ROADMAP TO BUS RAPID TRANSIT IN BOGOR

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ROADMAP TO BRT IN BOGOR
<table>
<thead>
<tr>
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<th>Definition</th>
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<tr>
<td>APTB</td>
<td>Angkutan Perbatasan Terintegrasi Busway</td>
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<tr>
<td>B&amp;A</td>
<td>Boarding and Alighting</td>
</tr>
<tr>
<td>BMC</td>
<td>Bus Management Company</td>
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<td>BPTJ</td>
<td>Badan Pengelola Transportasi Jabodetabek</td>
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<tr>
<td>BRT</td>
<td>Bus Rapid Transit</td>
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<tr>
<td>B-TOP</td>
<td>Bogor Transportation Program</td>
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<tr>
<td>FVO</td>
<td>Frequency and Vehicle Occupancy</td>
</tr>
<tr>
<td>GIZ</td>
<td>Deutsche Gesellschaft für Internationale Zusammenarbeit</td>
</tr>
<tr>
<td>HOV</td>
<td>High Occupancy Vehicle</td>
</tr>
<tr>
<td>PCE</td>
<td>Passenger Car Equivalent</td>
</tr>
<tr>
<td>PDJT</td>
<td>Perusahaan Daerah Jasa Transportasi</td>
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1. EXECUTIVE SUMMARY
The aim of this report is to explore the potential for full Bus Rapid Transit (BRT) in Bogor City, and to make recommendations for the best path forward.

Although motorbike and private auto use is on the rise, Bogor continues to maintain a significant volume of public transit users, most of whom use private minibuses, known as Angkots. However, these riders are stuck in increasing traffic congestion every year. For riders, public transport is becoming increasingly unattractive; for Angkot owners and operators, the public transport business is becoming a losing proposition.

TransPakuan, a more formalized bus system in Bogor, has been an attempt at solving these problems through the use of newer, bigger buses and real stations. However, the bus fleet and stations are now in a poor state of repair and without dedicated lanes, the TransPakuan system is subject to the same traffic congestion in which all of the other cars and private buses are stuck. Because it is run by a single government-owned company, the system lacks competitive quality-of-service contracting to ensure that the buses and stations are well-maintained. Because TransPakuan operates on nearly the same routes as several Angkot operators, competition between them means lower profits for Angkot operators and the need for subsidies for TransPakuan.

A BRT system in Bogor can take the ideas brought to Bogor with the implementation of TransPakuan, to another level. BRT for Bogor means fully dedicated lanes with beautiful, enclosed, weather-protected center stations and off-board fare collection, at-level boarding, and brand new buses. It means a quiltwork of BRT services that can use the new infrastructure and bring people to their destinations without transferring. It means bringing in the Angkot industry as BRT operators, to create modern, competitive companies out of informal sector operators.

*Photo 1.1: View of Bogor, Source: Republika*
Recommendations for Full BRT Infrastructure

Recommendations for BRT in Bogor were made based on data received from the city, data collected during peak hours, on-the-ground observations, and meetings with the city. Full BRT infrastructure is recommended on the following roads (as illustrated in Figure 1.1):

Figure 1.1: Recommended BRT Infrastructure for Bogor

This configuration of BRT infrastructure includes the following:

Upgrade a Large Portion of TransPakuan Corridor 1 to Full BRT

TransPakuan Corridor 1, from the Botanical Gardens to the northern connection to the toll road, generally has space for a center-aligned BRT with two lanes of mixed traffic on each side, and center BRT stations at certain points. Figure 1.2 shows a typical cross section for BRT on Jalan Pajajaran.

Figure 1.2: Typical BRT configuration recommended for Jl. Pajajaran

Jalan Pajajaran (typical)
Build the Future TransPakuan Corridor 4 as Full BRT

The proposed TransPakuan Corridor 4 has the highest demand of all public transport corridors in the city. Not only does it carry heavy volumes of public transport passengers between the city center and points northwest, it also includes the road that passes Bogor Railway Station. Here, many routes converge and many passengers are accessing the railway station each day. Additionally, traffic congestion is heavy along this corridor; therefore, simply installing a new TransPakuan service will not solve the problems. This corridor, including the road that passes the railway station (Jl Kapt. Muslihat) should be a high priority for BRT. Because of the narrowness of many of the streets on this corridor, it is recommended to create a new one-way traffic scheme, with two lanes of westbound traffic on this road and two lanes of eastbound traffic using Jl. Sumeru, as shown in Figure 1.3 below. Eastbound traffic would continue south on Jl. Paledang to reach the city center.

Figure 1.3: A one-way traffic scheme is recommended on Sindang Barang and Sumeru, south along Paledang, in order to accommodate two-way BRT on Sindang Barang
Then, the BRT would be designed along the northern curb in a two-way configuration, using 9-meter vehicles as illustrated in Figure 1.4.

**Figure 1.4: Typical BRT cross section along Sindang Barang Corridor**

**Build BRT Infrastructure in a Counterclockwise loop around the clockwise-flowing Botanical Gardens Streets**

The City of Bogor recently converted the two-way streets around the Botanical Gardens to a one-way, clockwise-flowing loop (Figure 1.5). To ensure maximum distribution of BRT trips from the two main corridors, around the city center, it is recommended to dedicate one lane – the inner lane – to full BRT. This design would operate best if the BRT were to flow in the counterclockwise direction. All BRT services would make this loop.

**Figure 1.5:** BRT infrastructure in a counterclockwise loop around the Botanical Gardens
BRT Service Recommendations

A preliminary BRT service plan (Figure 1.6) was developed based on the routing of existing Angkot and TransPakuan services. Ridership on each route was collected and taken into account. A direct services model is recommended. This means that routes will operate in the BRT infrastructure and then exit into mixed traffic to continue to their destinations.

In most cases, traffic congestion is lighter where the services operate in mixed traffic.

The following map depicts the recommended services to operate on the BRT infrastructure described above.

Figure 1.6: Recommended BRT service plan for Bogor. Solid lines represent operations in BRT infrastructure, dashed lines represent operations in mixed traffic.
**APTB Routes**

The Angkutan Perbatasan Terintegrasi Busway (APTB) routes, which bring passengers from Bogor into Jakarta, use TransJakarta infrastructure so that passengers may get much closer to their destinations than they might by using the train. However, in Bogor, the APTB routes stop at the edge of the city – at the Bubulak Terminal and at Ciawi Rancamaya in the southeast of the city.

In order to better serve trips between Bogor and Jakarta, with service that gets passengers much closer to where they are going, it is recommended that APTB routes be allowed to use the new Bogor BRT infrastructure. In exchange, private intercity bus routes, could potentially reach an agreement with TransJakarta to use TransJakarta infrastructure as well.

Traffic congestion on the toll roads between Bogor and Jakarta is not too severe and dedicated lanes are not necessarily needed; however, traffic congestion does become a problem at the toll plazas. It is recommended that a more sophisticated electronic toll tag program be adopted that incentivizes the use of these tags through pricing. This would decongest the toll plaza significantly. Additionally, a longer, fully dedicated lane should be given to all vehicles holding electronic toll tags, including APTB bus routes, so that any remaining congestion would be avoided.

**Angkot Transformation**

As is typical international best practice, Angkot owners affected by the new BRT system should be included as owners of the new BRT. A similar approach has already been raised in the B-TOP report for transitioning to TransPakuan. BRT presents an even stronger business case for the affected Angkot owners. Based on the recommended service plan, Angkot owners on the following existing Angkot routes would be considered “affected”: Route 2, Route 3, Route 6 AP, Route 6A AP, Route 5A AP, and Route 9.

Cooperatives that include affected Angkot owners as members would need to reorganize to form companies capable of bidding on BRT operator contracts. A competitive tender for two to three separate bus operator companies is recommended. This would allow the BRT system to operate with a higher quality of service, as the contracts could be written to penalize poor performing companies and reward better performing companies.

Bidders would procure their own buses according to specifications set by the city. A financial model has not been built for the recommended BRT system so it is not yet clear whether the system would be able to cover the investment cost of the new buses purely from the farebox revenue; if not, the government might provide a subsidy to assist the operators to buy new buses.
Towards a Gold-Standard BRT for Bogor

The city should begin conversations with BPTJ (Badan Pengelola Transportasi Jabodetabek), a new funding agency set up to coordinate transportation planning in the Jabodetabek region. BPTJ disburses federal funds for transportation projects to the cities in the Jabodetabek region. Because the agency is so new, it is still setting its agenda. Specifically, it has cited Bogor as being a city targeted for funding pilot projects. A new gold-standard BRT in Bogor could be a great candidate project for this new agency.

The City of Bogor has been progressive on transportation, having built out kilometers of wide sidewalks that are protected from parked cars, and often shaded by large trees. The city should continue to be a leader in this regard by building out a network of gold-standard BRT that brings tremendous benefits to its citizens and is a demonstration to the rest of the country.
2. INTRODUCTION
About the Project

Bogor City is located approximately 60 kilometers south of Jakarta in West Java, Indonesia, and is part of the Jabodetabek metropolitan area. With a population of just over one million, it is the 14th biggest city in Indonesia. There are more than 1.2 million trips made every day, with approximately 600,000 between Bogor and Jakarta. Like other cities in Indonesia, public transport in Bogor is losing its share to private cars and motorbikes.

The share of trips being made by public transport has dropped to 23% while there are approximately 65,000 private cars (growing 8.4% each year) and 280,000 motorbikes (growing 13.3% each year). The streets in Bogor tend to be narrower than in most Indonesian cities. The narrowness of the streets combined with the growing car usage means that traffic congestion is getting significantly worse.

Several attempts at formalizing the public transport system have been made in recent years. For example, the City recently passed a regulation which requires individual minibuses—known as Angkots—to enter into cooperatives or form companies. This is a first step towards creating legal entities which operate and maintain fleets collectively, though the cooperatives still function more like loose associations of individual owners.

The implementation of TransPakuan—a system likened to BRT but with few BRT elements—has brought the concept of integrated fleet management and newer, bigger buses to Bogor. Lacking dedicated lanes, however, TransPakuan buses are subject to the same traffic congestion as everyone else and Angkots continue to operate in parallel in competition with TransPakuan.

A long-distance inter-city rail service serves central Bogor and goes to Jakarta, Depok, and other big cities in the Jabodetabek region but does not serve trips within Bogor. Most passengers take Angkots to the train station, contributing to congestion on the approaches to the train station. Something more must be done to decongest Bogor’s streets and bring people back to public transport.

Among other things, B-TOP laid out strategies for Bogor towards the development of a mass public transportation system and provided initial guidance on the formalization of informal public transport in Bogor.

Bus Rapid Transit (BRT) is a strategy that follows neatly on the tenets laid out in the B-TOP report: a sustainable form of mass transportation that has had incredible success worldwide in creating modern, competitive companies from informal, disjointed public transport systems. BRT could be implemented in just a few years and at a cost that may be within the transportation budget of the national government.

This report, the “Roadmap to BRT in Bogor” is a technical document that lays out a preliminary plan for BRT in Bogor. This document represents the most complete thinking to date on how BRT might be implemented in Bogor.

The Transportation Master Plan of Kota Bogor 2013-2030 (Masterplan Transportasi Kota Bogor) was approved into local regulation in 2013. The Bogor Transportation Program (B-TOP) has taken the master plan several steps further.
3. WHAT IS BRT?
**BRT Explained**

Bus Rapid Transit (BRT) is a bus-based rapid transit system that can achieve high capacity and speed at relatively low cost by combining dedicated bus lanes, off-board fare collection, platform level boarding, bus priority at intersections, and other quality-of-service elements, such as real-time information technology and strong branding. Special vehicles and iconic full-featured stations can help make a good BRT system great.

High quality BRT systems have been implemented in cities around the world. Starting in 2010, a committee composed of the world’s leading BRT experts came together to define the common elements of the best BRT systems. The result of this effort, first codified in 2012, was The BRT Standard. The BRT Standard is a rating system that scores the quality of BRT. It lays out the essential elements of BRT and provides a framework for engineers, decision makers, and community leaders to compare their own system or plans against best practice.

The BRT Standard uses design characteristics that have been proven to correlate with enhanced performance and superior customer experience in a wide variety of circumstances. Under The BRT Standard, a corridor of a BRT system can be certified as gold-standard, silver-standard, bronze-standard, or basic BRT.

Indonesia has one system that meets the minimum requirements of BRT: TransJakarta. With all of the basic elements of BRT, this bronze-standard system is still lacking some of the higher quality elements that make a good BRT great.

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**BRT Standard Scorecard**

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<thead>
<tr>
<th>CATEGORY</th>
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<td>Dedicated Right-of-Way</td>
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<td>Busway Alignment</td>
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<td>Off-Board Fare Collection</td>
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<td>Intersection Treatments</td>
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<td><strong>Service Planning</strong></td>
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<tr>
<td>Multiple Routes</td>
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<tr>
<td>Express, Limited-Stop, and Local Service</td>
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<tr>
<td>Control Center</td>
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<tr>
<td>Located in Top Ten Corridors</td>
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<tr>
<td>Demand Profile</td>
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<tr>
<td>Hours of Operations</td>
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<td><strong>Infrastructure</strong></td>
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<td>Passing Lanes at Stations</td>
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<td>Stations Set Back from Intersections</td>
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**COMMUNICATIONS**

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**ACCESS AND INTEGRATION**

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**OPERATIONS DEDUCTIONS**

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<td>Low Off-Peak Frequency</td>
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<td>Permitting Unsafe Bicycle Use</td>
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<tr>
<td>Lack of Traffic Safety Data</td>
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<td>Buses Running Parallel to BRT Corridor</td>
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<td>Bus Bunching</td>
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As a first step to assessing how BRT might function in Bogor, it is important to understand the existing public transport options for making trips within Bogor.

There is a diverse network of public transport in Bogor. TransPakuan is a public bus operation that provides service within Bogor. Angkots are an informal form of paratransit which are still quite prevalent in and around Bogor. Angkots serve trips within Bogor as well as to the rural areas around Bogor. APTB feeder bus routes travel between Bubulak Terminal on the edge of Bogor and Jakarta, using TransJakarta infrastructure once in Jakarta. Private inter-city bus services operate between central Bogor and many cities throughout the Jabodetabek region. Finally, a passenger rail service operates frequently between Bogor and Jakarta with several additional trips to other parts of the Jabodetabek region, including Depok and Sukabumi.

Angkots

As in many developing country cities, Bogor has a network of informal minibuses serving the majority of the city’s public transport demand. In Bogor, they are called Angkots.

There are 23 official Angkot routes in Bogor City and 10 routes that operate between Bogor City and the rural areas shown by Figure 4.1 on the next page. Angkots are licensed to specific routes and more or less stick to them.

Route numbers are posted on the front and sides of Angkots, and recently there has been an attempt to paint a colored stripe on vehicles according to their route number to make it clearer to passengers.

As of 2014, there were 3,412 Angkots in Bogor (though sometimes Bogor is referred to as “the City of One Million Angkots”) with 2,693 operating each day. This number has reportedly increased in the intervening years. Because of the large – and growing – number of Angkots on the street, combined with the increasing use of private car and motorbike, the Angkot business is becoming less and less profitable.

“Until now, public transportation in Bogor still relies on informal public transport, such as paratransit (angkot) and ojek for reaching the remote areas. So far, TransPakuan has played a very limited role in the provision of public transport services relative to the other types of public transport found in Bogor. The high use of private vehicles, particularly two-wheeled vehicles, is one of the main reasons why Bogor has long-suffered with an overloaded transportation system.”

- Bogor Transportation Program (B-TOP), Executive Summary
Typically, a driver rents an Angkot from an Angkot owner for a set rental price per day. The driver must pay the rent to the Angkot owner and may then keep all profit made over and above this cost. Rental prices vary depending on:

1. **Route:** The more lucrative routes come with higher rental prices. This is because the profit is kept by the driver and there is more profit to be made on those routes.

2. **Time of shift:** Certain shifts are also more profitable than others (e.g., shifts that include peak commuting times) and those also come with a higher rental rate.

Additionally, most Angkot drivers employ a “conductor” whose job it is to collect the fares. The conductor is hired and paid directly by the driver out of the driver’s profit. This is a fairly typical model for paratransit in the developing world. The result is stiff competition for passengers and sometimes, diversions from set routes in order to “cruise” for more passengers. Angkots will stop anywhere on the route if it means picking up more passengers.

Figure 4.2 shows one Angkot’s trip pattern for five different trips within one morning peak period. Each colored line represents a different trip (note that overlap causes some colors to become obscured) and each colored pin represents a stop on the same trip. While this driver followed the prescribed Route 2 pattern to some degree, note the variations to both routing and stops during each trip. Additional observations reinforced this finding.

![Figure 4.1: Angkot routes in Bogor Source: Bogor Transportation Program (B-TOP)](image-url)
**Angkot “Shift” Program**

Beginning in 2009, the City of Bogor began rolling out a program known as the “Angkot Shift Program.” The Angkot Shift Program distributes one “shift” number to each Angkot which must be displayed in the windshield. Shifts are designated as either A, B, or C, and Angkots may only operate on days which correspond to their shift.

The Angkot “Shift” Program has been an attempt to reduce overall Angkot congestion and balance supply with demand. In practice though, vehicles often travel at any time, regardless of their shift.

![Figure 4.2: Trip pattern for Angkot Route 2. 5 trips in one morning peak period. Stopping patterns vary.](image)

![Photo 4.2: Example of an Angkot with the Shift Program letter on the front of the vehicle. Photo: Annie Weinstock](image)
Organization of Angkots

Until 2009, individual Angkot owners applied to the city transport agency (Dishub) for route licenses. In 2009, a national regulation was passed which required public transport owners to associate into cooperatives or companies. Only appointed members of the cooperatives or companies could apply for route licenses on behalf of an owner. As a result of the regulation, by about 2013 approximately 19 Angkot cooperatives formed, as well as 4 family-owned companies.

Angkot cooperatives are not assigned to individual routes; rather, a cooperative applies for a license on any routes, so each route includes Angkots from a mix of cooperatives. While the daily rental price of an Angkot varies by route, the licensing fee is the same from route to route, as per city regulation. Route licenses are valid for five years.

The program of Angkot cooperatization has done little to actually cooperatize the Angkot owners. In theory, an Angkot cooperative should collectively own and maintain their fleet and in fact, the regulation requires the cooperatives to own depots. In practice, however, the Angkot cooperatives function as loose associations of individual owners with elected leadership that changes only every few years (depending on the cooperative). There is a general meeting once a year and membership dues. In fact, the Angkot cooperatives have generally avoided forming companies because there is a fear of losing control of their own vehicles.

“An Angkot cooperative should collectively own and maintain their fleet.”

Most Angkot cooperatives have rented small garages to comply with the regulation to own depots but most Angkots are still stored and maintained in the homes of their individual owners. Even spare parts are generally purchased by the individual owner. Only the family-owned companies have true depots that are used.

More broadly, all of the Angkot cooperatives are members of Organda, a larger organization in Indonesia which sets rules and regulations for paratransit. Bogor has its own chapter of Organda to which each association pays membership dues.
TransPakuan

In 2007, the City of Bogor began implementing TransPakuan. TransPakuan is considered “BRT-Lite” although it is basically a bus system that operates in mixed traffic with curbside stations and at-level boarding. To date, three TransPakuan corridors have been implemented and four more are planned.

Corridors 1-3 have lower demand than some of the future planned corridors. However, they were considered to be less difficult to implement due to there being a lower number of Angkots operating on them. A total of 5,000 combined passengers ride TransPakuan on Corridors 1-3 daily with approximately half of these on Corridor 1. Another 3,000 passengers ride Angkots on the same three corridors. Stops are between 500 meters and one kilometer apart – a much greater average spacing than the existing Angkot routes, which stop on demand. TransPakuan currently operates a fleet of 30 buses for the three corridors combined. All but one of the buses is operational but the fleet is about 7 years old and looks to be in fair to poor condition.

Stations are located on the sidewalk and range from an uncovered stop to a slightly higher-quality shelter. Most of the stations, however, are not well-maintained, painted with graffiti, and sometimes even have vehicles parked in front of them.

Occasionally, vehicles park in front of the entrances.

Photo 4.3: TransPakuan buses, about 7 years old, will need to be renewed soon. Photo: Walter Hook

Photo 4.4: TransPakuan stations are made of low-quality materials and are not well-maintained. Photo: Annie Weinstock
The one feature of true BRT that TransPakuan has is at-level boarding, a requirement for national government funding when the project was built.

Corridor 4 is the next of the seven corridors planned for implementation and has the highest existing ridership (on Angkot) of all of the seven corridors. GIZ, which has an on-the-ground presence in Bogor, estimates that an additional 45 TransPakuan buses will be needed to operate Corridor 4, more than the number operating on Corridors 1-3 combined.

Perusahaan Daerah Jasa Transportasi (PDJT) is a city-owned company that manages the operations of TransPakuan. This includes bus maintenance, depot maintenance, bus scheduling, driver hiring and slotting, fare collection, and all other service operations. Bus maintenance is done collectively by the company though the maintenance facility is poor. In addition, the depot is not weather protected, lacks the basic washing and maintenance facilities of a depot, is not secure and the buses are not particularly well-maintained.

To date, TransPakuan has not included the existing Angkot operators into the system and the City has not attempted to fully stop parallel operation of Angkots. As a result, TransPakuan loses a significant number of potential passengers to competing Angkots. TransPakuan may have trouble competing for riders in part because of the long spacing between TransPakuan stops. The fares are approximately equal. Additionally, the Angkots employ a more complex routing pattern than the TransPakuan routes, meaning that many passengers who use the Angkots can get closer to their destinations without a transfer. Because of the competition with Angkots, and because TransPakuan buses are stuck in an increasing amount of traffic congestion every day, among other things, TransPakuan loses a lot of money. Currently TransPakuan covers only 60% of its operating costs from fare revenue and 40% from a government subsidy (paid upfront capital that is being paid down). The government pays a fixed subsidy in rupiah per passenger. The subsidy is approximately R7.3 billion per year for the 3 corridors and 30 buses. Angkots, by contrast, operate without subsidies.

If true BRT were to be implemented on one or more TransPakuan corridors, this would go a long way towards increasing the attractiveness of TransPakuan, thereby increasing revenues and reducing the need for subsidy.
A large amount of the transit demand in Bogor is between Bogor and Jakarta. Many people live in Bogor and work in Jakarta. Most people who travel to Jakarta from Bogor take the commuter rail service which takes them to a few stations in Jakarta, as well as a few in between (Depok, etc). There are also private intercity buses that leave from downtown Bogor and take the toll road directly to a bus terminal in Rambutan, South Jakarta.

However, since March of 2013, Dishub in Jakarta introduced a new intercity bus service, APTB, that has direct access to the TransJakarta BRT corridors with doors that interface with TransJakarta stations. APTB is operated by a private bus operator but licensed by Dishub Jakarta. This bus service provides faster travel times and access to a greater number of destinations without a transfer as compared to private commuter buses or the commuter rail.

The APTB routes were introduced by the former Dishub head, Pristono. They are currently operating without a contract in Jakarta though they are still operating on TransJakarta corridors.
There are six APTB routes that operate between Bogor and Jakarta and many more that operate between Jakarta and other cities in the region.

**ROUTE 6**
Route 6 goes from Bubulak Station to Rawamangun Terminal in Jakarta, using TransJakarta Corridors 4 and 9.

**ROUTE 9**
Route 9 goes from Bogor Bubulak Station to Blok M in Jakarta.

**ROUTE 10**
Route 10 goes from Bogor Ciawi Rancamaya to Tanah Abang in Jakarta.

**ROUTE 12**
Route 12 goes from Bogor Ciawi Rancamaya to Tanjung Priok in Jakarta.

**ROUTE X**
Another route (without a number) goes from Bogor Bubulak Station to Grogol in Jakarta.

**ROUTE Y**
A final route (without a number) goes from Ciawi Rancamaya to Jakarta Pasar Senen.
APTB Services - Current Challenges

The APTB routes currently operate on the Jagorawi toll road, as shown in the route maps above, between Bogor and Jakarta. Congestion on this toll road is not too much of a problem except at the toll plazas. Most of the congestion delay faced by the APTB routes, however, is in Bogor and Jakarta, once the buses are off the toll road. Several of the APTB routes use TransJakarta Corridor 9 on the Jakarta Inner Ring Road, where the bus lane is frequently obstructed by vehicles queuing to enter the South Parman toll road.

The APTB routes operate from the Bubulak Terminal in Bogor at the northwest corner of Bogor and from Ciawi Rancamaya, at the southeast corner of Bogor. Both are far from the city center. Competing Bogor-based private intercity bus operators successfully convinced municipal authorities not to allow APTB routes to enter downtown Bogor. Thus, passengers wanting to use this service need to take another mode from the Bubulak Terminal or Ciawi Rancamaya into the city center.
5. DATA ASSESSMENT
Towards a BRT Network

In order to undertake a full assessment of the potential for BRT in Bogor, the Consultants collected and analyzed data related to public transport demand – as well as traffic data – in the City of Bogor. The goal of this data analysis was two-fold:

1. Existing public transport demand data would indicate where BRT infrastructure could serve the most people; and

2. Existing route by route demand data would provide a baseline for making recommendations regarding the BRT services that should use the infrastructure.

Before designing a data collection plan, a request was made to the transport department (Dishub) and to the PDJT, the TransPakuan management company, for any such data. Dishub provided data from its 2014 Bogor Public Transport Performance Evaluation and its 2015 Bogor Road Performance Evaluation. This Angkot data provided enough information to make an initial determination as to which routes had high demand and should be explored further. The table above shows that Routes 2, 3, 6, 7, 8, 9, 12, and 13 have the highest fleet numbers and frequencies.

PDJT provided demand data on the TransPakuan corridors, in terms of annual ridership, by corridor for the three operational corridors:

<table>
<thead>
<tr>
<th>Route Number</th>
<th>Routes (Origin - Destination)</th>
<th>Total Number of Fleet</th>
<th>Operating Fleet Per Day</th>
<th>Route Length (km)</th>
<th>Peak Hour Load Factor</th>
<th>Peak Hour Frequency (veh/hour)</th>
<th>Peak Hour Headway</th>
<th>Round Trip Time (minutes)</th>
<th>Average Round Trip Per Day</th>
<th>Rent Per Day (IDR)</th>
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<tr>
<td>01-AK</td>
<td>Cipinang-Gading - Terminal Merdeka</td>
<td>52</td>
<td>35</td>
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<td>73.98</td>
<td>20</td>
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<td>80,000</td>
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<tr>
<td>02-AK</td>
<td>Bukeatu - Terminal Bulubuk</td>
<td>563</td>
<td>375</td>
<td>28.8</td>
<td>76.66</td>
<td>69</td>
<td>0.91</td>
<td>94.5</td>
<td>7</td>
<td>80,000</td>
</tr>
<tr>
<td>03-AK</td>
<td>Terminal Baranangsiang - Terminal Bulubuk</td>
<td>382</td>
<td>255</td>
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<td>86.46</td>
<td>113</td>
<td>0.5</td>
<td>95.7</td>
<td>6</td>
<td>80,000</td>
</tr>
<tr>
<td>04-AK</td>
<td>Warung Nangka - Ramayana</td>
<td>182</td>
<td>121*</td>
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<td>111</td>
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</tr>
<tr>
<td>05-AK</td>
<td>Ramayana - Cinaphir</td>
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<td>100,000</td>
</tr>
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<td>06-AK</td>
<td>Ramayana - Cheuleul</td>
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<td>74.84</td>
<td>96</td>
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<td>49.9</td>
<td>8</td>
<td>120,000</td>
</tr>
<tr>
<td>07-AK</td>
<td>Terminal Merdeka - Ciparang</td>
<td>211</td>
<td>211*</td>
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<td>92</td>
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<td>146</td>
<td>146*</td>
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<td>09-AK</td>
<td>Bukeatu - Ciparang</td>
<td>141</td>
<td>141</td>
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<td>123</td>
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<tr>
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<td>Bantar Kemang - Terminal Merdeka</td>
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<td>11-AK</td>
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<td>12-AK</td>
<td>Paser Anyar - Cimanggu</td>
<td>180</td>
<td>180</td>
<td>19.6</td>
<td>55.45</td>
<td>51</td>
<td>1.2</td>
<td>89</td>
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<tr>
<td>13-AK</td>
<td>Bantar Kemang - Ramayana</td>
<td>154</td>
<td>77*</td>
<td>15</td>
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<td>86</td>
<td>0.58</td>
<td>71.6</td>
<td>8</td>
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<tr>
<td>14-AK</td>
<td>Bukeatu - Paser Kuta - Terminal Bulubuk</td>
<td>120</td>
<td>80*</td>
<td>25.3</td>
<td>70.68</td>
<td>50</td>
<td>1.13</td>
<td>108.2</td>
<td>6</td>
<td>80,000</td>
</tr>
<tr>
<td>15-AK</td>
<td>Sindang Barang Jero - Terminal Merdeka</td>
<td>105</td>
<td>105*</td>
<td>17.8</td>
<td>67.24</td>
<td>53</td>
<td>1.2</td>
<td>90.1</td>
<td>6</td>
<td>90,000</td>
</tr>
<tr>
<td>16-AK</td>
<td>Paser Anyar - Selabenda</td>
<td>219</td>
<td>219*</td>
<td>24</td>
<td>56.87</td>
<td>33</td>
<td>1.6</td>
<td>138.7</td>
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<td>80,000</td>
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<tr>
<td>17-AK</td>
<td>Pomad-Tanah Baru - Bina Marga</td>
<td>55</td>
<td>55*</td>
<td>18.4</td>
<td>61.24</td>
<td>64</td>
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<tr>
<td>18-AK</td>
<td>Ramayana - Mulyaharja</td>
<td>58</td>
<td>58*</td>
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<td>19-AK</td>
<td>Terminal Bulubuk - Kencana</td>
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<td>38*</td>
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<td>79.44</td>
<td>13</td>
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<td>20-AK</td>
<td>Paser Anyar - Vila Mutia</td>
<td>23</td>
<td>23*</td>
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<tr>
<td>21-AK</td>
<td>Terminal Baranangsiang - Ciawi</td>
<td>170</td>
<td>170*</td>
<td>18</td>
<td>66.21</td>
<td>170</td>
<td>0.37</td>
<td>4S.4</td>
<td>6</td>
<td>90,000</td>
</tr>
<tr>
<td>22-AK</td>
<td>Paser Anyar - Pondok Rumput</td>
<td>51</td>
<td>51*</td>
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<td>73.25</td>
<td>69</td>
<td>0.62</td>
<td>40</td>
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<td>80,000</td>
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<tr>
<td>23-AK</td>
<td>Ramayana - Tanam Kencana - W. Jambu</td>
<td>80</td>
<td>53*</td>
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<td>42</td>
<td>1.36</td>
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<tr>
<td>TOTAL</td>
<td></td>
<td>3412</td>
<td></td>
<td>2693</td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Table 1: 2014 Bogor Public Transport Performance Evaluation. Source: Dishub Bogor

<table>
<thead>
<tr>
<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Corridor 1</td>
<td>410,368</td>
<td>824,472</td>
<td>1,087,154</td>
<td>982,676</td>
<td>517,871</td>
<td>1,296,106</td>
<td>1,212,846</td>
<td>1,129,054</td>
<td>1,095,052</td>
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<tr>
<td>Corridor 2</td>
<td>15,388</td>
<td>11,881</td>
<td>2,380</td>
<td>21,615</td>
<td>21,615</td>
<td>21,615</td>
<td>21,615</td>
<td>21,615</td>
<td>21,615</td>
</tr>
<tr>
<td>Corridor 3</td>
<td>77,745</td>
<td>110,830</td>
<td>177,718</td>
<td>298,667</td>
<td>417,873</td>
<td>361,220</td>
<td>361,220</td>
<td>361,220</td>
<td>361,220</td>
</tr>
<tr>
<td>TOTAL</td>
<td>410,368</td>
<td>824,472</td>
<td>1,102,542</td>
<td>1,072,297</td>
<td>1,031,081</td>
<td>1,495,439</td>
<td>1,512,453</td>
<td>1,546,727</td>
<td>1,456,272</td>
</tr>
</tbody>
</table>

Table 2: TransPakuan annual ridership by corridor
As mentioned below the table, since 2013, the operation of Corridors 1 and 2 have been merged. This table shows that for the most recent year of data, 2015, the combined Corridors 1 & 2 had approximately three times as much demand as Corridor 3. Moreover, based on historical data (years 2012 and before), the large majority of this demand is on Corridor 1. This means that when thinking in terms of upgrading one or more TransPakuan corridors, Corridor 1 has by far the highest demand.

Additional field data collection would indicate whether Corridor 1 could be a viable corridor for upgrade to BRT.

Early field visits to the corridors on which the Angkot and TransPakuan routes operate indicated several locations at which collecting additional demand data would be useful.

During the week of March 21, 2016, a team of surveyors stood at the points shown in the figures above, during peak periods, and conducted “Frequency and Vehicle Occupancy” (FVO) surveys. Surveyors recorded route numbers and vehicle occupancy of all buses – Angkots, TransPakuan, and private buses – passing each location. Surveys were conducted at each point for one hour in the morning (between the hours of 6:30AM – 9:30AM) or evening (between the hours of 4:00PM – 7:00PM) peak period, in the peak direction, on normal working days (Tuesday, Wednesday, and Thursday).
Based on this survey, a preliminary peak hour public transport demand in the peak direction was determined. This is equivalent to persons per hour per direction, or PPHPD.

The four highest points of peak demand were identified as follows (Figure 5.3):

- Jl Veteran: 3,020 PPHPD
- Sindang Barang: 2,342 PPHPD
- Jl. Juanda: 1,754 PPHPD
- Pajajaran: 1,273 PPHPD

These four points indicate that public transport demand is the highest along these roads. In fact, two of these points are on the next corridor planned for TransPakuan: Corridor 4. One of the points is on TransPakuan Corridor 1, where TransPakuan and Angkot routes make up the majority of the demand. And one of the points is on the loop road that encircles the Botanical Gardens.
6. BRT INFRASTRUCTURE PROPOSAL
Figure 6.1: Rendering of BRT station and lanes on Pajajaran
The data collected indicates that BRT infrastructure would best be routed in the following way:

This proposal represents BRT infrastructure on the corridors – rather than routes – where the highest public transport demand currently is, based on the data that was received, as well as collected, for this project.

BRT infrastructure would include:

- Fully dedicated lanes (alignment of lanes discussed in individual sections below),
- Enclosed, weather-protected BRT stations
- Off-board fare collection system
- At-level boarding
- Treatments at intersections to allow the bus travel through quickly with few conflicts.

In order to make the determination as to whether dedicated BRT infrastructure could work on the proposed routing, field measurements (curb line to curb line) were taken at a set of locations as shown in Figure 6.3 and Figure 6.4 on the next page. Points were chosen along the proposed infrastructure routing as well as along some alternative routings through bottleneck areas as described in the sections to follow.
Figure 6.3: Street widths (curb to curb) at key locations in Bogor where BRT and/or traffic changes have been considered.

Figure 6.4: Zoom-in of street measurements (curb-to-curb) along Jl Sindang Barang.
Upgrade TransPakuan Corridor 1 / Pajajaran to Full BRT

TransPakuan Corridor 1 runs from Jalan Cidangiang, on the southeastern side of the Botanical Garden, north up Jalan Raya Pajajaran, and west across Jalan KH Sholeh Iskandar to Bubulak Terminal. Since 2013, Corridor 1 and 2 were merged so that Corridor 1 continues southward to Harjasari in the southeastern part of Bogor.

The portion of the merged Corridor 1 that represents former Corridor 2 has far lower ridership than the former Corridor 1. As a result, the portion of the corridor that represents the former Corridor 2 was not explored any further. Additionally, while the east-west portion of Corridor 1, on Jalan KH Sholeh Iskandar makes up a larger proportion of Corridor 1 in terms of distance, the Angkots that operate on this road showed low demand and the TransPakuan demand alone is not enough to justify an upgrade to BRT. Therefore, the proposed area for upgrading TransPakuan Corridor 1 is along Jalan Raya Pajajaran from Jalan Cidangiang – the former Corridor 1 terminus – to the intersection at Jalan KH Sholeh Iskandar. Because this corridor is somewhat different from TransPakuan Corridor 1 and because the BRT system would represent a new system for Bogor, we call this the Pajajaran Corridor.
From the survey that was conducted, it was found that the total persons per hour in the peak direction (PPHPD) on Jalan Pajajaran just north of the Botanical Gardens was 1,273.

However, the large majority of public transport passengers at this point were in Angkots, rather than on TransPakuan. Figure 6.8 is a pie chart that shows the proportion of public transport users at the survey point on Pajajaran in Angkots versus TransPakuan versus private buses.

This means that while Corridor 1 is the most popular TransPakuan corridor, it is still far more popular for Angkot use. Therefore, any upgrade to Pajajaran would need to be a full BRT upgrade that benefits Angkot transport users, rather than only TransPakuan users. A BRT design on Pajajaran would therefore need to be robust enough to handle the full demand of 1,273 PPHPD. The specific BRT services recommended to operate on Pajajaran will be described in a later section entitled “Service Concept”.

Figure 6.8: Proportion of public transport users on Pajajaran in Angkots vs TransPakuan vs Private Bus

Figure 6.9: 1,273 PPHPD at the FVO survey point on Jalan Raya Pajajaran
Pajajaran is relatively wide with a typical curb-to-curb width of anywhere between 15.5 and 21.4 meters as shown in Figure 6.10. Where it is on the wider side, north of Jalan Salak, there is a median which can be useful for conversion to BRT.

North of Jalan Salak, the typical curb-to-curb width is between 19.6 and 21.4 meters. Here, it is recommended to take over the median and narrow the lanes to 2.8 meters.

The 2.8 meter traffic lanes are on the narrow side for traffic lanes on an arterial – they can accommodate most traffic but the traffic will move somewhat slower. However, there is currently a stretch of Pajajaran (see below, “Recommendation at the bottleneck”) in which the two mixed traffic lanes in each direction of about 3 meters each narrow to one mixed traffic lane of about 5.4 meters in each direction. Because of this, the entirety of Pajajaran is constrained by this narrower section. This observation is confirmed by traffic data obtained from Dishub which showed a consistent traffic flow, in both directions, of an average of 1,600 passenger car equivalents (PCEs) per hour on Pajajaran. This data demonstrates that most of the traffic is going through on Pajajaran and not turning off. Hence, it is constrained by the bottleneck. As a result, this narrowing of the lanes on Pajajaran is consistent with the narrowest point and is not likely to cause additional congestion. Further, narrower lanes tend to lead to slower speeds, which is safer for pedestrians.
Where Pajajaran is 15.5 meters, south of Pangrango, conversion to BRT can be trickier. 15.5 meters is not quite wide enough to maintain two-way mixed traffic plus two-way, center-running BRT. It is not advisable to reduce the number of moving traffic lanes since Pajajaran carries a significant number of vehicles into and out of Bogor each day. However, there is an open drainage ditch that measures 2.2 meters, and a 2 meter swale (see Photo 6.1).

In order to upgrade Pajajaran in this section to full BRT, the best option is to widen the road by covering the open drainage ditch. This would incur some construction costs but, when faced with other possible trade-offs (taking a lane, acquiring land, etc.), is more likely to be politically palpable. This would buy enough space to include two moving traffic lanes in each direction of 2.8 meters each, plus a two-way BRT. The cross section would be similar to the one shown above, north of Jalan Salak.

Stations would be located in the center of the road and need to be cited carefully at locations where there is demand and where there is land available to further widen the road.

**Recommendation at the Bottleneck**

Jalan Raya Pajajaran is 15.5 meters in width (curb-to-curb) or wider, from the Botanical Gardens all the way north to the toll road, which is the recommended terminus of this corridor. However, there is a 370 meter long section on this corridor – from just north of Jalan Pangrango to Jalan Salak – in which Pajajaran narrows to 11.2 meters, curb-to-curb.

![Figure 6.11:Curb-to-curb street widths along Pajajaran Corridor. Red line indicates 370 m long bottleneck section where road narrows to 11.2 m.](image)
11.2 meters is too narrow to maintain two lanes of mixed traffic in each direction plus a two-way BRT, even if the traffic lanes are narrowed to 2.8 meters. A minimum of 17.8 meters is needed to provide the full cross section shown above. There are two options for this section:

- **Survey the land adjacent to the corridor and consider acquisition.** While the road itself is narrow in this section, there is unused, or low-use land along the entire stretch. It is possible that this constitutes an encroachment on the part of the land owners. A survey should be done to make this determination. If it is, in fact, an encroachment, then the city should consider widening Pajajaran in the bottleneck section to accommodate the BRT cross section shown in the section above.

- **Allow buses to enter mixed traffic at the bottleneck with a “leading bus interval”:** If the city is unwilling to consider land acquisition at the bottleneck, the next best thing is to allow the BRT to enter mixed traffic. When the bus arrives at the intersection just before the bottleneck, it should receive a “leading bus interval.” That is, if the light is red, the bus should get a green light before the cars. This will allow it to jump the queue and travel free of congestion until the bus lane begins again.

Photo 6.2: East side of Pajajaran in the bottleneck section. There is a large section of unused or low-use land along the entire stretch. Photo: Stevanus Ayal
BRT on TransPakuan Corridor 4 / Sindang Barang

TransPakuan Corridor 4 is the next corridor scheduled for implementation. Corridor 4 begins at Bubulak Terminal and travels in the southeastern direction along Jalan Sindang Barang, which turns into Jalan Raya Cibungbulang-Bogor, Jalan Mayjen Ishak Djurastra, Jalan Gn. Batu, Jalan Veteran, and then crosses the river where this road becomes known as Jalan Kapt. Muslihat, to cross in front of the Bogor Railway Station. Corridor 4 then loops around the Bogor Botanical Gardens to terminate at Cidangiang, before heading back.

Passenger demand along the proposed TransPakuan Corridor 4 is among the highest in Bogor, as shown in the image below. This is due, in part, to the presence of the Bogor Railway Station. The Bogor Railway Station is located on Jalan Kapt Muslihat where several Angkot routes converge. High passenger volumes (estimated at 3,020 PPHPD) travel to and from the railway station in the AM and PM peaks, mainly for trips to Jakarta. Yet, even further out on Jalan Sindang Barang, there are very high passenger volumes – estimated at 2,342 PPHPD as shown in the image above. Therefore, building full BRT on this corridor would have large benefits. The city government, the bus operators, and GIZ have all reiterated that this corridor has very high public transport demand.

The loop around the Botanical Garden, while also carrying high passenger volumes, will be treated separately in the next section. Therefore, because this corridor is somewhat different from the proposed TransPakuan Corridor 4 and because the BRT system would represent a new system for Bogor, we call this the Sindang Barang Corridor.
Traffic congestion is also bad along this corridor. Therefore, it is proposed that full BRT infrastructure be built along this corridor. Full BRT on this corridor would displace plans for TransPakuan on Corridor 4 since it represents a more intensive investment. As will be described in a later section, the services that operate on this corridor will also be more varied than a single "TransPakuan" service that would operate only up and down the corridor.

Full BRT would include all of the same key elements as those defined for Rajajaran. However, the design would be somewhat different.

### Typical Cross Section and Mixed Traffic Operations

Sindang Barang and Kapt. Muslihat are narrow streets –too narrow to accommodate two-way mixed traffic and two-way BRT, plus the occasional BRT station. Therefore, conversion to one-way westbound mixed traffic operations is proposed on the Sindang Barang Corridor. Jalan DR. Sumeru, a parallel street, that is proposed for TransPakuan Corridor 5 would, in this scheme, need to be converted to one-way eastbound mixed traffic operations to allow for added eastbound capacity since it has been lost on Sindang Barang.

![Sindang Barang BRT Corridor](image)

Figure 6.14: Recommended location of BRT infrastructure on Sindang Barang BRT corridor

![One-Way Traffic](image)

Figure 6.15: One-way scheme for mixed traffic with BRT on Corridor 4. Options for routing mixed traffic east of here discussed below
With one-way westbound mixed traffic operations on Sindang Barang, there is space along most of the corridor for two westbound mixed traffic lanes (in case one lane gets blocked, it is important to maintain where possible) and BRT in two directions. However, it is recommended to use smaller 9-meter BRT vehicles on this corridor in order to reduce BRT lane widths to 3 meters.

There are several options for designing a two-way BRT on a one-way street. If you place the BRT in the center of the road, as is typically advised on two-way streets, the BRT avoids conflicts with curbside use, such as drop-offs and deliveries. However, it requires one-way traffic on both sides of the BRT system. This design exists in Downtown Johannesburg but has proven to be confusing to drivers since they don’t always know which side of the busway to be on and often cross at inopportune places. It can also be dangerous and confusing to pedestrians who may not know from which direction to look when crossing the street. Finally, it does not solve the problem of having one lane of traffic that could get blocked with no way around it.

Instead, it is better to design the two-way BRT along one side of the street with two lanes of westbound mixed traffic adjacent to it. Because driving in Indonesia is on the left side, the two-way BRT should be on the north side of the street so that traffic operations continue to flow normally.

So from north to south, that is, one lane of eastbound BRT services along the north curb, then one lane of westbound BRT services, with two lanes of westbound mixed traffic along the south curb. Stations would be located between the two directions of BRT with higher quality station infrastructure than that which currently exists in Bogor. A typical cross section is shown below. Note that in some places where the road widens and narrows, some adjustments would need to be made to the lane widths.
As the corridor heads west, onto Jl. Gn Batu, it encounters an embankment. Here, the corridor is very narrow – 9 meters (11.8 meters including sidewalks) – and constrained by the embankment on both sides.

In order to fit the full cross section in this area, the embankment would need to be widened.

Further west, as the road becomes Jl. Raya Cibungbulang-Bogor, and then Jl. Sindang Barang, the existing road width (curb to curb) narrows even further, down to 7.8 meters.

Since this road is one of the few roads headed out of Bogor to the northwest, and it carries the highest volume of public transport passengers, the road should be widened. A land survey should be carried out to determine if these are encroachments on the public right of way or if the property lines are indeed up to the roadway. If they are encroachments, the encroachments should be removed. If property lines are indeed up to the edge of the existing roadway, the city should begin the difficult process of expropriation. This process is likely to take some time, however, in the meanwhile it is recommended to provide a dedicated lane for eastbound BRT, but to allow westbound services to mix with the one-way westbound traffic. Westbound traffic would need to merge into a single lane of about 4.2 meters wide. At BRT stations, additional right of way would need to be found to allow at least 6 meters in the westbound direction – enough space for passing a stopped bus at a station.

At the bridge over Cisindangbarang where Sindang Barang becomes Ibrahim Aji, the corridor reaches its most constrained point, at 7.2 meters. The city should rebuild that bridge to be 16 meters wide.
River and Railway Crossing

The one-way eastbound and westbound mixed traffic operations, which uses Sindang Barang (westbound) and Sumeru (eastbound), converges just west of the Cibalok River and the railway tracks.

East of here, on Jalan Kapt. Muslihat, there is not space for two-way BRT operations and two lanes each of eastbound and westbound mixed traffic. The Cibalok River and the railway tracks are both obstacles to accessing the city center from Sumeru and there are only a few possible routings.

Because of the importance of this issue, four alternatives were explored in detail for eastbound and westbound access through this “pinchpoint” and across to the city center.

ALTERNATIVE 1

Alternative 1: Route the BRT north off of Kapt. Muslihat.

By routing the BRT to the north before the river crossing, there would be enough space on Jl. Kapt. Muslihat to allow eastbound traffic to converge with westbound traffic on Jl. Kapt Muslihat and cross the river and railway tracks, as they do today. There are two ways of doing this: send the BRT north on Jl. Perintis Kemerdekaan (Alt 1a) or send the BRT north on Jl. Merdeka (Alt 1b). In both cases, the BRT would cross the river and railway tracks on Jl. Moh. A. Salamun, turn right onto Jl. Sawojajar, and left onto Jl. Pengadilan over to Sudirman for southbound access to the city center.
Pros

- Maintains two-way mixed traffic on the road in front of the railway station – the most direct routing to and from the city center for both directions of traffic.
- Creates a direct BRT connection to the popular market, a destination for many transit passengers.
- Creates an opportunity to use BRT to revitalize the market area.

Cons

- While there is a bridge over the river on Jl. Moh. A. Salumun, the crossing of the railway tracks is at-grade and currently blocked by concrete barriers so that only pedestrians may cross. There is an approximate frequency of 18 trains per hour using these tracks. This is enough to cause a significant delay to BRT operations, unless a new bridge or underpass were constructed over the railroad tracks, which would add cost.
- Much of this BRT routing goes through a busy market so the busway would face continual encroachment by pedestrians and delivery vehicles.
- Requires depedestrianization of a piece of Jl. Moh. A. Salamun, which was recently pedestrianized through the market.
- (Alt 1a) The short segment of Jl. Sumeru where the two-way BRT and one-way eastbound traffic mix is narrow. Finding space for two-way BRT and two lanes of one-way eastbound traffic would require land acquisition.
- (Alt 1b) Jl. Merdeka must carry two lanes of eastbound mixed traffic and two-way BRT for a stretch longer than the short segment of Jl. Sumeru mentioned above. Jl. Merdeka is narrow, varying between 9 and 10 meters.
**ALTERNATIVE 2**

**Alternative 2: Route the BRT south onto Jl. Paledang.**
By routing the BRT to the south, there would be enough space on Jl. Kapt. Muslihat to allow eastbound traffic to converge with westbound traffic on Jl. Kapt. Muslihat and cross the railway tracks, as they do today. The BRT would turn right onto Jl. Paledang and reach the city center via Jl. Paledang. Eastbound mixed traffic would reach Jl. Kapt. Muslihat via Jl. Mayor Oking and would turn left to reach the city center.

**Pros**
- Does not require routing the BRT through the market area.
- Provides a much more direct route for BRT services than would have been faced with Alternative 1.
- Avoids constructing any new bridges or underpasses to cross the railroad tracks since there is already a railroad overpass on Paledang.
- Routes eastbound mixed traffic onto Jl. Mayor Oking which currently has some available capacity.

**Cons**
- Jl. Paledang is currently a narrow (8.8 meter) two-way street. It is not wide enough to handle a two-way dedicated BRT and maintain existing traffic flow or even reduce existing traffic flow to one-way. If the City were to consider prohibiting traffic from Jl. Paledang and turning it into a bus and pedestrian street, it could be a very nice alternative, given that it is next to the river. However, this could be difficult due to the need for deliveries to the businesses along Jl. Paledang.
- Misses the opportunity for a BRT station directly in front of the Bogor Railway Station, though the BRT station could be close, for example before the turn onto Jl. Paledang.
ALTERNATIVE 3

Alternative 3: Allow two-way BRT and one-way westbound traffic straight through to the city center.

In this alternative, eastbound mixed traffic is routed onto Jl. Moh. A. Salamun, south onto Jl. Mayor Oking, and then straight through the intersection at Jl. Kapt. Muslihat onto Jl. Paledang. The traffic signal at Jl. Kapt Muslihat and Jl. Paledang/Mayor Oking would need to be upgraded to handle this more sophisticated traffic and BRT movement.

Pros

- A two-way BRT in front of the railway station and going straight through to the Botanical Gardens is the most direct routing to the city center.
- No new infrastructure would be needed on Jl. Paledang since the eastbound traffic could mix with the existing eastbound mixed traffic on that street.
- Avoids closing Jl. Paledang to traffic.
- Allows a BRT station directly in front of the railway station.
- The routing on Jl. Paledang to the south of Jl. Kapt Muslihat means that eastbound mixed traffic can turn left onto the Botanical Garden loop road (a later section discusses the new one-way scheme which has redirected traffic in a clockwise loop around the Botanical Garden) and travel back up to Jl. Kapt Muslihat. With another left, this traffic can use the one-way westbound lanes on Jl. Kapt Muslihat and reach destinations unreachable by eastbound traffic. It is only a short diversion.

Cons

- Misses the opportunity for a busway along the river.
- Eastbound mixed traffic cannot travel on Jl. Kapt Muslihat east of the railway station, as they currently do.
- Jl. Paledang would need to be converted into a one-way street in order to preserve two lanes of eastbound mixed traffic; otherwise, the two lanes would need to merge into one. A one-way eastbound Jl. Paledang, however, would be workable since Jl. Kapt. Muslihat would still allow westbound traffic and there are no movements lost by this conversion.
Of these three main alternatives, Alternative 3 provides the simplest and most direct routing for both the mixed traffic and the BRT. It is the preferred alternative.

The remainder of this report assumes that Alternative 3 will be used; however, if the city is not comfortable with Alternative 3, the other alternatives may be revisited. So the full routing of mixed traffic would be as follows:

The widest point on this corridor is in front of the railway station. From building line to building line, there are approximately 21 meters (although there is a lot of additional dead space in front of the railway station that could potentially be used if needed). Assuming adoption of Alternative 3, it would make sense to include a BRT station at this point for direct access to the railway station as well as because the street is widest here. A sample cross section would look as follows:
BRT Loop around the Botanical Gardens

Both the Pajajaran and Sindang Barang corridors terminate in the city center. For maximum circulation around the city center, and for optimal access to other parts of the city, a one-way loop of BRT infrastructure would go around the Botanical Gardens. Additionally, the Botanical Gardens are the centerpiece of Bogor and a high-quality piece of public transit infrastructure would be instrumental in showcasing Bogor as a city looking towards the future.

Street widths (curb to curb) on the roads around the Botanical Gardens range from 17.9 meters at the widest to 9.2 meters at the narrowest (along the northeastern side). The majority of the streets are about 15.6 meters wide – wide enough to include three lanes of mixed traffic and a two-way BRT. However, because this loop constitutes one cohesive traffic pattern and merging the traffic into fewer lanes at the choke point where the street is 9.2 meters wide would cause some significant congestion, it is best to design for this narrower point. With 3 meter wide lanes, the 9.2 meter section could handle two lanes of mixed traffic and one lane of BRT in a one-way loop. Because it is a loop, a one-way BRT will not cause significant time lost to passengers wishing to go in the other direction.
On 1 April, 2016, the City of Bogor instituted a one-way traffic scheme in which the loop around the Botanical Gardens was converted from two-way mixed traffic to one-way mixed traffic. Several other more minor changes were made on smaller streets near the city center.

The design of the BRT on the loop around the Botanical Gardens, must therefore, align with the new one-way scheme. In fact, the one-way change is helpful to the inclusion of full BRT around the Botanical Gardens: the one-way BRT infrastructure will take out one lane of traffic but because the one-way scheme already increases capacity for traffic operating in one direction, there is no net loss of capacity.

Two questions must be asked with regard to the BRT design around the Botanical Gardens loop:

1. **Should the BRT go on the inner or outer part of the loop?**

   BRT should be given a lane as free as possible from conflicts with other traffic. Were the BRT to be built on the outer part of the loop, it would be subject to conflicts with turning traffic, deliveries, parked cars, etc. On the inner loop, the BRT is mostly free of such conflicts, aside from the occasional turn into the Botanical Gardens or Presidential Palace, which constitutes a very low proportion of turning traffic. Because of this, the Botanical Gardens functions as an “edge condition” meaning that the BRT is free to travel along the inner loop free of most conflicts with traffic. Therefore, the BRT should go on the inner loop.

2. **Should the one-way BRT travel with the flow of traffic (clockwise) or in the opposite direction (counter-clockwise)?**

   There are pros and cons to allowing the BRT to travel with the flow of traffic or in the opposite direction. A BRT lane in the direction of traffic is potentially subject to some encroachments from mixed traffic, perhaps because of congestion in the mixed traffic lanes or because a vehicle has decided to pull over into the BRT lane. A BRT that travels in the opposite direction is more or less self-enforcing since it would be more dangerous for mixed traffic to enter the lane in the oncoming direction.
On the other hand, a BRT traveling in the opposite direction to traffic could become a safety issue to pedestrians crossing the street. Were the BRT to be on the outside of the loop, this would be particularly dangerous because Indonesia is left-side driving and the counter-clockwise BRT loop would function as a right-side driving situation: the BRT would travel on the right of the oncoming mixed traffic – i.e., “contraflow”. However, because the BRT is in the inner loop, it would travel on the left of oncoming mixed traffic, creating a more typical traffic situation. Additionally, because the number of pedestrians crossing the loop at most points is very low, this safety risk is not so serious. Therefore, it is recommended to allow the BRT to travel in a counter-clockwise loop around the Botanical Gardens.

Figure 6.28: One-way counterclockwise BRT infrastructure on the inner loop of the Botanical Gardens one-way traffic loop. BRT counterclockwise in green; mixed traffic clockwise in red.
7. BRT SERVICE PLAN
Beyond consideration of what infrastructure should be designed and where it should be built is the necessity to think about which BRT services should operate on the infrastructure.

One of the main advantages of BRT is that its vehicles can travel on a piece of BRT infrastructure, then turn off of the infrastructure to operate in mixed traffic to pick up or drop off people at popular destinations. This service pattern avoids forcing all the passengers to transfer at a transfer station, which can take extra time and hassle and be a costly and land-intensive piece of infrastructure. Instead, passengers could walk directly to a bus stop in their neighborhood for a bus that will eventually enter the BRT infrastructure.

BRT infrastructure is designed around a set of routes, to increase their speed and capacity. Unlike urban rail systems, where services often simply run up and down the rail infrastructure, designing a service plan with multiple routes, to give passengers the best possible experience, is at the heart of BRT system planning.

A preliminary BRT service plan was developed for this project, using this methodology. Existing Angkot and TransPakuan routes were considered for inclusion in the service plan.

A BRT service plan is typically developed based on the route structure of the existing bus and minibus services in a city. Bus or minibus routes with high demand that overlap with the BRT corridor are usually brought into the BRT service plan as new BRT routes, sometimes with no changes and other times with some modifications. Other routes that operate nearby the corridor might be rerouted onto the BRT corridor in order to take advantage of the higher speeds that can be achieved when operating on BRT infrastructure. Note that once a bus or minibus route becomes a BRT route, the administrative structure of that route changes, as will be discussed in a later chapter.

“[BRT] vehicles can travel on a piece of BRT infrastructure, then turn off of the infrastructure to operate in mixed traffic to pick up or drop off people at popular destinations.”
The data collected during the FVO surveys helped to inform the service planning process. The frequency and occupancy on each route, at each point, provided an indication of which routes could benefit most from being included in the BRT system.

An additional survey – a boarding and alighting (B&A) survey – was conducted on Angkot Route 2, one of the highest demand routes. For this B&A survey, the surveyor rode Route 2 during the AM and PM peak periods and counted how many people boarded and alighted at each stop. The boarding and alighting data turned out to be relatively insignificant due to wide variations in stopping patterns and the small size of the vehicles.

However, one important piece of information was gleaned from this survey: Drivers licensed to Route 2 often split the route into two routes, a northern section and a southern section. This is because both serve two distinct travel markets, generally destined for the city center and/or railway station. The northern section of Route 2 is more similar, in fact, to Route 3 than to Route 2. Therefore, in designing the BRT service plan, this split nature of this route was important.

The recommended BRT service plan includes six routes.

Figure 7.1: BRT service plan. Solid line indicates BRT route operating on BRT infrastructure, dashed line indicates BRT route operating in mixed traffic
**BRT 1**

BRT 1 is the "main" BRT route that travels up and down the BRT infrastructure without exiting. It is most similar to the northern section of the existing Route 2, as described in the introduction above (which is similar to Route 3 without the loop to the southeast). It is also similar to the proposed TransPakuan Route 4. It travels from Bubulak Terminal in the northwest of Bogor south down the Sindang Barang BRT corridor, past the railway station, around the Botanical Gardens loop, and back.

![Figure 7.2: Routing for BRT 1](image)

**BRT 2**

BRT 2 is most similar to the full routing of Angkot Route 2, with a few minor changes near the railway station. It travels from Bubulak Terminal south down the Sindang Barang BRT corridor, then south down the western segment of the Botanical Gardens loop. Then it continues off-corridor to the loop that Angkot Route 2 currently makes down Jalan Pahlawan and up Jalan Siliwangi (this loop is done in mixed traffic). It then completes the Botanical Gardens loop and heads back out to Bubulak Terminal along the Sindang Barang BRT corridor. While today, many of the Route 2 Angkots indeed split this route in half, some drivers still see the value in maintaining this one continues route due to some demand traveling between north and south.

![Figure 7.3: Routing for BRT 2](image)
BRT 3 and 3A

BRT 3 and 3A are most similar to Angkot Routes 6 AP and 6A AP. They follow the same route as BRT 1 around the Botanical Gardens loop and back up to Bubulak Terminal. However, they continue north off-corridor along Jl. Raya Semplak and split at Jl. Salebenda Raya. BRT 3 follows this road to Parung while BRT 3A follows Jl. Letkol Atong Senjaya to Bantarkambing.

Figure 7.4: Routings for BRT 3 and 3A

BRT 4

BRT 4 is most similar to Angkot Route 5A AP. However, rather than making the loop on Sindang Barang and Sumeru, it enters the BRT corridor at Jalan Gn. Batu and continues east along Jalan Veteran and Kapt. Musliat. It then loops around the Botanical Garden and heads back out in the same way.

Figure 7.5: Routing for BRT 4
BRT 5

BRT 5 is most similar to TransPakuan Route 1. It travels from Bubulak Terminal east along Jalan Raya Cibadek-Ciampea and Jalan KH Sholeh Iskandar to the Pajajaran BRT Corridor. It turns south onto the Pajajaran Corridor and makes the loop around the Botanical Gardens.

BRT 6

BRT 6 is most similar to Angkot Route 9 with two exceptions: first, BRT 6 does not continue south of the Botanical Gardens Loop but instead, loops around and heads back north. Section, BRT 6 continues straight up Pajajaran without the diversion to the east around the narrow section that Angkot Route 9 currently makes.
8. RECOMMENDATIONS FOR APTB ROUTES
Currently, unless a passenger is going from the Bogor Railway Station to one of several Jakarta railway stations, using the train to go between Bogor and Jakarta can be very time consuming due to the need to transfer at least once, but more often two or more times, to make the trip.

The APTB feeder buses are a better option for some since, at least on the Jakarta side, they use TransJakarta infrastructure and therefore, reach more destinations in Jakarta. However, on the Bogor side, they still require getting to Bubulak Terminal which is quite far from most Bogor destinations, including the city center. Were the APTB routes allowed to travel to more destinations within Bogor, including the city center, they would provide much better access for Jakarta-bound passengers, with far fewer transfers.

Because it was the private intercity bus operators who opposed allowing the APTB routes to access the city center, there is the possibility to strike a deal with them: allow private intercity bus operators coming from Bogor to operate within TransJakarta BRT corridors (provided they purchase the right buses and get licensed). In exchange, the City of Bogor would allow APTB routes a more direct connection to downtown Bogor. APTB routes would then use the proposed Pajajaran BRT corridor (upgrade of TransPakuan Corridor 1), as well as the loop around the Botanical Gardens. They could also be given the option to use the toll road entrance closer to the city center, which would constitute another option for a faster and more direct trip.

Because congestion on the Jagorawi Toll Road is not a serious concern, it is probably not necessary to dedicate a lane for APTB routes. In the future, a high-occupancy vehicle (HOV) lane might be justified, but it is not yet necessary. Instead, the public toll road operator, PT Jasa Marga, should focus on decongesting the toll plazas, where most of the congestion is. That issue has been solved in most countries by expanded use of electronic toll tags.

“Were the APTB routes allowed to travel to more destinations within Bogor, including the city center, they would provide much better access for Jakarta-bound passengers, with far fewer transfers.”

PT Jasa Marga should offer a discount for electronic tagholders, would increase the number of tagholders, thus minimizing the delay per vehicle and increasing the throughput at the toll plazas. A dedicated lane for electronic toll tags should be provided with physical barriers protecting it from the other lanes beyond the typical congestion point, so that tagholders do not get stuck in toll plaza congestion. APTB buses should be outfitted with electronic toll tags so that they too can benefit from the lack of congestion.

The APTB routes also use the Jakarta Inner-Ring Road, one of the poorest functioning of the TransJakarta corridors due to encroachments into the buslane from motorists queuing to enter the South Parman Toll Road. Increased use of electronic toll tags at the toll road entrances, and stricter police enforcement of the integrity of the TransJakarta bus lanes at the entrances onto the South Parman toll road, would significantly reduce delay on TransJakarta Corridor 9, affecting several of the APTB routes.
9. POLICY TOWARDS AFFECTED ANGKOT INDUSTRY
As the City moves to implement TransPakuan Corridor 4, the B-TOP report has proposed a scheme to involve the Angkots as operators in the TransPakuan system. This is primarily for two reasons:

- Destructive competition between TransPakuan and the Angkots, as discussed in an earlier section, results in a loss of passengers for TransPakuan; and

- TransPakuan Corridor 4 is particularly attractive in terms of demand. Should the City move forward with TransPakuan Corridor 4 without involving the Angkots, Angkot owners would be aggrieved.

GIZ’s scheme involves tendering out operations for TransPakuan Corridor 4 with incentives for existing Angkot cooperatives or companies to win. PDJT would be turned into a bus management company (BMC) and would no longer directly operate TransPakuan. Drivers and conductors of TransPakuan, currently employed by PDJT, would be hired by the winning bidder. PDJT would continue to operate Corridors 1-3 during a transitional phase.

This is a good first step towards developing an Angkot Transition Policy for a BRT system. The purpose of this section is to add details to these proposals, with a particular emphasis on how the Angkot industry would relate to a new BRT system.

When deciding how to relate a new BRT system to the existing Angkot and TransPakuan operations, it is best if the City of Bogor develops a clear policy with respect to what it wants. In most cases, governments want to end up with good quality, internationally competitive modern bus operating companies that provide a high quality of service for many years. They also want to minimize any loss of employment as well as to make sure that most cooperatives and companies in the old Angkot businesses are able to become part of the new BRT businesses, albeit in altered corporate forms.

This requires a careful balance in terms of how much the government guarantees to affected parties. Guaranteeing too much weakens the government’s leverage in negotiating the best deal possible for taxpayers and passengers and risks compromising the quality of service provided by the companies; not guaranteeing enough risks adversely impacting the existing industry and causing social disharmony. The government therefore must remember that it is entering into a new relationship with the existing Angkot industry, and this relationship has to be negotiated, with the government having to protect the interest of passengers. As in any negotiation, the government should be careful about what information it shares when, and it should enter into negotiations with more information than the people with whom it is negotiating.

Furthermore, the first phase is extremely important to get right, as it will establish a precedent for future phases, which if done incorrectly will prove extremely difficult to rectify.
Why Involve the Angkot Industry?

Most of the BRT systems in the world, and all of the best BRT systems, have involved former bus or minibus owners and operators in the ownership and operation of the new BRT bus operating companies. There are four reasons why cities have either given the entire new BRT business over to the impacted owners and drivers of existing informal transit services through negotiated contracts, or created competitive tenders which gave strong incentives to include the impacted operators as shareholders and employees of new BRT operating companies.

1. Legal Reasons

Legally, many cities have already awarded route licenses, some of them open-ended in terms of duration, to private companies. These route licenses might award exclusive rights to operate a particular corridor for an unlimited period or for a long period (say 12 years). These contracts are sometimes legally enforceable. To take them away would constitute a taking and hence require compensation, significantly increasing project cost. In other cities, companies have been operating quasi monopolies in particular locations without any particular legal sanction but with long term customary rights. The legal position of such customary rights is ambiguous, but could in fact require compensation under some legal systems. Where these legal and quasi legal rights exist, these existing operators have to be legally compensated or else the courts could stop the project, and it is not always clear that the government has the right to expropriate their licenses.

2. Political Reasons

In cities where the rights are not legal but mainly customary, as is more common, aside from the legal issue the operators may have political power. They are frequently organized into powerful, politically-connected associations or companies that protect their customary rights and award route licenses to their members, earning a fee for this. They often have close relations with regulatory authorities which offer route licenses. This gives them political power. This power derives from their ability to congregate their buses, block roads, and suspend transit services throughout the city, bringing the city to a halt economically. Bus blockades and strikes are especially worrisome. In Quito, when a new BRT service was introduced without the former minibus operators, the impacted operators called a strike where the minibuses blocked the new BRT system for more than one week and could only be removed by the intervention of the National Guard. They also have other forms of political power. Sometimes they have powerful hidden political connections because the owners are sometimes government officials. These forms of power can delay the project in more insidious ways.

3. Financial Reasons

Sometimes, not involving the minibus industry means that they simply refuse to cooperate with new route licenses and route cancellations, and siphon passengers from the new BRT system. This can constitute a large financial loss to the BRT system, requiring subsidies that would otherwise be unnecessary. Including the impacted industry in the new BRT operating companies has proven to be the best way to mitigate this political risk.

4. Social Reasons

Cancelling route licenses of existing minibus operators could mean destroying the livelihoods of hundreds of independent entrepreneurs. By bringing them into the BRT system, as operators, not only do they not lose their businesses, they are brought into a more secure business venture, usually with government guarantees. This also means a stronger private sector in a developing country where the growth of the private sector could mean a stronger economy.
Best Practice in Involving the Minibus Industry

BRT systems are best operated by modern bus corporations with integrated fleet management. Integrated fleet management requires a depot where maintenance regimes are carefully optimized, and where economies of scale can be earned from the mass purchase of spare parts and the deployment of talented managers and mechanics.

There are two ways to involve the affected industry in the new BRT operations: competitive tenders which award extra points or require as a minimum qualification requirement firms composed at least in part of affected operators and owners, and negotiated contracts where the BRT authority negotiates a new operating contract with the affected former owners and operators.

There is a big difference between the BRT systems with negotiated monopoly contracts and competitively tendered contracts managed to ensure many affected operators are brought into the new system. Systems with negotiated rather than competitively tendered have faced the following problems:

- Higher operating costs: the government’s ability to control the cost of the contract is compromised in a negotiated contract and international experience has shown fees as high as 40% more per kilometre than in a competitively awarded contract.
- Significant implementation delays as government loses control over the project timetable.
- Incomplete corporate formation. In a competitive tender, the government can require as minimum qualification criteria the type of management the firm has, and it can require the company to comply with ISO 9000 and other indicators of good corporate governance. This can help to make the company successful in the long run. The government would have less leverage in a negotiated contract.
- Requires much greater intervention into company formation on the part of the government. In Bogota, once the competitive tender requirements were established, it was up to the affected bus operators to figure out how best to comply with the tender requirements because their incentive was to win the contract. In a negotiated contract, there is no such incentive and thus, there is a risk that the industry will be unable to organize itself into a modern company with a clear shareholding structure. The government may need to intervene and dictate the ownership structure in order to resolve conflicts within the industry.

Best practice is therefore clear: competitive tender for bus operations with either incentives or a requirement that at least part of the ownership of the bidding companies be represented by affected owners and operators.

This, of course, requires carefully determining who is in fact an ‘affected owner.’
Angkot Transition for the Bogor BRT

The first step in determining how to relate to the affected industry for the Bogor BRT system is first to decide on a government policy about this. If the government decides to give some sort of preference to companies that include affected operators among their shareholders in a competitive bidding process, as this report recommends, then precisely who is an affected operator needs to be carefully defined.

Identifying the Affected Routes

Which routes are ‘affected’ depends on the final service plan for the future BRT system. The service plan will indicate which routes will be included, which routes will be cut, and which routes will be unaffected. As the service plan is likely to be changed frequently and the project timetable is condensed, it is advisable to take the following approach:

The preliminary service plan developed in this report provides an indication of which former Angkot routes would be included, in some way, in the BRT system. As the Bogor BRT project moves forward, it is expected that the service plan will be refined and changed several times before the project is completed, as is normal in BRT system planning. For the time being ‘affected’ routes are the following Angkot routes: Route 2, Route 3, Route 6 AP, Route 6A AP, Route 5A AP, and Route 9, as well as TransPakuan Route 1.

‘Non-affected’ routes are all routes remaining.

There were significant regulatory changes in the Angkot industry in 2015. The new regulation revoked all old vehicle-specific route licenses. Now, only cooperatives or companies meeting some minimum criteria (i.e., they have a garage and own a minimum number of vehicles) are allowed to get route licenses. These new licenses are good for five years, but so far only two companies have gotten the new licenses and the rest are in process.

If Bogor decides to move forward with BRT, it should make sure that any new operating licenses issued to an Angkot cooperative or company on any of the affected BRT routes become null and void as soon as the Bogor BRT begins. As it will probably take five years for a BRT system to become operational, it should be sufficient to simply issue one more round of legally valid route licenses on affected routes in 2016, but to issue no new route licenses after that.
**Company Formation**

As explained above, BRT systems are best operated by modern bus corporations with integrated fleet management.

Unlike in some other cities where the minibus industry is entirely fragmented, in Bogor, loose cooperatives have already been formed. This is a first step towards forming larger modern bus companies. However, the tendering of BRT operations will need to push corporatization farther to ensure the creation of sustainable, viable companies.

Angkots, while organized into cooperatives, are still individually owned. Angkots are nominally associated with a garage but in fact are still brought home every night and maintained and repaired by their owners, not by the collective. As such, the industry is not fully corporatized and still largely informal.

When the service plan is finalized, the Angkot cooperatives will need to classify those Angkot owners with routes deemed ‘affected’ by the service plan as ‘affected’ owners. The Angkot cooperative heads should be included in the process of identifying the affected owners. They can be given the opportunity to be officially designated by the affected owners and operators as their legal representatives, or they can get their cooperative certified as the legal representative of their members, and cooperative minutes and bylaws can be used to certify their leadership positions. In this way, the cooperative heads, whether or not their own Angkots are ‘affected’, can usually secure a stake in the new businesses, or they can buy the licenses and Angkots from affected owners when it becomes known that this is the ticket into the new BRT company.

“The tendering of BRT operations will need to push corporatization farther to ensure the creation of sustainable, viable companies.”

The government should use the competitive tender to force these companies to form; sort out their shareholding structure; establish clear management structures; and collect the necessary minimum capital requirements to meet the minimum bidding criteria. The bidders also need to demonstrate that they have brought on board a competent management team, complete with their CVs, by either hiring individuals from abroad with experience, or partnering with firms with experience operating BRT companies in other companies, or at least with experience operating other logistics-related enterprises with integrated fleet management. The bidding documents would also provide the technical specifications for the buses that would properly interface with the BRT trunk infrastructure.

It would be advisable for Bogor to structure the tender for BRT operations based on both the qualifications of the bidding company and the price they offer to provide the service per kilometre. The bidders gain a higher score on their qualifications if they are in possession of a minimum number of affected route licenses. Some, yet fewer, points would be awarded to bidders involving ‘unaffected’ Angkot owners. If public procurement rules require that tendering be based solely on price, then the requirement to involve the existing operators should instead be embedded in minimum qualification criteria.

By placing all these conditions into a competitive bid, rather than simply requiring it and trying to get these things implemented through negotiation, the government can be far less involved in micromanaging exactly how this process is handled, and can be more sure that it has been properly completed.
The Tendering Process

Normally, a ‘managed’ competitive tender to award BRT bus operating contracts includes the requirement that the winning bidders turn over the required minimum number of affected route licenses and the affected minibuses to the city. This is done in part to ensure the removal of competing routes from the BRT corridor, and in part to ensure that the bidders, who may not directly be the original owners and license holders, offer shares or compensation to the current owners of minibuses and licenses.

If this approach is taken in Bogor, the affected Angkot vehicles and route licenses should be turned over only once the contract is signed, to ensure they are taken out of circulation only once the new BRT service is ready to become operational. Otherwise, there will be no transit service in the interim. Until the date of contract signing, the holders of the Angkot route licenses and affected vehicles sign an affidavit that they are willing to turn over their vehicles and licenses to the head of the consortium upon signing, as the transaction cannot actually take place until the bidding process is complete.

In many cases, the Angkots are turned over for scrapping. The scrapping requirement is generally a ratio of the number of old buses operating on the corridor to the number of new buses needed to operate the new system. As the service plan determines fleet size, this number will be determined with the finalization of the service plan.

The decision to scrap the Angkot vehicles should be based on how old the vehicle fleet is. One option, as has been done in most Latin American cases, is to have the companies bidding on the contracts purchase the oldest buses from their owners and turn them in for scrap, while relocating the newest buses to other unaffected routes, or selling them to the operators of unaffected routes, without much involvement of the city. In this way, the tender process naturally tends to remove only the oldest buses from the streets, as many are very old and polluting.

The scrapping allowance and requirement to turn over the licenses tends to relate closely to the valuation of shares within the new BRT operating companies. In Bogota, for example, where there was a managed competitive tender, the way the bus scrapping and licenses were valued and translated into shares in the new BRT operating company was done through private negotiation, and it differed from case to case. This tended to drive the valuation down to their market price, and factors such as the age of the bus, the value of the route, the length of the license, could all be factored into the valuation.

Generally, it is best to let the companies determine the value of the shares but often, the practice has been to value the shares at one bus and one license equals one share.

For this reason, in the case of Bogor, we recommend that a competitive ‘managed’ tender be used, and to let the industry sort out the valuation of shares in relation to this requirement internally.

The tender then would work as follows: Each consortium that has managed to accumulate the required number of affected Angkot owners as shareholders would offer to provide for service a certain number of the buses required in the tender. The lowest bidder (the lowest price per bus kilometer offered) would be awarded the tender at the price they offered for the total number of buses they offer, the second lowest price would be awarded the tender at the price they offered for the number of buses they offered, and so on until all the services required have been filled. This “Dutch Auction” approach ensures that the City pays the lowest price for the services overall. It needs to be checked for compliance with Indonesian procurement law.
Currently, Angkot operators collect fares directly and are able to keep 100% of the revenue (with payments distributed between driver, conductor, and owner). This is typical of informal transit services and is known as “net cost contracting.” Most BRT systems operate with a “gross cost contracting” model. The fare collection company collects the fare and the government pays a flat rate to the operators, regardless of demand.

The benefit of the current system of net cost contracting is that operators are fully responsible for the demand risk on their routes: if ridership is higher than operating costs, the operator profits; if it is lower, the operator loses money. No government subsidy is ever necessary. The major drawback of this system is that operators do not travel on a schedule since it is more important to fill up the bus. As a result, bus drivers often wait until the bus fills up and then travel at a high, often unsafe, speed. Operators also tend to compete for passengers at the curbside, leading to unsafe conditions at minibus stops, leading to pedestrian fatalities.

In a gross cost contracting system, a separate fare collector collects the fare on the government’s behalf and the bus operators are paid by the city for every kilometer they operate. Bus kilometers are scheduled by the city. In a gross cost contracting system, operators follow a schedule and no longer have the incentive to wait until the bus fills up or speed to pick up more passengers.

For the BRT system, a gross cost contracting structure is recommended: Each bus operating company should be paid by the bus kilometer. Fares will be collected by a separate company on behalf of the city. The city, or a separate company, will create and maintain bus schedules which will ensure a minimum payment to bus operators. Some amount of demand risk should continue to rest on the bus operating companies so as to ensure that fare payments are indeed collected.
Bus Procurement

In most cases in which BRT systems are operated by private companies, the buses are procured by the private companies. This is because the private companies have experience procuring and operating buses and have an incentive to make the most cost-effective choice of vehicles. It also places full responsibility for maintenance on the private operator and eliminates the risk that the operator will blame the government for any problem with the buses, should problems emerge.

Usually this is possible because the fare revenue is estimated to be high enough to both cover the cost of operations and recover the cost of the bus investment.

If a BRT system is designed in a manner in which the operations are not profitable, then some form of subsidy will be needed. One option is to provide a higher fee per kilometer in the operating contract to cover both the operations and the bus procurement. But this means that the government will be providing an open-ended subsidy for a one-time purchase. So, rather than providing a direct and ongoing operating subsidy, having the government purchase the buses while still requiring that operations cover their costs out of fare revenue is a valid way to avoid open-ended financial obligations on the government. This was the case in Cape Town, for example. Another alternative, in the case where the fare revenue cannot cover bus operations and bus procurement, is for the government to provide a one-time subsidy, in the form of a capital injection, for the bus companies to purchase the buses themselves. This still achieves most of the goals of private bus procurement.

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For Bogor BRT a financial model has not yet been built. Therefore, it is currently unknown whether the farebox will be able to cover bus procurement.

If it is determined that the farebox revenue will fully cover the full cost of the required new bus fleet, the municipality still may need to guarantee loans from private banks to the operators to be able to pay for the bus procurement. If farebox revenue proves to be insufficient to cover the bus procurement and the ongoing operating costs, then public money will be needed to help underwrite the cost of the bus fleet, but the procurement should still be led by the private bus operators.

Table 3: Public vs. private bus procurement in BRT systems internationally
Relationship to TransPakuan

Whether the new BRT system is branded as a new BRT system or as an upgraded TransPakuan, the new BRT system will completely replace the current TransPakuan system.

Existing TransPakuan Corridor 1 buses will be entirely replaced by new BRT Route 5 buses. The current TransPakuan buses only have doors on the left side and are not compatible with the proposed BRT infrastructure, which requires center boarding (right side doors) as well as curb-side boarding (left side doors). The current TransPakuan bus fleet is old and will need to be retired by the time the BRT system would be built.

On TransPakuan Corridors 2 and 3, where there is no BRT infrastructure planned, TransPakuan services should be suspended when the BRT system becomes operational, if not before. Ridership is very low and the TransPakuan stations built along the curb lane are ineffective and in a state of poor repair. Services should only resume on Corridor 2 and 3 if fully dedicated BRT infrastructure is built on these corridors and in that case, would still replace TransPakuan as a new BRT service.

On Corridor 1, the TransPakuan stations should be rebuilt and relocated in the central median of the roadway following the proposed infrastructure designs above.

TransPakuan (PDJT), as a public bus operator, would be transformed into a Bus Management Company (BMC), following on the recommendations in the B-TOP report. BRT operations, whether branded as TransPakuan or something else, would be contracted out by the BMC to private operators composed primarily of former Angkot owners. The current bus operation of PDJT could form the base of a new private consortium with other private partners (Angkot owners or other private investors) to bid to become one of the BRT operators, and would qualify as having ‘experience’ operating bus services on the corridors.
10. TOWARDS A GOLD-STANDARD BRT FOR BOGOR
This report represents a preliminary concept for building and operating BRT in Bogor. Ultimately, it will be up to the City to decide whether this concept can go forward.

At this point, the two most important ingredients in determining the future of BRT for Bogor are the availability of funding and the political will to build out a high-quality BRT network.

On funding, the city should begin conversations with BPTJ (Badan Pengelola Transportasi Jabodetabek), a new funding agency set up to coordinate transportation planning in the Jabodetabek region. BPTJ disburses federal funds for transportation projects to the cities in the Jabodetabek region. Because the agency is so new, it is still setting its agenda. Specifically, it has cited Bogor as being a city targeted for funding pilot projects. A new gold-standard BRT in Bogor could be a great candidate project for this new agency.

While there may be funding available for construction of a new BRT system, it is unclear whether there is funding available for detailed design. It might be worth exploring whether a design-build contract could be funded by DTKJ. Otherwise, the City may need to explore other funding mechanisms, e.g., the Asian Development Bank.

The City of Bogor has been progressive on transportation, having built out kilometers of wide sidewalks that are protected from parked cars, and often shaded by large trees. The city should continue to be a leader in this regard by building out a network of gold-standard BRT that brings tremendous benefits to its citizens and is a demonstration to the rest of the country.

“[The City of Bogor] should build out a network of gold-standard BRT that brings tremendous benefits to its citizens and is a demonstration to the rest of the country.”