus-lanes (orbital route)	25,000	5	Yes
Madrid	Bus-VAO	16.1 (16.1)	Tidal segregated lanes	33,000 ⁵	< 1 ⁴	No
Nantes	BusWay	7 (6)	Bus-lanes	24,600	3.3	Yes
Paris	TVM	20 (19)	Bus-only road (suburban/orbital)	65,800	3.5	Yes
Stockholm	Blue Line	40 (12)	Bus-lanes	36,575 ⁶	5	Yes

Reflection Point



- Bus transit is a viable option in almost all cases
- It is not inherently better nor inherently inferior to rail-based transit – each has its strengths
- Each city needs to assess the options on their merits, for that city, according to its goals
 - For some cities or corridors, Metro, LRT or tram will best meet the goals and constraints
 - For other cities or corridors, BRT or BHLS is the better fit
- BRT should never be eliminated at the options generation stage
 - As the lower cost mode, it should be the default option

Specific points for Ireland



- A bus-based network can be developed for the cost of a single LRT line, rolled-out quickly
 - BRT/BHLS can connect the city, not just the corridor
- Study groundwork has already been done
 - Dun Laoghaire, Cork, Galway, Limerick, (Metro West?)
- NAMA has control of a significant land stock
 - Idle or underutilised property, development land
 - BRT could stimulate development, NAMA could direct it
 - Value-capture mechanisms could part-finance BRT/BHLS
- Dublin urgently needs orbital transit routes
- Merger of RPA/NRA combines skills and powers

Information resources for BRT, BHLS



- ITDP – www.itdp.org
 - BRT Planning Guidelines (2007, v.4 in 2012)
 - Review of US BRT, case studies
- EMBARQ – www.embarq.org
 - Case study materials, usage guidance, evaluation
- COST Action on BHLS - www.bhls.eu
 - Final report available 11/2011 (at POLIS Annual Conference)
- US National BRT Institute – www.nbrti.org
- SUTP – www.sutp.org
- Volvo Centre of Excellence, Santiago – www.brt.cl
- US TRB/TCRP - www.trb.org/TCRP/Public/TCRP.aspx
- World Bank, APTA, UITP, ...
- Thredbo 12 (conference) – www.thredbo-conference-series.org

Contact details



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BRT– Bus Rapid Transit



Features

Examples and practice

Features of BRT – Running Ways

Source : Sam Zimmerman, World Bank



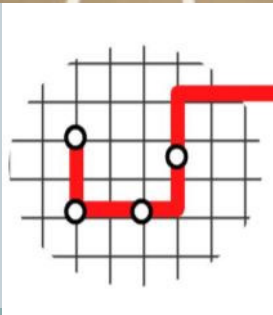
Vehicles



Running Ways



Stations & Terminals



Systems



Service Plan

Running way - Istanbul



Source: EMBARQ

Running Way – Beijing, China



Source : Sam Zimmerman, World Bank

Running Way – Guangzhou, China



Source : Paul Barter

Running way – Seoul, Korea



BRT Running way - Pereira



Source : Sam Zimmerman, World Bank

BRT running way - Pereira

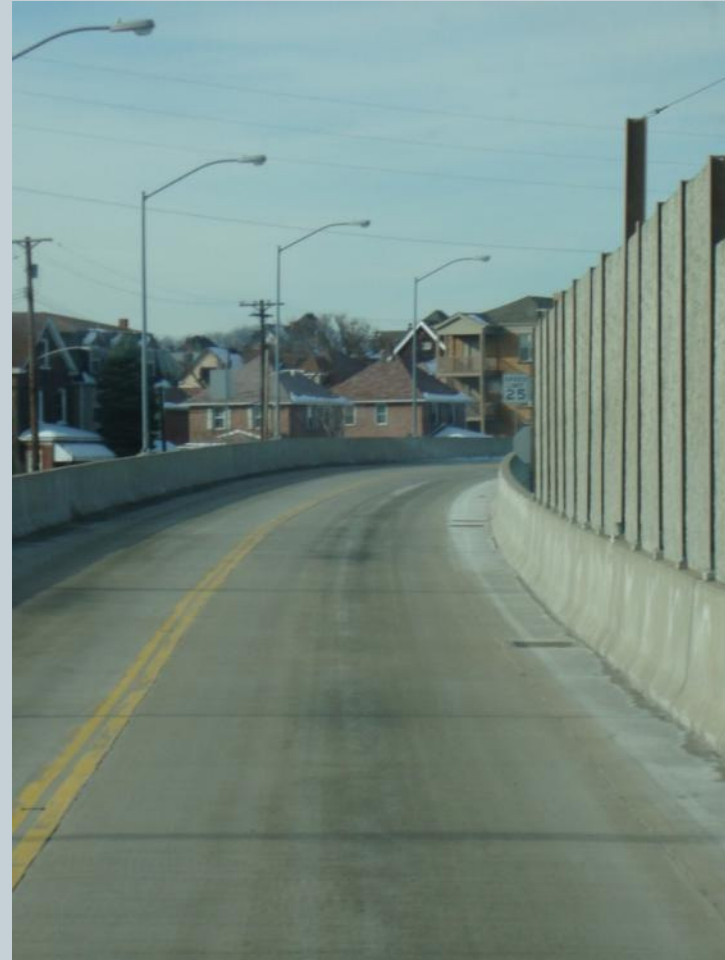


Source : Sam Zimmerman, World Bank

BRT running way - Amsterdam



Pittsburgh – East Busway construction



Cambridge : Busway



Source : Cambridgeshire County Council

Cambridge : Busway track



Source : Cambridgeshire County Council

BRT Tunnel section - Brisbane



BRT Running Way - Nantes



BRT running way - Paris



Features of BRT – Stations and Terminals

Source : Sam Zimmerman, World Bank



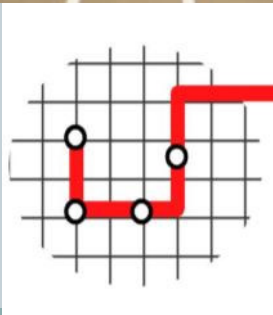
Vehicles



Running Ways



Stations & Terminals



Systems



Service Plan

BRT Bus Station - Bogota



Source : Peter Danielsson, Volvo Bus Corporation

BRT Station - Johannesburg



BRT Station, Sao Paulo



Source : Toni Lindau

BRT Station - Istanbul



Source: EMBARQ

BRT Station - Pereira



Source : Sam Zimmerman, World Bank

Precision docking – Amsterdam



Precision docking - Nantes



Wheelchair ramp - Nantes



Wheelchair ramp - Cleveland



Passenger lift at BRT station - Brisbane



BRT Station - Brisbane



Busway Station - Pittsburgh



Cambridge : Park'n'Ride



Source : Cambridgeshire County Council

Features of BRT – Service Plan

Source : Sam Zimmerman, World Bank



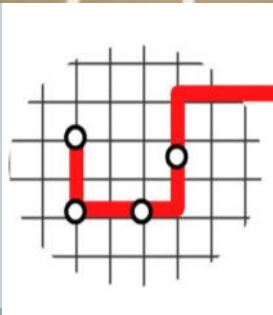
Vehicles



Running Ways



Stations & Terminals

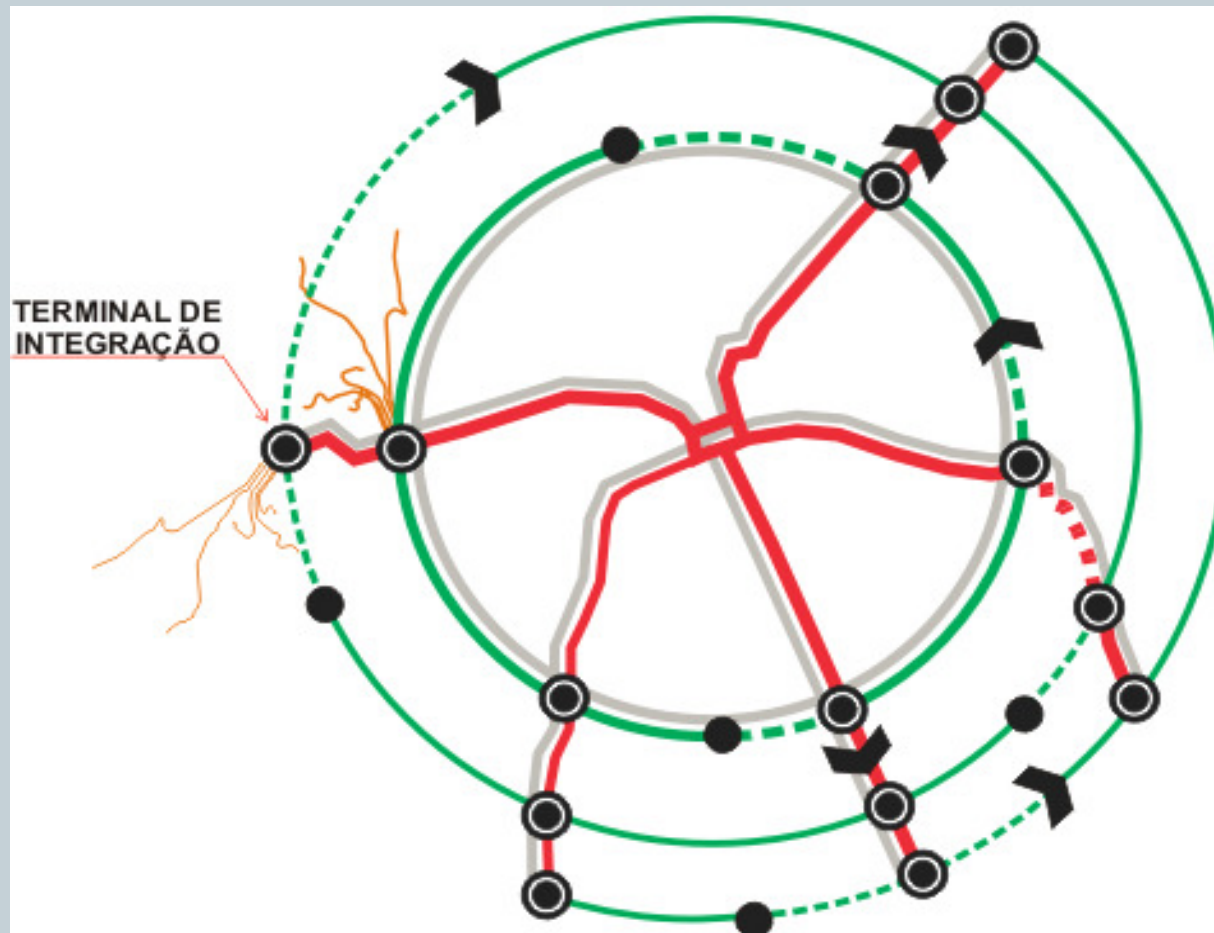


Systems



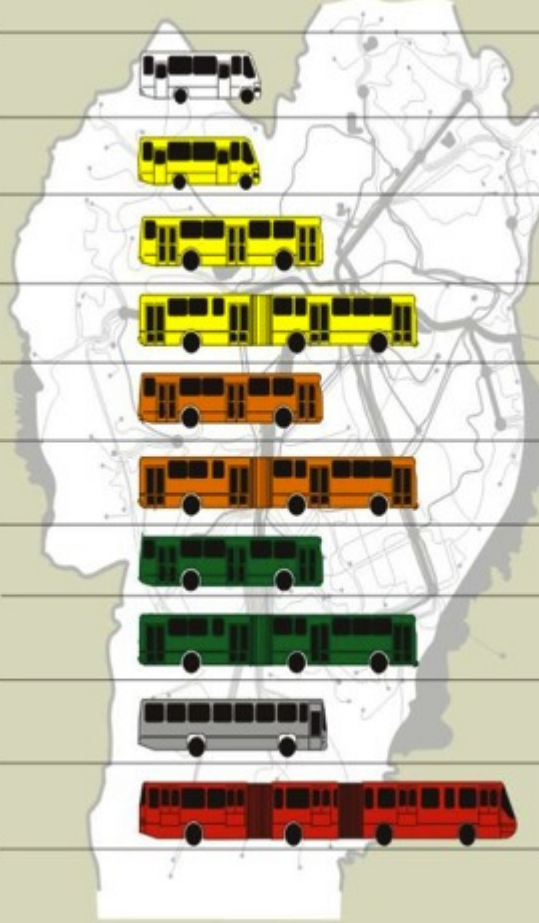
Service Plan











BRT Network - Curitiba



Source : URBS Curitiba

Service differentiation - Curitiba



	tipo de linha	Capacidade	Frota Operante	Número linhas
	Circular Centro	30	09	02
	Convencional	40	98	10
	Convencional/Troncal	80	327	97
	Troncal Articulado	160	19	
	Alimentador	80	670	21
	Alimentador Articulado	160	50	
	Interbairros Padron	110	46	07
	Interbairros Articulado	160	72	
	Linha Direta	110	355	18
	Expresso Biarticulado	270	163	06

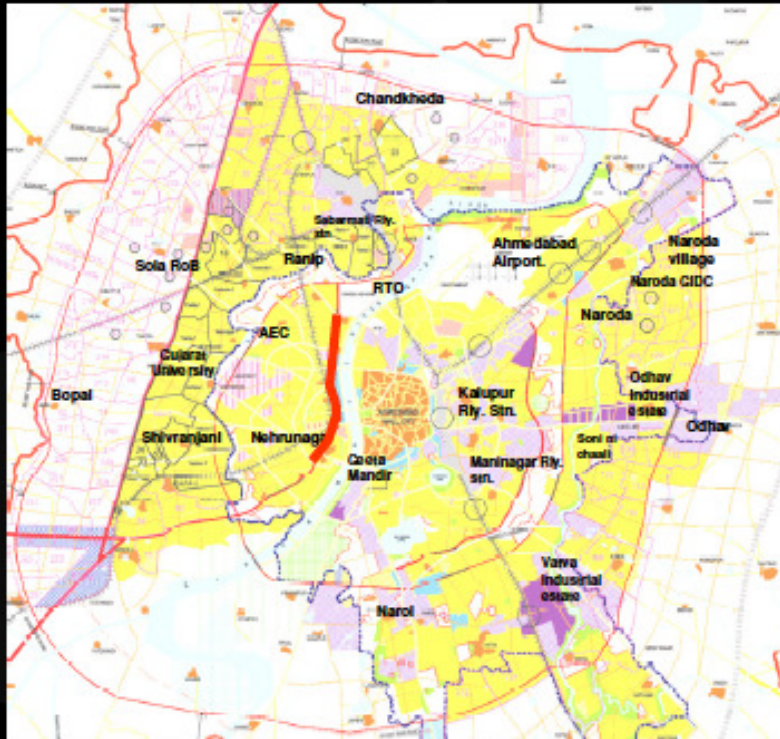
Source : URBS Curitiba

Ahmedabad – “Metro v BRT” – easy choice!

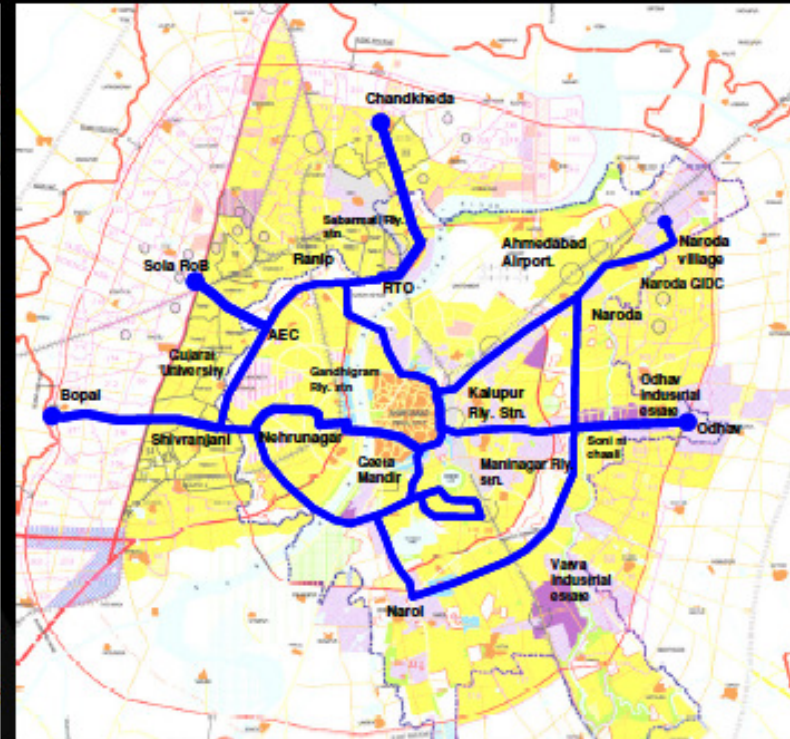


TRANSIT TECHNOLOGY CHOICE Metro-VS BRT- Unnecessary debate

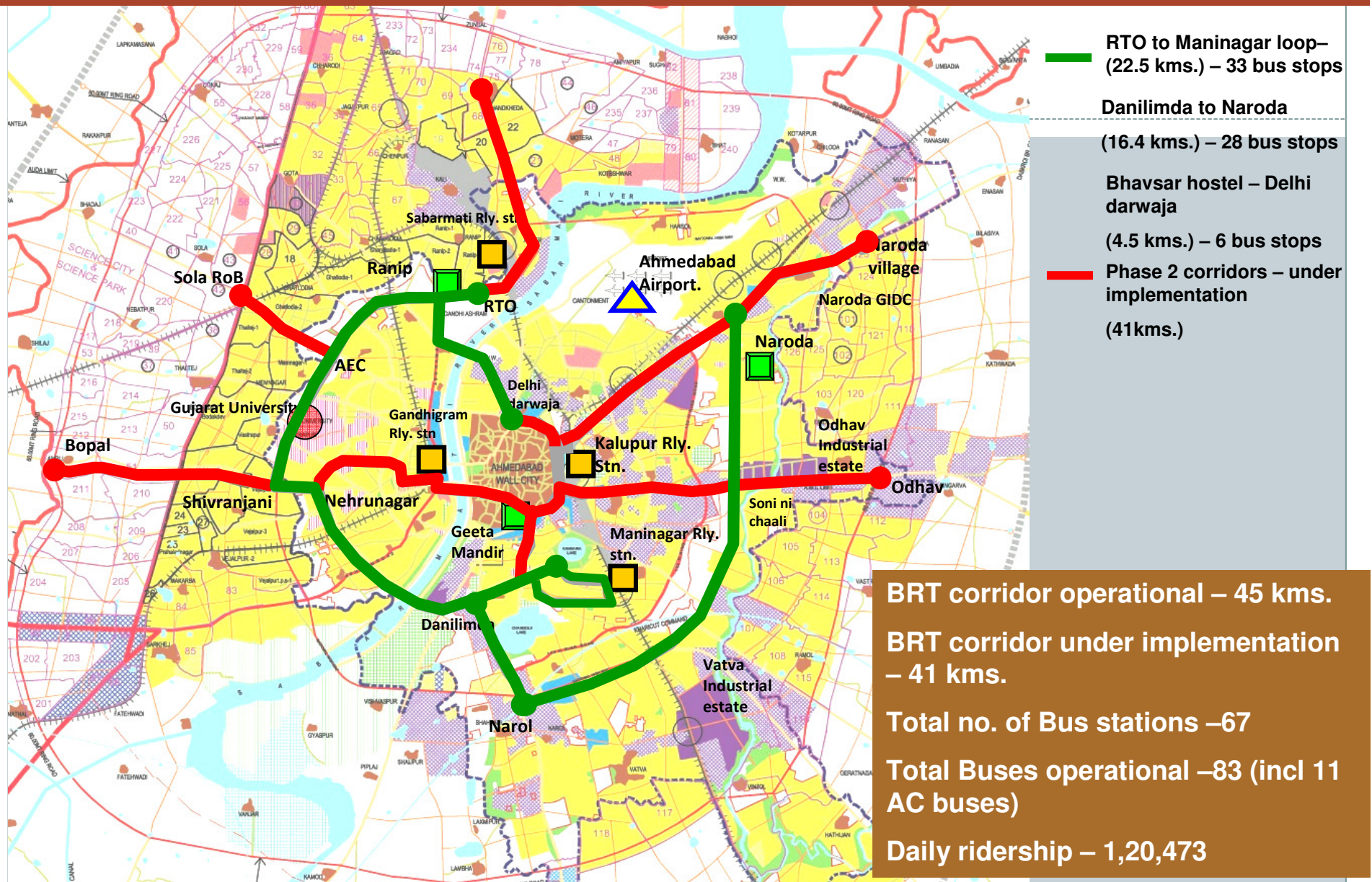
Metro Rail system (6 kms. only)



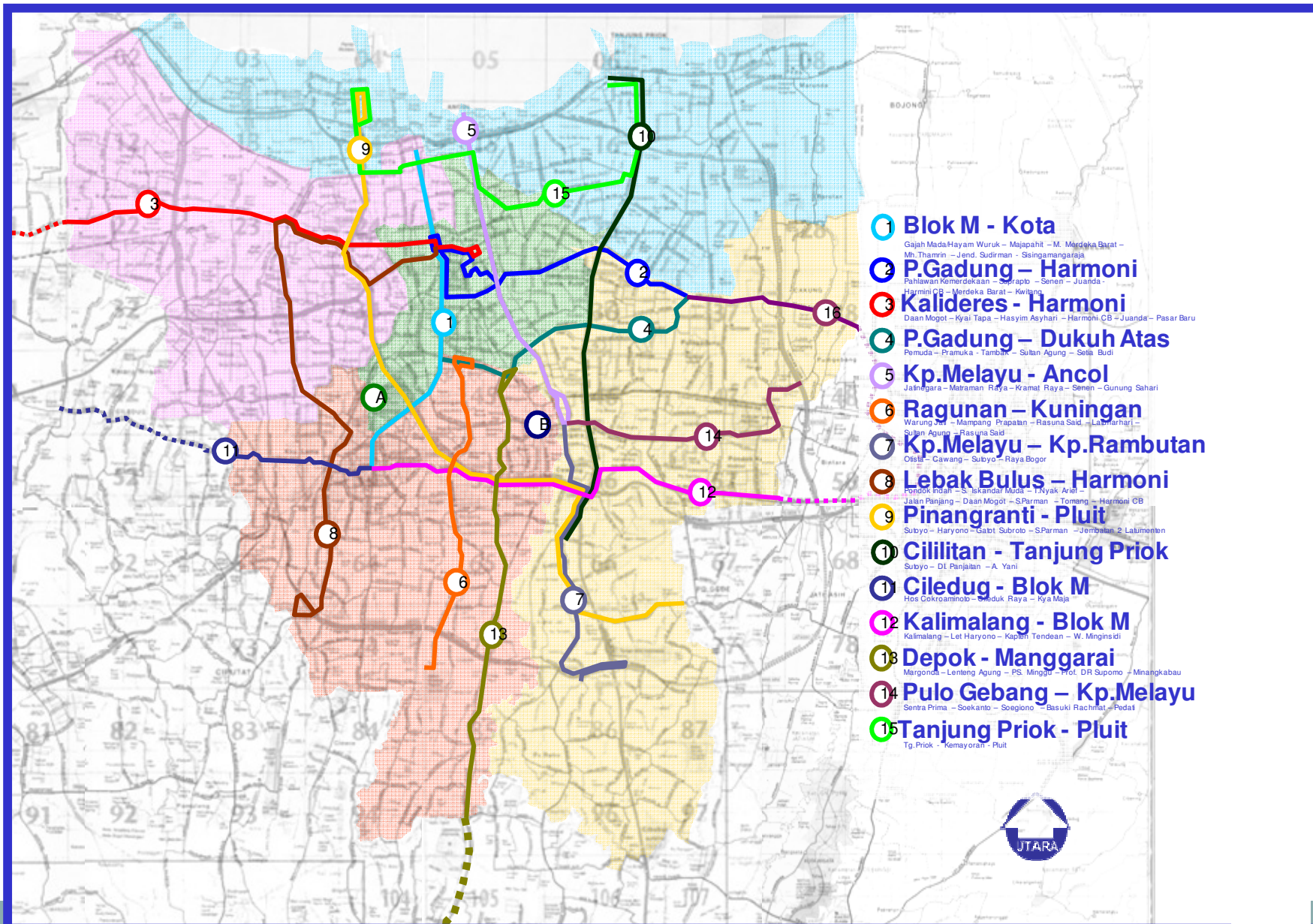
Bus Rapid Transit system (88.8 kms.)



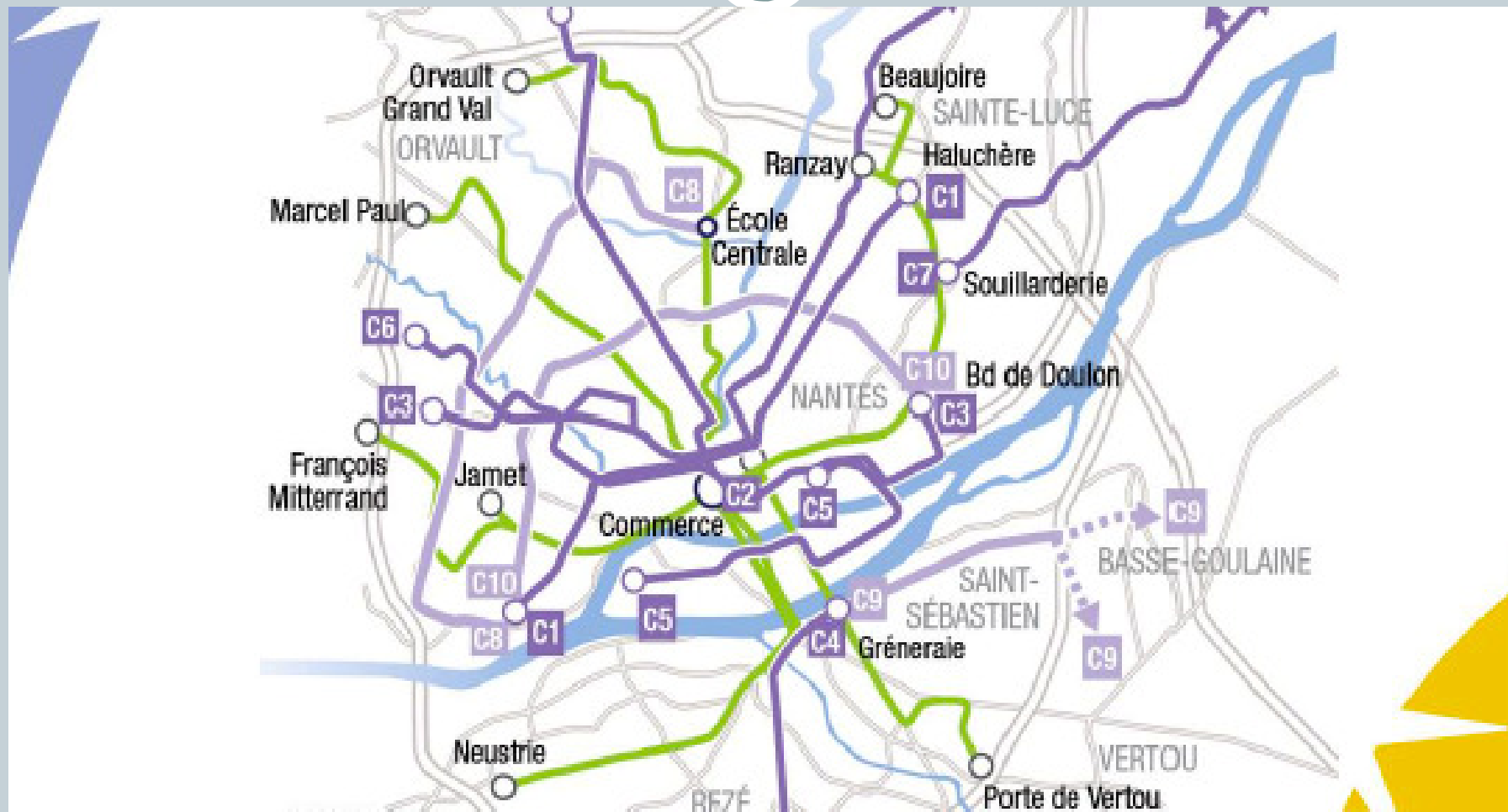
JANMARG – Operational corridors, Status, Extensions



15 CORRIDORS OF BUSWAY - JAKARTA



Nantes – Busway and Chronobus network



Features of BRT

Source : Sam Zimmerman, World Bank



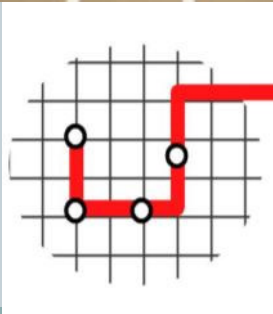
Vehicles



Running Ways



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Systems



Service Plan

Articulated buses – Bogota and Curitiba



Source : Sam Zimmerman, World Bank

BRT vehicle - Pereira



Source : Sam Zimmerman, World Bank

BRT Vehicle - Nantes



BRT Vehicle – Amsterdam



Standard Bus – Brisbane



Features of BRT

Source : Sam Zimmerman, World Bank



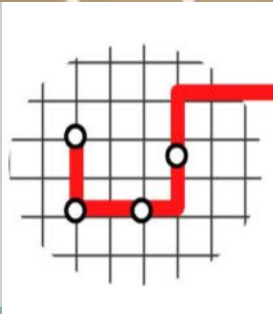
Vehicles



Running Ways



Stations & Terminals



Systems



Service Plan

Fare collection at BRT Stations



Smart Card Fare Gates TransMillenio, Bogota



*Mag. Ticket
Quito: TroleBus*



Source : Sam Zimmerman, World Bank

Image and Marketing - Brisbane



Brisbane: S.E. Busway



South Bank



Woolloongabba



Cambridge : Park'n'Ride



Source : Cambridgeshire County Council

Bike carrier - Brisbane



BHLS - Customer comfort - Cambridge

- WiFi on bus
- Socket for PC, phone
- Leather seats
- CCTV for security



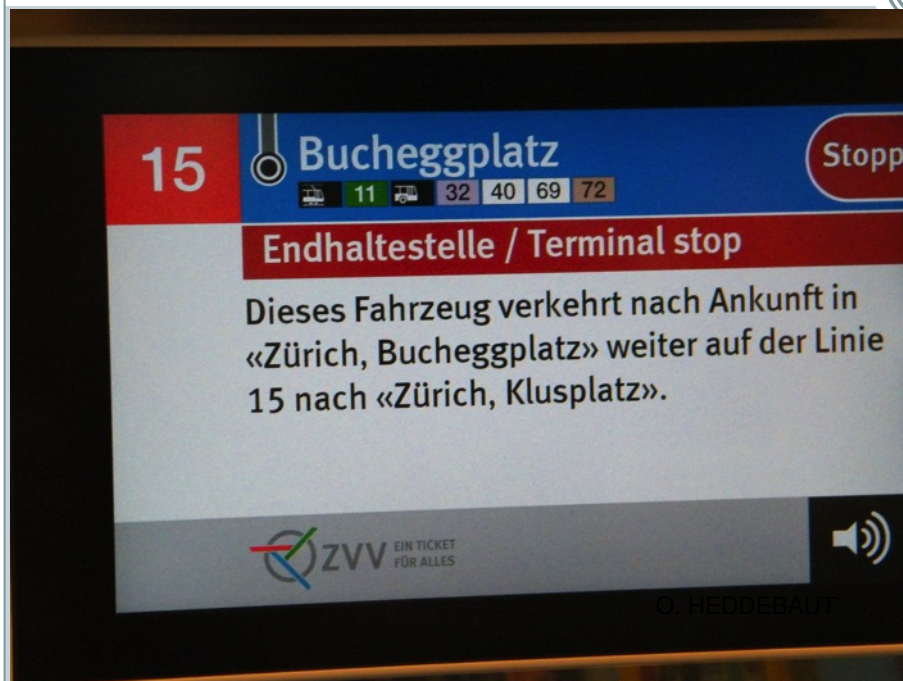
BHLS - Real-time information – at stops



O. HEDDEBALIT



BHLS - Real-time information – in-vehicle



- Next stop
- Transfer routes, times
- Announcements



BHLS - Bicycle facilities



- Bike'n'Ride
- Extensive bike parking
- Amsterdam, Almere
- Bike on bus is rare



Information resources for BRT, BHLS



- ITDP – www.itdp.org
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- EMBARQ – www.embarq.org
 - Case study materials, usage guidance, evaluation
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- Volvo Centre of Excellence, Santiago – www.brt.cl
- US TRB/TCRP - www.trb.org/TCRP/Public/TCRP.aspx
- World Bank, APTA, UITP, ...
- Thredbo 12 (conference) – www.thredbo-conference-series.org

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