Division 44
Water, Energy, Transport

Bangkok Rapid Transit

BRT System of Bangkok, Thailand

A Short Survey

Case Studies in Sustainable Urban Transport #1

gtz Transport Policy Advisory Services

On behalf of
Federal Ministry
for Economic Cooperation
and Development

Bangkok Rapid Transit

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Short Survey

By

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Introduction

After years of contemplation, the city of Bangkok has implemented its first Bus Rapid Transit (BRT) system. The BRT system is called “Bangkok Rapid Transit (BRT)”. The system started operation on 29 May 2010. The project is owned by the Bangkok Metropolitan Administration (BMA) maintained by Krungthep Thanakhom, the system manager and operated by the Bangkok Mass Transit System Public Company Limited (BTSC). This report aims to describe the features of this BRT. The data obtained in this report is through first hand observation of Mr. Santhosh Kodukula of the GTZ Sustainable Urban Transport Project (SUTP) and some feedback from BMA and Krungthep Thanakhom. The system was visited during July 2010.

Physical Details of the system in operation

The current system in operation is 15.9 km in length and has 25 buses and 12 stations along the route (The orange dotted line with green dots in the map below). There are two terminals at each end of the trunk line i.e. Sathorn and Ratchaphreuk.

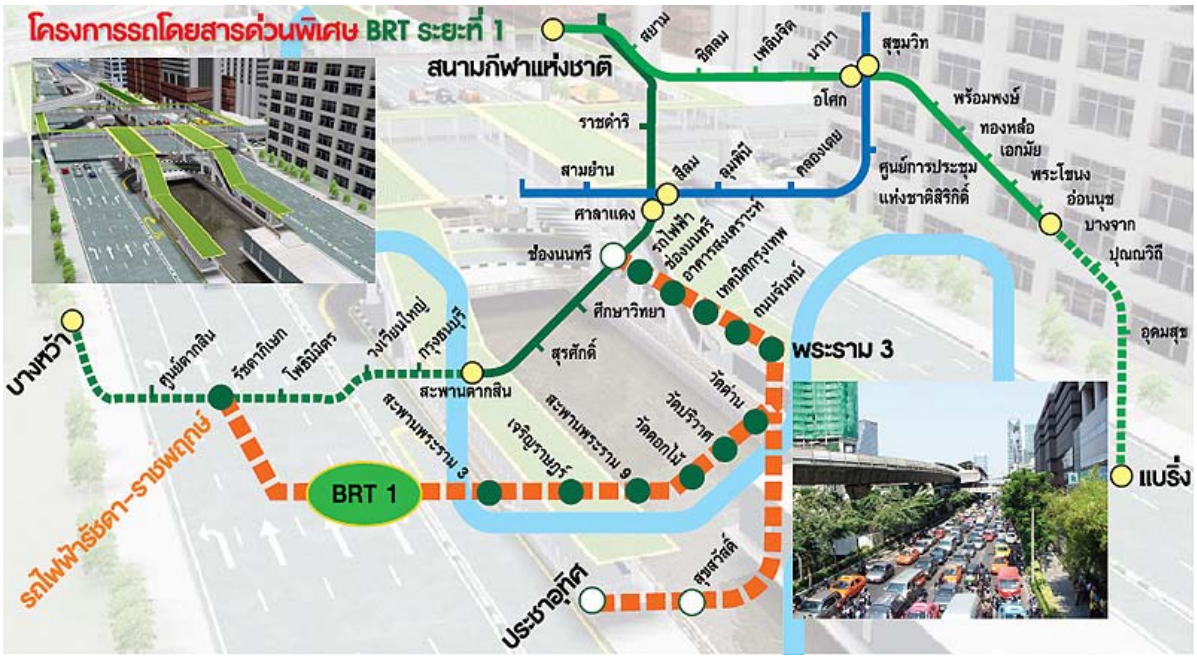

Figure 1: Bangkok BRT Map

The system currently handles 18,000 passengers a day (as of July 17, 2010) and runs at an average speed of 30 km/hr. The average headway is 5 min. during peak hours and 10 min during non-peak hours.

Route Characteristics

The BRT station “Sathorn” is integrated to the Skytrain or the BTS at station “Chong-non-Si”. The terminal at the other end of the BRT trunk line, Ratchaphreuk, has the potential to be connected to another BTS station, Ratchada. Such a connection will be possible provided the BTS obtains the necessary funding from BMA.

Figure 2: Signboard at BTS Station showing the BRT Station Direction

The BRT trunk line is not entirely physically segregated from mixed traffic and it goes over 4 overpasses or bridges, over which the BRT route is not physically segregated (only the lane is marked with striped lines). Also, the unsegregated lanes are actually High Occupancy Vehicle (HOV) lanes. So, even regular vehicles with more than 2 passengers can pass on these lanes.

The decision on segregation seems to have been the following: in areas where mixed traffic previously had 3 lanes per direction, physical segregation was given to the BRT, while on roads where less than 3 mixed traffic lanes were available, physical segregation was not implemented. As it stands, segregation for the latter should be implemented as well. This would be a traffic calming measure along the BRT corridor and people using the personal automobile on the BRT corridor would shift to the BRT.

Figure 3: Physically segregated section of Bangkok BRT

Additional to the above, the entire trunk line for the BRT is composed of a single lane (no overtaking lane is provided at stations or elsewhere). This is coherent with the fact that there are only regular services (not express services stopping at fewer stations). Having no express services would increase the number of buses required for operation. On the other hand, since only one phase has been implemented, there is still a chance for BMA to have express lanes on the corridors that will be developed in the future.

Figure 4: The BRT lane on one of the overpasses. The lane is also a High Occupancy Vehicle (HOV) lane

Station Characteristics

The 12 stations have high platform, enabling level boarding (see bus description below). Stations at the terminals are air-conditioned while the rest of the stops are regular non-air conditioned. Stations are located in the centre of the carriageway (also known as median stations). Since most of the trunk line is located alongside an existing canal, stations do not have direct linkage between one direction and other. If users must travel in the opposite direction, they must cross to the other side of the station in order take the opposite route (however, this is all within the “paid zone” of the station). Stations are equipped with escalators for both directions.

Figure 5: Escalators at the BRT Sathorn Station

All stations have electronic displays providing information about the next vehicle and its time of arrival. Stations also have electronic ticket verification systems (smartcard), while there is yet no operation of this system. This implies that in future there will be an electronic ticketing system for the BRT. Discussions with BMA in March 2010 revealed that there is a plan for having an integrated ticketing system for the BRT, BTS and the MRT (subway). This will be an initial step towards having and integrated fare structure, though details on fare distribution are not yet known. Currently free paper tickets are given to the riders that have to be deposited on exit.

Figure 6: Information system at the BRT Sathorn station

Stations have a single door which is about 3 meters wide and stations are wide enough only for one bus to dock at a time. Even the buses have a single door on both sides of the bus. Having a single door will increase the time for boarding and alighting when the demand at a particular bus stop is high. The current dwell time for each bus at the station is 20-30 seconds.

At the terminals the buses take a U-turn. However, due to improper calculation of the bus turning radius, buses frequently hit the curb while turning.

Figure 7: Level boarding at all BRT stations

Fleet Characteristics

Buses used for the Bangkok BRT are standard 12m buses (high-platform) with level boarding and alighting i.e. no step while boarding or alighting. Inside the buses it is not a level floor but a step exists for all the seating. They have a 3m-wide door on both sides of the bus at the same level i.e. no step on one side. All 25 buses are air conditioned and are only being used on the BRT corridor under present circumstances. Buses run on Compressed Natural Gas (CNG). The capacity of each bus is 80 passengers, 20 seats and 60 standing.

Figure 8: The Bangkok BRT bus. Standard 12m with a single door on both sides

One important issue to mention is the guiding mechanism of the buses. A mechanical wheel-based system is used to guide the bus when docking at the station. Stations have a special extra curb in placed to guide the wheels into bus bays (see image).

Operational Aspects

As stated earlier, the BRT system is owned by the BMA. Krungthep Thanakom a company was appointed as the system manager while the skytrain (BTS) operator has a 7year agreement for operating the system won through an open bidding scheme.

Though the BTS currently operates the BRT system, the fare integration is not yet implemented as the BRT is currently on free rides until end of August 2010. Once the BRT is charging for the riders there is a possibility of integrating the fares of BTS and BRT, upon agreement between BMA and BTSC.

Figure 9: The mechanical wheel guiding the bus into the bay. A special curb designed for guidance.

From September 1st until December 31st 2010, a flat fare will be charged at US$ 0.3 per ride. From 1st January 2011, a distance based fare ranging between US$ 0.36 and US$ 0.66 will be charged.

The total cost of implementation of the current phase was 2, 443 million THB (US$75.85 million) for 15.9 kms (US$ 4.77 million per kilometre). The breakup of the cost is

- 2, 000 million baht for the infrastructure (stations, ITS, AFC, depots and gas staion)
- 436 million baht for the planning of the system
- 7 million baht for the trunk vehicle rental. The vehicles are not owned by either BMA or by Krungthep Thanakhom(KT). KT being the system manager rents the buses from the operator (BTS in this case). In other words, 1,990 million baht for BRT operation in 7 years, and BTSC as Bus Operator will provide buses for the operation.

The issue of operational subsidies has not been decided yet. It is known from sources at KT that BMA will collect all the fare box revenues. Once the system starts to charge for operations the issue of subsidies will be decided.

Marketing Plan

The BRT currently operates at no cost to users until the end of August 2010. This is a marketing strategy to allow people to experience the system but may also reflect an internal problem with fare management, structures and distribution (no information has been received from BMA regarding this issue). Further, the quality of the bus stations and terminals is high compared to the conventional bus stations and terminals of bus services in Bangkok and South East Asia in general.

The buses are also equipped with information systems that inform commuters about the next stop and also show the route map inside the bus. This increases perception of quality of service of the passenger and also makes them aware that this bus system is different (and better) than the conventional system.

The marketing plan is developed by KT and a public relations plan for the BRT system.

Future plans for the BRT system

Currently, the BRT system is 15.9 km and one route is open. The OTP's master plan for Bangkok aims at a network with a total of 110 km with 5 routes, with an expected cost of 13 billion baht (403.22 million US$). Which is 0.12 billion baht (3.722 million US$) per kilometre compared to the 2.52 billion baht (78.162 million US$) per kilometre spent on the recent BTS extension (Wikipedia, 2010[1]).

The figure below shows the 5 BRT trunk lines, their lengths and expected dates of completion.

Bus Routes	Kilometers	Finished
Sathorn - Rama 3 Road - Ratchapruek, Thonburi	16.5km	29 May 2010
Don Mueang - Min Buri - Suvarnabhumi	38km	
Mor Chit - Pak Kret	18.7km	2012
Min Buri - Si Nakharin - Sukhumvit 107	25km	
Bang Na - Suvarnabhumi	15.6km	

(Source: Wikipedia, 2010)

Areas possible for further improvement in the BRT

1. *Integration:* The system has the potential to be integrated in terms of the fare structure and physically with the other existing mass transit systems. In terms of fare, as explained above, since the BRT in the future will be using an electronic ticket service there is a chance to have a common ticket on all the mass transit systems and thus integrating fares or at least form of payment (i.e. smartcard or magnetic strip card).

   In terms of physical integration, currently the BRT is integrated with the BTS at one terminal of the BRT system (Sathorn Station). Commuters using the BTS system need to exit the system and then take a specially designed connection to the BRT station. The other end of the BRT station in the current phase i.e. Ratchaphreuk station, has the potential to be integrated to another yet to be installed BTS station (Ratchada) and this potential needs to be further explored and if possible then integrated.

2. *Non-motorised Transport:* Currently the BRT stations are not integrated with any bicycling facilities. The route neither has bike lanes/paths nor bicycle parking at the BRT stations. The current lack of integration of the non-motorised transport with the BRT would discourage the bicyclists to take the BRT or BTS and BRT to complete the trip. This can be done by providing sufficient parking facilities at the BRT stations. If such integration is made possible, there is a chance that people who bicycle would tend to use more of the BTS and BRT as part of their commute.

[1] Wikipedia, 2010, http://en.wikipedia.com/wiki/BRT_Bangkok Accessed on 10 May 2010

3. *Access for physically challenged:* The existing BRT infrastructure is not friendly for the physically challenged. The stations could improve this by providing elevators for the physically challenged and haptic tiles for the blind.

4. *Feeder Services:* Currently there are no dedicated feeder services to the BRT system. In an ideal BRT system, there will be feeder buses dedicated for the BRT system bringing in passengers into the trunk route. Currently, the Bangkok BRT system does not have dedicated feeders and thus there is no financial structure in place to determine how operational costs would vary. Based on the current situation, there are two possibilities to create feeder services:
    a. Reroute some parallel bus routes along the BRT corridor so that the main access is through the BRT system and such bus routes are perpendicular to the BRT. This measure will help reduce existing traffic volume on the roads by reducing the number of buses and easing the road for car traffic. The buses rerouted can serve as feeders to the various BRT stations on the corridor, thus creating a network and bring in more ridership to the BRT.
    b. Developing a specific feeder service with buses having their own identity. Users, this way, can easily identify a feeder bus service to the BRT. If such a feeder service is provided it can be also extended to the BTS and the MRT and there by combining the all the existing mass transit options and increasing the city wide network (BTS has developed feeder routes via water canals in some stations). This option is also very viable for implementing in Bangkok, as there is an existing feeder service for the BTS that have their own identity. These bus routes can be extended in such a way that they also connect the BRT terminals.

5. *Improved Marketing Plan:* The current marketing plan can be extended to reach a wider audience. Some options for making this possible are:
    a. Make maps of the BRT available at various locations such as conventional bus stops, BTS stations and MRT stations. These could be paid for by publicity.
    b. Include the BRT map in the existing BTS and MRT maps. It is important to denote in these maps the available services and the future routes planned in the city. This will help users know how the city will be connected in the future.
    c. Another important aspect of the marketing plan is to create an identity for the BRT system. Merely, calling the system a BRT might not provide sufficient impact but rather having a distinctive image and a name for the system is strongly recommended.

6. *Land-use Planning:* Land use regulations along the BRT corridors need to be adjusted for higher density. This will enable a reduction of sprawl when properly developed. Also, there is a possibility of land value capture, which will enable to improve financing options of the BRT network.

7. *Fleet:* The current buses which are 12 m high floored seem suitable for a standard BRT system, however, the existing buses have a single door and are not level floored inside. These two factors will affect the whole system on a longer run. Once the system attains more demand for ridership having a single door for the buses will drastically increase the dwell time of the buses at the stations which will in turn affect the frequency of the whole system. Similarly, not having a levelled floor inside the bus will be an obstacle for the physically challenged and the senior citizens.

Conclusion

This report has described the newly implemented BRT system in Bangkok known as the Bangkok Rapid Transit. In a broader perspective the implementation of a BRT is definitely a positive step for Bangkok and the way it has been implemented is comparable to some of the developing cities in the region. The system still has a potential to improve in terms of integrating the BRT with the subway and skytrain services and also in terms of fare. If such integration is made possible there will be more ridership in the BRT and also less dependency on a personal vehicle.

It is also recommended that during the implementation of the future phases of the BRT an overtaking lane is provided and express services are run. This will result in lesser fleet numbers. Also dedicated feeder services are suggested to bring in more ridership into the system.

Finally an improved marketing strategy where in more information on the BRT is dispersed to the residents along the BRT corridor and also to the commuters of the BTS and MRT. This information dispersal will provide information to the commuters on the total network and hence assist them in planning their trips.

More Images of Bangkok BRT

Figure 10: Corridor connecting BTS and BRT stations

Figure 11: The paper tickets that are currently being distributed free of charge. Theses have to be deposited on exit.

Figure 12: Inside the BRT bus. Rear end notice the step inside the bus for the passenger

Figure 13: Map of the route being displayed on a screen in the bus

Figure 14: Information System inside the bus

Figure 15: Inside the BRT front end

Figure 16: Mechanical Wheel for guiding the BRT bus into the bus bay.

Figure 17: Damaged side of a BRT bus due to incorrect turning radius at one of the BRT terminals

Figure 18: Signal Priority for BRT. There are 3 intersections where signal priority is given for the BRT.

Figure 19: Display at the driver showing the passengers in the bus and also to manually control the opening and closing of the door.

Figure 20: An unsegregated BRT lane congested with regular traffic. This shows that lack of segregation will hinder the smooth functioning of the BRT.

Qualitative Details of the Bangkok BRT system X = No, P = Partial, | = insufficient information NA=Not applicable		
BRT Feature	**Bangkok BRT**	**Remarks**
Segregated busways or bus-only roadways	P	
Existence of an integrated “network” of routes and corridors	X	
Enhanced station environment (i.e. not just a bus shelter)	Yes	
Special stations and terminals to facilitate transfers	Yes	
Overtaking lanes at stations / Provision of express services	x	
Improvements to nearby public spaces	P	
High average commercial speeds (> 20 km/h)	Yes	The average speed is 30 km/hr
Actual peak ridership over >8000 passengers per hour per direction	X	
Pre-board fare collection and fare verification	Yes	Will be implemented from 1 September 2010
At-level boarding and alighting	Yes	
Fare- and physical-integration between routes and feeder services	P	Only physical integration (No new feeder system, only normal buses and motorcycle), fare not yet
Entry to system restricted to prescribed operators under a reformed business and administrative structure (closed system)	Yes	System is operated by BTS and a special purpose vehicle, Krungthep Thanakhom oversees the contracts
Competitive-bidding and transparent contracts and concessions	Yes	
No need for operational subsidies	|	Subsidies will be decided once the system starts charging for the rides
Independently operated and managed fare collection system	X	

Qualitative Details of the Bangkok BRT system X = No, P = Partial, | = insufficient information NA=Not applicable		
BRT Feature	**Bangkok BRT**	**Remarks**
Quality control oversight from an independent entity/agency	Yes	BMA as owner, hire SDC (Strategic development consultant) as their consultant in this project for quality control
Low-emission vehicle technology (Euro III or higher)	Yes	CNG operated buses
Automated fare collection and verification system	Yes	
System management through centralised control centre, utilising automatic vehicle location system	Yes	
Signal priority or grade separation at intersections	P	Signal priority is available
Distinctive marketing identity for system	Yes	Part of KT's scope of work to design the marketing plan and public relations plan
High-quality customer information (e.g., clear maps, signage, real-time information displays)	Yes	A full ITS system having a BIS (Bus information system) to show the waiting time, arrival of the next bus to the station is available.
Modal integration at stations (e.g., bicycle parking, taxi stations, easy transfers between public transport systems)	P	Transfers between the starting BTS Station (Chong Non Si) and the BRT are integrated through a specially connected walkway (approx. 400 m)
Supporting care-restriction measures	P	No specific car restraint measures yet. Will there be any in the future? There is HOV and BRT lane regulation that driver who violent will be fine.

Quantitative Details of the Bangkok BRT system		
BRT Feature	**Bangkok BRT**	**Remarks**
Year system commenced	2010	
Number of existing trunk corridors	1	
Total length of existing trunk corridors	15.9 KM	
Number of trunk routes	1	
Location of busway lines	Centre lanes	
Location of doorways	Median (right)	The buses have doors on both the sides at the same level
Type of surface material on runways	Asphalt	
Type of surface material on runways at stations	Asphalt	
Total length of existing feeder routes (km)	NA	No special feeder routes
Projected length of total future trunk corridors (km)	110 km	According to Office of Transportation Policy and Planning (OTP)'s BRT master plan
Number of stations	12	
Average distance between stations	1.3 km	
Number of stations with passing lanes	0	
Number of terminals	2	
Number of depots	1	
Number of total system passenger-trips per day	18,000	Information as of July 17, 2010
Actual peak ridership (passengers per hour per direction)	NA	As the Automatic Fare Collection (AFC) system is not yet completed there is no exact number of passenger for a period of time, but only total passenger per day.
Actual non-peak ridership (passengers per hour per direction)	NA	
Average commercial speed (km/h)	30 km/h	
Average peak headway (seconds or minutes)	5 minutes	

Quantitative Details of the Bangkok BRT system		
BRT Feature	**Bangkok BRT**	**Remarks**
Average non-peak headway (seconds or minutes)	10 minutes	
Average dwell time at stations (seconds)	20-30 sec	
Number of trunk vehicles	25	
Trunk vehicle type	Standard	
Fuel type used in trunk vehicles	CNG	
Trunk vehicle capacity	80	20 seats and 60 standee
Trunk vehicle length (m)	12 m	
Type of guidance system, if applicable	Mechanical	
Type of fare collection / verification technology	Contactless smart card	
Number of intersections with signal priority	3	
Number of grade separated intersections	0	
Fare (US$)	$0.3 (Flat fare) from Sep1 to Jan 1 2010 From 01.01.2011 $0.36 to $0.60 (distance based fare)	No fare until August 2010, then flat fare until December 2010. Distance based fare from Jan'2011
Total planning cost	436 Mil. Baht	
Average trunk vehicle costs	7 Mil. Baht	KT as system manager hires bus operator who will provide all 25 buses for the service and KT will be charged on rental, so the buses are not bought but rented.
Total infrastructure costs	2000 Mil. Baht	Stations, depot, gas station, ITS, AFC

Note: Both the above qualitative and the quantitative details are adopted from the BRT Planning Guide published by the GTZ and ITDP. See the section on BRT Planning Guide on the SUTP website http://www.sutp.org