TRANS-JAKARTA BUS RAPID TRANSIT SYSTEM
TECHNICAL REVIEW

DECEMBER, 2003

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This report was prepared primarily by Walter Hook, Executive Director of ITDP, with critical inputs from John Ernst, Asia Regional Director of ITDP, Lloyd Wright, former BRT Programs Director at ITDP (now at University College London), Fatimah Sari Nasution, ITDP Indonesia Country Director, independent consultants Paulo Custodio, Pedro Szasz, Michael King, Remi Jeanneret, and Jaroslav Vlasak.

While much of the credit for the hard work reflected in this report belongs to our partners and consultants listed above, the opinions, and the many mistakes no

doubt reflected herein due to our tight timeline, are the responsibility of the primary author alone, and do not necessarily reflect the opinions of ITDP, its Board of Directors, US AID, or any of the above-mentioned individuals.

I. EXECUTIVE SUMMARY

The following report is a summary of the technical issues surrounding the implementation of the TransJakarta Bus Rapid Transit (BRT) System, scheduled to open in January 2004. It was compiled by the Institute for Transportation and Development Policy, based on numerous visits by staff and technical consultants, between October 2002 and December of 2003. It was drafted for the following purposes:

a. To consolidate the expert advice provided by ITDP technical experts to DKI Jakarta to facilitate Jakarta's own internal decision-making process regarding a number of critical outstanding issues.
b. To provide an independent source of information for the general public regarding the TransJakarta BRT project.
c. To create a written record for the general public of the work done and the positions taken by ITDP under the first year of our Indonesia Liveable Cities Project grant.

This report discusses what will be completed and the problems that will be faced in early 2004 as Phase I, as well as what could be completed by 2004-2005 as Phase II. As none of the critical decisions have yet been taken for Phase II, this represents our list of recommended actions for Phase II.

TransJakarta has the potential to be the first important step to providing Jakarta not only with a state-of-the-art, modern mass transportation system, but also of transforming itself into a more liveable city. We are grateful to DKI Jakarta for giving us the opportunity to provide assistance with this project.

Phase I

Phase I of TransJakarta will be a 12.9 km exclusive busway connecting the Blok M Bus Terminal to Kota Railway Station. It will be operated by a private consortium, probably led by PT Ratax, a taxi company, under contract to "a busway management authority" either under the City Secretary or Dinas Perhubungan. The initial fare will be Rp.2500 per trip. There will initially be no feeder services. Seven existing bus lines will be cut. The busway will be operated as a closed system.

On the positive side, ITDP's experts concluded the following:

- The corridor is perfect for BRT. There is plenty of space and about 12,000 public transit trips per direction at the peak hour in the corridor.
- BRT makes much more sense for the corridor than any other mass transit option. The demand levels are not high enough to justify the far more expensive systems such as metro or monorail.

- TransJakarta could save its own passengers 59 minutes during the morning peak, and 26 minutes during the off peak.

However, we also observed several problems. The most important problems relate to the projected ***level of demand*** (the number of riders using the system):

- TransJakarta's system is too short to have enough demand to be financially viable by itself. A system of at least 25km is needed to ensure financial sustainability.
- A plan for what the full BRT system will look like should be developed right away to show the public that the Blok M – Kota Corridor is not the entire planned system. The corridors with the highest public transit volumes should be prioritised. A map showing the current and future routes should be developed and publicized.
- Until the feeder lines are contracted and a second, East West BRT corridor is constructed, the demand on TransJakarta will be between 2000-3000 passengers (both directions) and maximum volume per direction will be 1280 – 1500 passengers per peak hour.
- At this level of demand, the mixed traffic lanes will get much more congested, slowing traffic speeds by as much as 20%.
- At this level of demand, TransJakarta will require operating subsidies.
- The peak hour demand (both directions) could be maximized to between 6500 – 7000, and the one-way volume maximized at 3400 just by reducing the fare to Rp.2000 and by providing passengers transferring at Blok M a discount fare of Rp.200 or less. This is the best short term scenario for reducing congestion in the mixed traffic lanes.
- TransJakarta optimizes its profitability at a Rp.2000 fare with no discount for transferring passengers. While operating costs need to be clarified, we estimate the system would be close to covering its full operating costs with this fare structure. This is the best short term scenario for minimizing government subsidies.
- The figures above are based on existing modelling capacity in Jakarta, which is limited. Proper operational planning requires that this capacity be upgraded, which can be done in 3 – 5 months.

There are also several ***problems with the capacity*** of the current system's design.

- In Phase I, the maximum capacity of TransJakarta will only be about 3250 passengers per direction per hour, mainly due to the limited number of buses available.

- This will be enough to handle TransJakarta's projected initial demand at Rp.2500. At the Rp.2000 fare with a deep transfer discount, the buses will become crowded.
- By adding more buses alone, TransJakarta's capacity can reach just under 8000 passengers per hour per direction at 15kph. This is a low capacity and a very low speed for a busway by international standards.
- This is not enough to handle most of the existing transit trips in the corridor, so at this capacity level, TransJakarta will not substantially decongest the mixed traffic lanes.
- The roadway, particularly in front of the bus stops, will still be in asphalt, which may sink under the weight of the buses.
- Several intersections need to be reconfigured to avoid serious congestion.
- Little is being done to improve the cycle and pedestrian facilities along the corridor. In some places pedestrians are likely to spill over into the street, creating safety problems.
- While some improvements are being made on the pedestrian overpasses, many of them will still be old, too narrow to handle a high volume of passengers, and will need to be reconstructed.

Some institutional problems will also remain at the completion of Phase I:

- The busway project requires direct participation, not just coordination, of various agencies. The project remains under the full budgetary control of Dinas Perhubungan, as reflected in the 2003 budget and the proposed 2004 budget, precluding the direct participation of Dinas Pekerjaan Umum (Public Works), Dinas Pertamanan, and other departments.
- The contracting has been done in a non-transparent manner and not subjected to competitive bidding. This is of particular concern for the potential ticketing system operators and the bus operators.

Phase II

While many decisions regarding Phase II have not yet been made, the following basic points reflect our current understanding of DKI Jakarta's plans:

- Some 15 feeder bus lines will be contracted out to private bus companies, and many more bus lines currently operating in the Blok M – Kota corridor will be cut.
- A second, 13 km. TransJakarta line connecting Harmony to Pulo Gebang will be constructed in 2004.
- An additional 80 buses will be procured.

While modelling estimates are even less reliable on the second corridor, as much remains undecided, nonetheless, some likely impacts can be estimated.

First, the impact of adding 13-16 feeder buses and cutting bus lines with a 50% overlap of the corridor would be as follows:

- If there are no discounts for passengers transferring from feeders, peak hour demand (both directions) would increase to around 3200 – 3500, with a maximum one-way volumes in the 1800 – 2500 range. This would reduce the negative congestion impact in the mixed traffic lanes but congestion would still get worse in the corridor.
- Peak hour demand (both directions) would be maximized at 8500 – 9500 if the fare were Rp.2000 and feeder bus trips cost Rp.200 or less. This scenario would have a maximum one-way volume of around 4500. At this demand level, 30 buses in addition to the original 56 will need to be added to the Blok M – Kota corridor. At this point, public reaction should turn more favourable.

Secondly, the completion of the second TransJakarta line, in addition to the above measures on feeder routes, should have the following impact:

- The completion of the second TransJakarta line will dramatically increase TransJakarta's demand. If there is a Rp.200 or less transfer fare between the Blok M – Kota corridor and the Harmoni – Pulo Gebang Corridor, peak hour (both directions) demand could increase to as much as 35,000, with a maximum one-way volume around 15,000 – 18,000 for the whole corridor. This could increase maximum one-way volumes in the Blok M-Kota corridor to 8,000 – 10,000. At this level of demand, significant congestion relief should be experienced in the mixed traffic lanes.
- At this level of demand, however, some elements of the infrastructure and bus station design in both the first and second corridors will need to be modified.

Based on this evaluation, we support the decision of DKI Jakarta to:

- Immediately expand the system to build the East-West line from Harmoni to Pulo Gebang.
- Convert the bus lines with 50% of their journey overlapping the Blok M-Kota Corridor to feeder buses contracted out under competitive bid to private operators.
- Hasten the procurement of additional buses.

However, we think the following should also be considered:

- Reduce the fare to Rp.2000 and offer a Rp.1000 or less transfer ticket at transfer locations.
- For the next 80 buses, procure articulated, CNG or Euro II diesel buses with a capacity of 140 people and three double doors on the right side, and two curb level doors on the left side.
- Have private bus operators winning operating contracts for both trunk lines and feeders procure future TransJakarta buses following TransJakarta technical specifications.
- Complete the demand studies, plan the basic BRT network, and decide on the operational plan for the full BRT system immediately.
- Design the new corridor and retrofit the first corridor to include a passing lane at each bus stop, and two bus stops at each station stop. Design the bus stops with three bays to match the three double doors on articulated buses.
- Consider reconstructing the Blok M terminal if the concession terms will allow it.
- Build a bus terminal as near as possible to the busway corridors.
- For Blok M – Kota corridor, have Public Works (Dinas Pekerjaan) pave the road in front of the bus stops in concrete to avoid sinking.
- Reconstruct the pedestrian overpasses at a lower height, with wider, more gradual stairs, especially in locations with a high pedestrian volumes.
- Consider having the fare collection area on the top of pedestrian overpass if the station has a high volume of passengers.
- Widen the sidewalks and pedestrian refuge islands along the busway corridor and at intersections where there are high pedestrian volumes.
- Install raised crosswalks painted with 'zebra' striping at major exit and entrance ramps along the corridor.
- Improve at-grade crossing facilities, particularly at Blok M entrance and exit, at Kota Station, at Al Azhar Mosque, and from Plaza Gadjah Mada north to Kota.

Institutional recommendations for Phase II include the following:

- Establish TransJakarta as a Badan Pengelola (management agency) and not as a Unit Pengelola Teknis (technical management unit), with a competent, professional staff, independent budgetary authority, planning, management, and contracting powers.
- Establish transparent and fair contracting procedures and put all operating and planning contracts up for competitive tender.

This report compiles the opinion of the world's most experienced bus rapid transit system experts. It emphasizes that while there will be significant problems when the system first opens, they can all be resolved within the first year of operation.

The Governor and all people who care to see Jakarta's traffic problems solved need to move quickly to address these problems, firm in their resolve to move boldly forward.

II. PROJECT BACKGROUND

Public transit trips in Jakarta are mostly by bus, but there is a limited commuter rail system. Of motorized trips, in 1998 49.3% of total trips were made by public transport, 24.5% by private car, and 26.2% by motorcycle.

For the past several decades, many studies and plans for Jakarta mass transit systems have been developed. However, none of these planned systems have progressed towards implementation. Prior to the economic crisis and the transition to democracy, major investment decisions tended to be made by the central government, often with little regard to the views of local governments and even national level ministries. Information was treated in a proprietary manner, so it was very difficult for one government department to know what the other was doing.

Most of these plans for a transit system focused on the main North-South corridor through the city connecting the Blok M bus terminal and shopping district in South Jakarta (Jakarta Selatan) to the Kota (city) railway station in North Jakarta. The focus on this corridor was less due to the high number of public transit trips, and more due to the concentration of important government and business offices, and major hotels. There were fairly advanced plans for a metro in this corridor, various consortiums were involved at different times. There was also a conflicting plan for a 'triple-decker' elevated toll road and light rail line proposed by a private consortium. The idea was that the revenues from the toll road would cross subsidize the light rail line. Conflicting lobbies supporting these two projects ensured that nothing was built prior to the economic crisis in 1998.

With the economic crisis and the transition to democracy, neither the national government nor the municipal government nor the private toll road company had the funds to pursue either of these grandiose plans. Underground metro systems in Jakarta are made more expensive by the high water table. The transition to democracy also led to a decentralization of municipal government financing.

Around 2000, the national government's aspirations for a metro in the corridor were re-awakened by an offer of a very low-interest loan from JBIC (Japanese Bank for International Cooperation), but DKI Jakarta would have been responsible for repaying at least 30% of the loan, (there may have been more conditions such as 50% Japanese contractors) and to date they have been unwilling to move forward. Nevertheless, the metro in the Blok M – Kota corridor remains in the Jakarta Master Plan.

DKI Jakarta's Governor Sutiyoso, while never ruling out a metro in the corridor, decided in December of 2001 that in the meanwhile, a Bus Rapid Transit System could serve the transit needs more quickly and at less expense than the metro. An ITDP-sponsored visit by former Mayor of Bogota Enrique Peñalosa to Jakarta

in November of 2001 led to a growing conviction by Governor Sutiyoso and then Lt. Governor Budihardjo that they could solve their mass transit needs with a much lower cost busway along the lines of TransMilenio in Bogota.

Beginning in early 2002, DKI Jakarta undertook an evaluation for the potential of Bus Rapid Transit (BRT) as a mass transit option in Jakarta. Partially on the strength of his promise to implement this tentative plan, Governor Sutiyoso was re-elected as Governor of DKI Jakarta by the Regional Parliament (DPRD) with the support of President Megawati Soekarnoputri. As such, the busway has become something of a litmus test for his administration, and its success is a political priority for him.

Initial concepts for the system were drawn up by PT. Pamintori Cipta, a long established private consulting firm frequently employed by Dinas Perhubungan (Dishub), the transportation department of DKI Jakarta. The lead on the busway planning was initially given to Dishub. In May, 2003, Irzal Jamal, an Assistant Secretary under City Secretary Ritola, became the coordinating head of the busway project, and a series of sub-teams or working groups were created but never formally established. However, as budgetary authority remained under Dishub, Dishub Department Head Rustam Effendi (head of DP) and his staff (Pristono, Sub-head of public works inside DP, and Ibu Rini, Sub-head of planning) remained in control of the critical contracting decisions.

The University of Indonesia's Center for Transportation Studies (UI CTS), meanwhile, had been working on a Regional Master Plan for JICA, and in order to coordinate this effort with the busway plans, UI CTS was also contracted by DKI Jakarta to do a master plan for the City of Jakarta, and was made head of Finance/Management sub-team and also play a leading role in the sub-team for Operations for the Busway task force.

Figure I: Delegates at International Conference on Human Mobility, February, 2003

In October of 2002, ITDP received support from US AID to provide technical assistance to DKI Jakarta for their busway development. A significant sub-contract went to the NGO Pelangi to coordinate civil society input into the planning process. ITDP was given an office first in Dishub and then in the Office of the Governor. ITDP hired Fatimah Sari Nasution to coordinate the project on an administrative level, and hired respected NGO activist and Sociologist Darmaningtyas to coordinate ITDP communication with the broader NGO community.

ITDP's Asian Regional Director for Asia, John Ernst, took over project management. Technical support to DKI Jakarta has been provided both by staff (ITDP's BRT Technical Advisor Lloyd Wright, and ITDP's Executive Director Walter Hook), and by leading expert consultants (Yaroslav Vlasak of McKinsey & Company on project management and contracting, Michael King on pedestrian facilities design, Eric Ferreira on surveying for operational design, Paulo Custodio and Pedro Szasz for developing the business plan, operational plan, station design, and infrastructure design, Remi Jeanneret on traffic modelling, Michael Walsh on fuel and emissions options for the buses, and Michael Replogle on complimentary traffic demand management measures.

Figure 2: Governor Sutiyoso, Fatimah Sari, and TransMilenio Experts, May, 2003.

ITDP also arranged for some 40 people involved in the project to visit Bogota, Colombia and Quito, Ecuador. The Governor, senior advisors, key technical advisors, bus operators, police officers, parliament members, NGOs, members of the press, consultant and bus suppliers all travelled to Bogota to learn from that system. There they visited both systems and were given seminars on the technical details of these systems. Roughly half of these visits were paid for by DKI Jakarta and operators, and the other half under the auspices of the project.

The prototype for the bus that will be used in TransJakarta was selected already in 2002, though the doors were later widened and the loading ramps were removed. Procurement of 2 prototype buses was completed in February of 2003. Some preliminary marking of the roadway with "Busway" signs and indicative red paint, a prototype station, and the prototype bus were displayed for the public in a soft launch in February of 2003. In the summer of 2003, the procurement order for 56 buses (slightly modified from the prototype) was signed with two local partners of Hino and Daimler Chrysler for a Euro II compliant vehicle. To date, a supply of lower sulphur diesel fuel to operate with the Euro II buses has yet to be finalized.

ITDP's formal involvement in the project is based on a Decree from the Governor in April 28, 2003 which also established Irzal Jamal as responsible for overall coordination and the working group structure. While 2 different draft Memorandum of Agreement were prepared to formalize the terms of ITDP's technical support, neither draft has yet been signed by the Governor.

The first line of the TransJakarta busway is scheduled to open in January 2003. Construction of the bus stations, pedestrian overpasses, and the road separators

is moving rapidly, and roughly half of the buses ordered have been completed. It is likely that many of the technical and institutional issues will not yet be fully worked out by the time of the busway opening early next year.

The balance of this document is intended to provide a full technical review of the TransJakarta project as it stands as of December, 2003. It is hoped that this will be the basis for some further technical modifications by the busway team, and will give the public and interested parties a basic grounding of the facts about TransJakarta as we know them.

III. INTEGRATION OF TRANS-JAKARTA WITH JAKARTA'S REGIONAL TRANSIT IMPROVEMENT PLANS

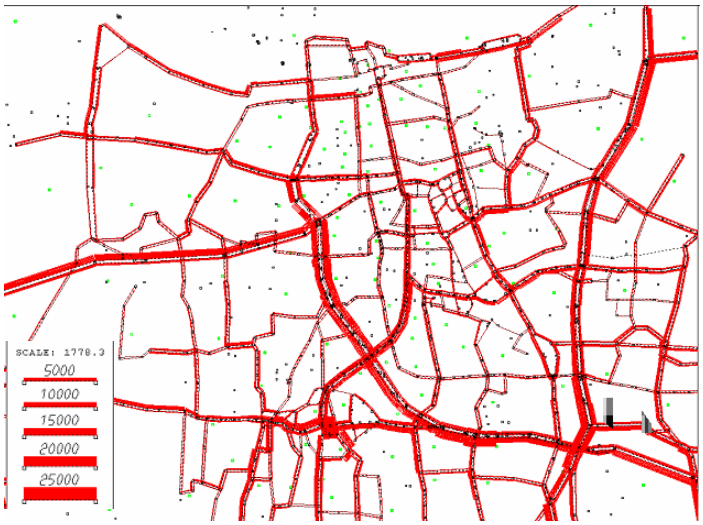


Figure 3: Map of Transit Passenger Demand, Main Corridors, Jakarta

DKI Jakarta has not formally approved a transportation master plan. As a result, over the years competing projects have gotten started only to later be shelved in favour of alternative plans. The TransJakarta busway has already proceeded farther than virtually any other mass transit project in Jakarta's history. It is important to keep this in mind when reviewing progress to date.

The closest thing that DKI Jakarta has to a transportation master plan is the master plans proposed by JICA SITRAMP and the Perencanaan Transportasi Makro-CTS-UI. JICA's SITRAMP was developed for Bappenas, the National Planning Agency, while the CTS UI study has been nominally accepted by the Governor, but it has no formal or legal status yet.

There is general agreement on which corridors are the most important for public transit passengers.

While data on existing public transit demand in Central Jakarta is not entirely reliable, (see Annex I) the above plot indicates the results of recent data collected by JICA and corrected with new counts done by UI CTS under ITDP supervision.

Demands on the proposed corridors are high according to available counts. Volumes are generally greater than ten thousand passengers per direction per hour. This means that it will be possible to design corridors with high performance and also high productivity for the buses.

	CORRIDOR	LENGTH (km)	Frequency (AM)	Demand (AM)
1	Blok M-Kota	12,9	296	12546
2	Pulo Gadung-Bundaran HI	12,2	254	11631
3	Daan Mogot-Djuanda	13,4	495	12548
4	Pulo Gadung-Tanah Abang	12,2	571	17319
5	Kampung Melayu-Ancol	11,3	631	11396
6	Kampung Melayu-Cideng	11,6	315	4295
7	Pasar Minggu-Manggarai	9,2	524	10228
8	Ciledug-Cawang	23,5	912	16170
	Total	106,3		

Figure 4[1]: Total demand estimates by corridor

Busway systems are easily capable of moving the entirety of this demand in single-lane busways with split stations and a passing lane at the stations.

Demand observed on the Blok M – Kota corridor at peak hour is roughly 12,500 passengers in the critical link. However, the demand of the busway will differ because most of the trips are going only over a part of the corridor or crossing the corridor using a bus route that partially uses the corridor.

To get demand for the day it was assumed a peak factor of 14%. (JICA data showed it to be 17%, but we believe this to be incorrect, as normal is about 13%). This gives a daily demand of about 85,700 per direction, or about 171,425 per day in both directions. If we assume 25% passenger growth in the medium term, this might get demand figures up to about 215,000 per day.

In our view, the busway system should be designed from the beginning to be able to handle the majority of these passengers, in order to reduce congestion on the mixed traffic lanes. This means designing a system for roughly 15,000 passengers per direction at peak hour, which is above the 13,000 per peak hour per direction in Curitiba, Brazil's busiest corridor. This level of demand can easily be handled by busway systems within the existing right of way.

The Phase I corridor, Blok M to Kota, is still envisioned for conversion to a metro line in the medium term, by 2010. These levels of demand, however, are not high enough to justify rail, monorail, or metro based systems. These systems will

[1] The number of significant digits used in these tables does not reflect the accuracy of the data available. These outputs from the Emme/2 model are shown here to make the model inputs more transparent.

never be able to recover their operating costs in this corridor, let alone the cost of depreciation of the infrastructure. Hence, they would require permanent government subsidy to maintain and operate.

Upgrading this line to a metro system, which could normally handle levels of demand in excess of 35,000 per hour per direction but at a capital cost around 20 times greater, is difficult to justify.

Line	Capital Cost/Km ($ million)	Actual capacity (passengers / hour / direction)
Hong Kong Metro	$220	81,000
Bangkok Skytrain	$74	25,000 – 50,000
Caracas Metro	$90	21,600-32,000
Mexico City Metro	$41	19,500 - 39,300
Kuala Lumpur LRT	$50	10,000 – 30,000
Bogota TransMilenio	$5	35,000 - 45,000
Sao Paulo Busways	$2	27,000 -35,000
Porto Alegre Busway	$2	28,000
Curitiba Busway	$2	15,000
Quito Electric Trolley Bus Rapid Transit	$5	9,000-15,000
TransJakarta	$1	8,000

Figure 5: Capital Cost and Capacity Comparisons, Metros and Bus Rapid Transit.

We have no information on the cost of the new monorail in Kuala Lumpur, but their capacity is generally around 10,000 passengers per direction per hour, far more limited than normal elevated light rail systems, whereas the cost is generally on the order of 4 times higher than light rail.

The corridor selected for the first BRT line in Jakarta was not the most heavily used by bus passengers, but it is rather the most 'prominent', as most important government offices and banks lie along this route. The selection of the Blok M-Kota corridor as the first BRT line introduced certain problems. Because only about half of the passengers are either getting on or off the buses in the corridor,

and only about 18% of the passengers are getting both on and off along the corridor, most of the passengers wishing to use the busway will be forced to transfer at least once, if not twice.

The consultants hired by DKI Jakarta calculated the total demand in the corridor by counting the number of passengers getting on and off buses at bus stops along the corridor. They came up with a total demand of about 12,600 for two directions, during peak hour, or about 100,000 passengers per day in both directions, roughly 58% of our estimate.

The reason for the discrepancy is that the Pamintori estimate ignores the large number of bus passengers just passing through the corridor on the way to origins and destinations not along the corridor.

Below is the most recent map of busway corridors prioritised by the UI CTS.

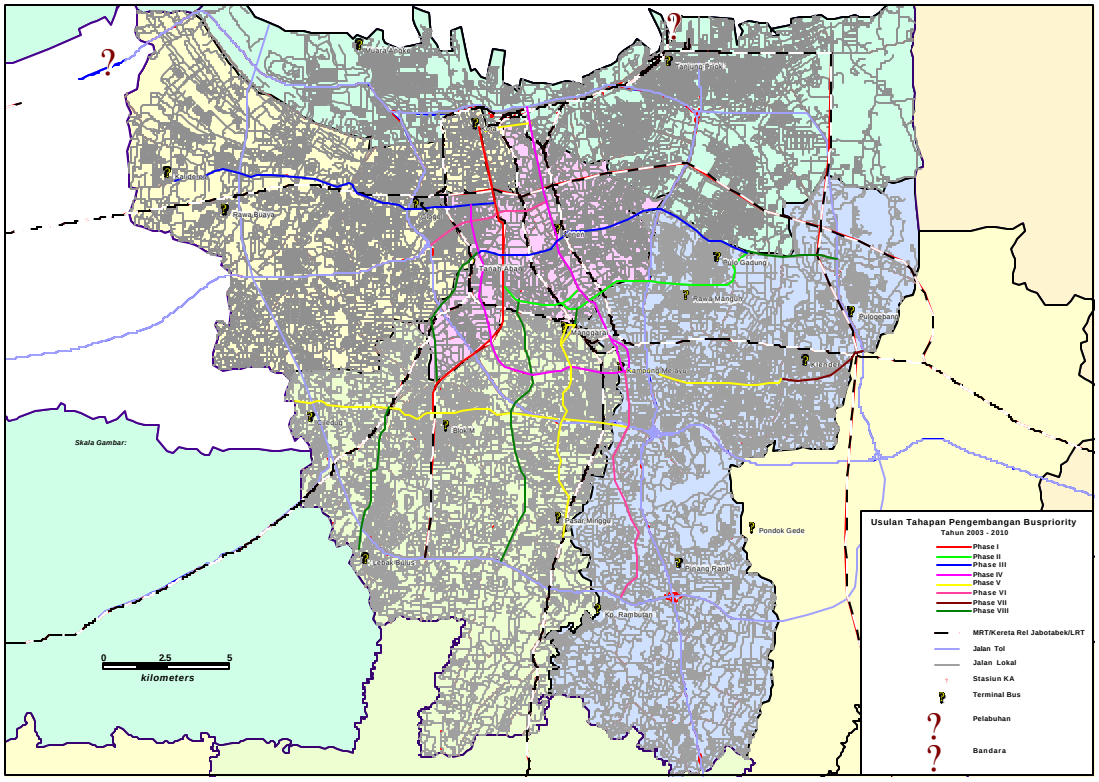


Figure 6: Planned Busway Corridors

The blue lines, from Kalideres to Glogol to Harmoni (on the Blok M-Kota corridor), and then from Pulo Gadung to Senen to the Blok M – Kota corridor, are shown here as Phase III, but the line to Pulo Gadung is already included in the 2004 budget, so it is likely to be Phase II.

There are also active current discussions for the construction of a Monorail, which could in some sense serve as part of a mass transit network if well integrated with the TransJakarta busway. The monorail plans are discussed for the corridors below.

According to our calculations, the proposed Blue Line Monorail will occupy one of the most dense public transit corridors in Jakarta. It is forecasted by **Mott MadDonald and their consultants that in the year 2007, the demand in peak hour on the Blue Line will reach 20,000 passengers per peak hour** per direction with a growth of 6% p.a., and the Blue Line with some 13,000 passengers per peak hour per direction at peak hour. However, this assumes that the monorail would capture virtually all of the transit trips in the corridor. Our experts believe that even in the best case scenario these demand estimates are three times higher than likely demand. **A more likely peak hour demand would be under 4000 per peak hour per direction**, as the price is extremely high and studies in the corridor show passenger demand to be extremely price elastic. This level of demand could happen only if all buses on all possible parallel routes were cut, and people were forced to transfer to the monorail. At the proposed fare of Rp. 7500, which is triple the cost of an AC bus, this would have an exceedingly negative impact on transit rider's overwhelmingly low income ridership.

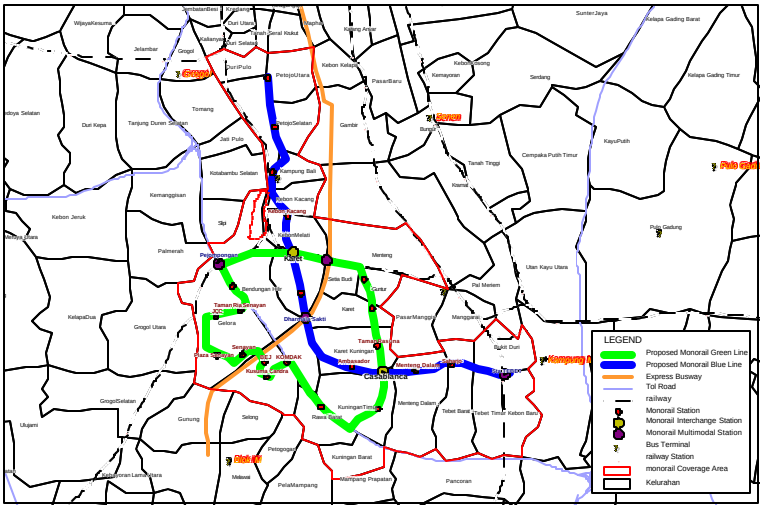


Figure 7: Proposed Monorail Line Map

Generally in cases with very high fare, it is impossible to avoid competing illegal or irregular services by small vehicles that can go almost anywhere on nearby parallel routes. People will accept to walk 500 meters to take another service that is cheaper. In this case, demand will be near to zero. With this fare, even taxis will be price competitive for short trips.

Most probably government will have to set fares in Rp 2500 and give Rp 5000 subsidy per passenger after the system is built. Any demand study that does not show this is probably inaccurate.

By making it a monorail, rather than an additional line of bus rapid transit, passengers will face additional problems transferring between the monorail and the bus services. One of the biggest advantages of Bus Rapid Transit as the system spreads over time is the seamless free transfer that passengers can have between lines. Because the monorail developer is a private investor, it is likely to be extremely difficult to integrate the fares of TransJakarta and the monorail. This fare integration is frequently a problem even with two separate state-run entities.

Monorails have not caught on internationally because they have great difficulty in allowing branching lines for system expansion. Their vehicle costs are also extremely high relative to bus technologies. Their capacity is also rarely above 10,000 per direction per hour, much lower than better-designed busways. For this reason, they have not really caught on except in countries like Japan and Malaysia where national industrial policy is subsidizing the industry in a hope of developing a lucrative export market for the vehicles.

The demand estimates generated for the monorail by Mott MacDonald were not based on an accurate modelling of the projected demand vis-à-vis other alternatives, but rather based on total public transit demand in the corridor.

Normally, with private investments of the type being proposed by the monorail, the contract will require a guarantee of demand, or will include clauses that require the government to ban all competing transit services in the same corridor.

If the government guarantees the demand, Jakarta taxpayers will be de facto subsidizing Malaysian monorail manufacturers for many years into the future. If passengers are given no alternative public transit option to very expensive monorail services, there is likely to be a powerful modal shift to taxi and motorcycle, dramatically worsening congestion. If competition is allowed, monorail demand could be near zero, unless the fares are greatly reduced, forcing high government subsidies. In each case, the option is not attractive.

IV. ESTIMATING DEMAND FOR TRANS-JAKARTA

There are two different measures of demand that need to be estimated when designing a busway. First, there is the maximum volume of transit passengers per direction per peak hour, sometimes called the 'static demand.' This is the total number of passengers that are likely to be on the buses in the busway at any given time. This 'static' demand is important for designing the busway infrastructure and selecting appropriate buses. Then there is 'dynamic' demand, which is the total number of passengers that will use the busway corridor. This is also important for designing stations, but is critically important to estimating the financial feasibility of the system. If a lot of passengers are getting on and off the buses after making very short trips, it is possible that dynamic capacity could be much higher than the static capacity.

The level of demand for the TransJakarta busway will be substantially different than the demand for the entire corridor. It will, however, be similar to likely demand for any other type of closed-system infrastructure developed in the same corridor, such as a metro or monorail. The level of demand will primarily be a function of:

a. The cost of using the busway,
b. The time it takes to connect origins and destinations using the busway (a function of commercial speed of the busway plus the transfer time, plus the time it takes to reach the busway)
c. The cost of transferring to the busway
d. The travel time and cost of bus passengers using alternatives to the busway. (the level of congestion in the mixed traffic lanes)
e. The travel time and cost of non-bus alternatives (driving a car, for example) to using the busway, for anyone who's trip origin and destination includes a journey along the busway.

Each of these factors will vary widely depending on the operational plan or scenario. Most important is how many of the existing bus lines on the corridor will be relocated. Getting a reasonably accurate estimate of demand for a given scenario requires a fully calibrated traffic model flexible enough to vary each of the above factors so that different scenarios can be tested. While such a model does not yet exist in Jakarta, (see Annex I) the system at UI CTS is good enough to do some preliminary analysis.

IV.1. Demand Estimate for Phase I Operational Plan

As of December 1, 2003, the operational plan had not yet been finalized. Nonetheless, the tentative plan is to have a consortium between existing operators and PT. Ratax, a company that currently operates radio taxis, create a new company that will operate TransJakarta buses under license from DKI Jakarta or TransJakarta. They will operate on a 12.9 km stretch of exclusive busway connecting the Blok M Bus Terminal to the Kota railway station. Seven existing bus lines whose routes overlap 100% with the busway corridor will be cut. We estimate that this will affect roughly 1097 passengers per direction at peak hour, or around 8,776 passengers per direction per day, or 17,552 passengers per day in total.

BUS #	ROUTE	COMPANY	Passengers Affected	
12	Banten Utr-Blok M	PPD	0	
P - 1	Kota - Blok M	PPD	67	
PAC - 01	Kota - Lb. Bulus	PPD	44	
PAC - B1	Kota - Blok M	PPD	0	
938	Kota - Blok M	Steady Safe	630	
P - 69	Kota - Ciputat	Bianglala	0	
PAC 45	Kota - Ciputat	Bianglala	133	
PAC 94	Kota - Lb. Bulus	Pahala Kencana	223	
			1097	

Figure 8: Lines to be cut when TransJakarta Opens

All other bus lines that operate in the corridor will be allowed to continue operation in the corridor, but they will operate only in the mixed traffic lanes.

The current level of congestion in the corridor can be seen from Figure 9 below.

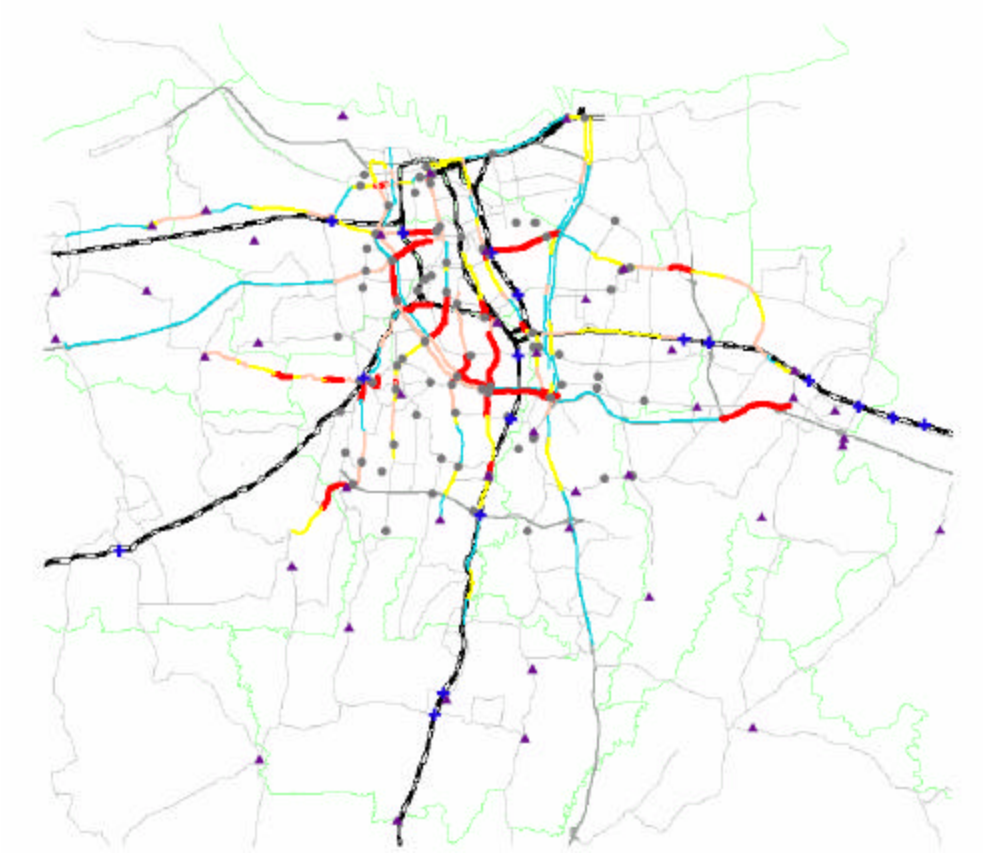


Figure 9: Current travel speeds in Central Jakarta.

The following table and graph shows time and distance diagrams based on data collected by ITDP consultants:

Jakarta BRT distance x time survey - resum								
Link		distance	travel time (minutes)			velocity (km/hour)		
From	To	Km	off peak	peak	BTR	off peak	peak	BTR
Kota Station	Veteran	3.4	23.0	**39.0**	9.2	8.8	**5.2**	22.0
Veteran	Kebon Kacang	3.0	11.0	16.0	8.2	16.4	11.2	22.0
Kebon Kacang	Ring Road	3.0	9.0	20.0	6.0	20.0	9.0	30.0
Ring Road	Blok M	3.4	14.0	15.0	7.6	14.5	13.5	26.6
Total		12.8	57.0	90.0	31.0	13.4	8.5	24.7

Jakarta BRT		projected travel time reduction					
Link		distance	minutes			minutes/km	
From	To	Km	off peak	peak		Off peak	peak
Kota Station	Veteran	3.38	13.8	**29.8**		4.1	**8.8**
Veteran	Kebong Kacang	3	2.8	7.8		0.9	2.6
Kebong kacang	Ring Road	3	3.0	14.0		1.0	4.7
Ring Road	Blok M	3.38	6.4	7.4		1.9	2.2
Total		12.8	26.0	59.0		2.0	4.6

Figure 10: Travel Time Benefits of the TransJakarta Busway

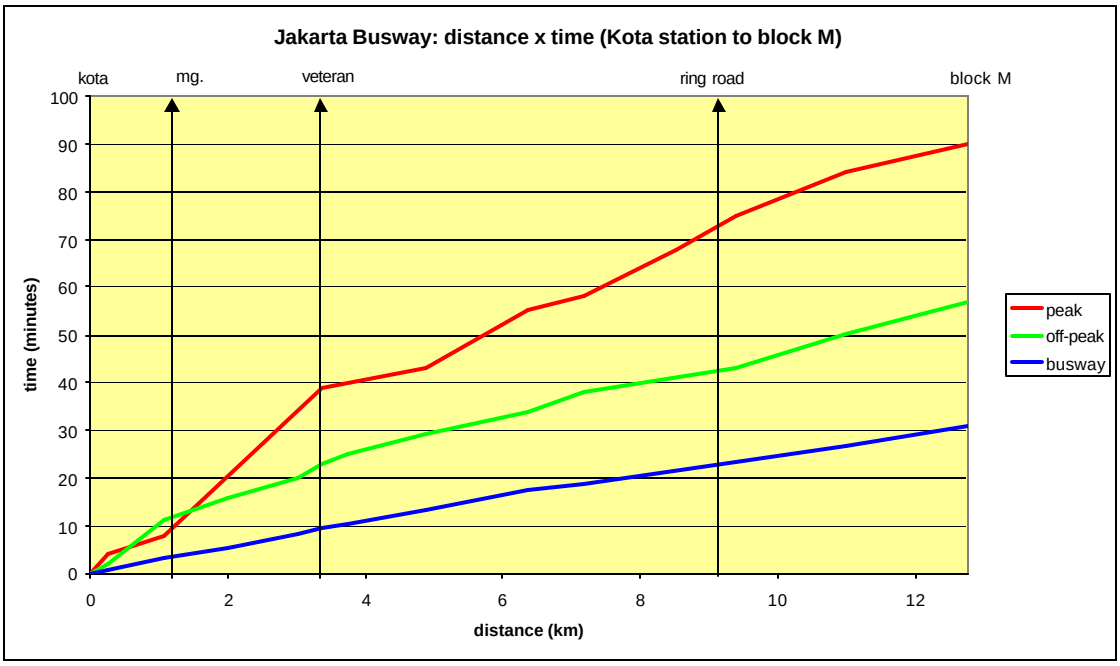


Figure 11: TransJakarta Travel Time Savings by Distance

We project that with good operation on the TransJakarta BRT corridor, there is a potential of 26 minutes of savings on the off peak period and 59 minutes on the peak period on a trip from one end of the corridor to the other. These values exceed the time benefits of most of BRT projects already implemented in the world. These factors could push a lot of demand onto the TransJakarta BRT system from both bus lines still operating in mixed traffic lanes and from current motorists.

However, two factors will tend to depress the number of passengers shifting from existing lanes and from motor vehicles. Transit passengers in Jakarta are extremely price sensitive. As such, most would be willing to endure very considerable traffic congestion in order to avoid having to pay for an additional bus fare. For motorists, the main issue is that very few motorists will be able to make their entire journey using only TransJakarta, and therefore will have longer travel times due to transit transfers.

The price of an air-conditioned bus from Blok M to Kota is currently Rp.3500 or roughly $0.40, DKI Jakarta officials have discussed Rp.2500 as a likely price for TransJakarta as well.

The current operative scenario, Scenario I, involves cutting the 8 bus lines listed in Figure 8, (of which only 5 function with any regularity). Demand for this scenario was tested using six different possible fare structures.

Scenario I: A fare of Rp.2500 without any discount for transferring passengers at Blok M.
Scenario II: A fare of Rp.2000 without any discount for transferring passengers at Blok M
Scenario III. A fare of Rp.2500 with free transfer at Blok M
Scenario IV: A fare of Rp.2000 with a transfer fare of Rp.1000 at Blok M
Scenario V: A fare of Rp.2000 with a transfer fare of Rp. 500.
Scenario VI: A fare of Rp.2000 with a transfer fare of Rp. 200.

To get demand for the full day, a peak factor of 14% was assumed (the share of full day trips that occur during the peak hour).

The results show a high sensitivity of the demand to variations in the fare. These numbers, however, have to be used cautiously, as the network is not properly calibrated.

Scenario	Dynamic Demand 2-Way	Maximum Transit Pass. Vol. (One Way)	Additional Demand from Integration
1	2114	1281	0
2	4426	2738	0
3	3871	2294	2751
4	3736	2384	477
5	5194	2583	2561
6	6399	3317	3924

Figure 12: Estimated TransJakarta Demand, Difference Pricing Scenarios

These demand estimates assume that TransJakarta will capture very few passengers from other bus lines if the price is Rp.2500 and they have to pay twice to complete their journey.

It also assumes that there will be very few current private car users who will suddenly switch to TransJakarta. While the new busway will have much faster travel times than the mixed traffic lanes, which it will further congest, some current motorists should be induced to switch from passenger cars to TransJakarta. However, long experience indicates that modal shift should be

estimated extremely conservatively. Nevertheless, there is a high degree of uncertainty about the modal shift ramifications specific to this busway.

The Phase I, Scenario I, pricing structure will attract some 2100 peak hour passengers both directions, or 14,000 per day. This is only 23% of the 65,000 daily trips estimated by DKI Jakarta's consultant. Due to the extreme congestion in the corridor, this number might rise as high as 3000 passengers both directions.

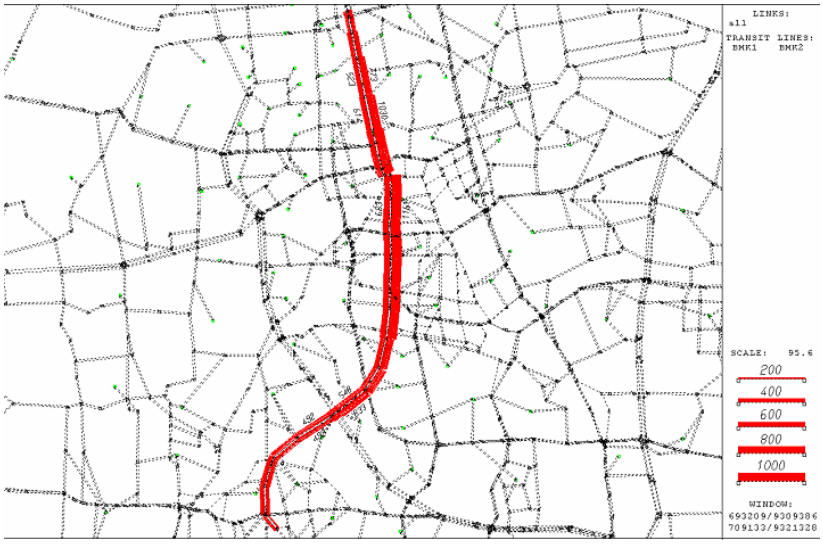


Figure 13: Projected demand for TransJakarta at Rp2500 with no discounted transfers

As these figures are dynamic capacity, even in the optimistic scenario of 3000 passengers for both directions per hour, the busway will only be moving some 1280 – 1500 passengers per direction at any given time. This is far less passengers than are carried on the mixed traffic lane that the busway replaced, which would have been around 2000 per lane per direction.

As a result, in the short term, under Scenario I, congestion in the mixed traffic lanes is likely to get much worse as a result of the TransJakarta busway. While exactly how much worse is beyond our modelling capacity until the model is fully calibrated, we estimate it could be as much as a 20% increase in traffic per lane, including the adverse affects of the busway on delay times at intersections. This worsening congestion will, of course, drive additional passengers to use the busway, but how many is very difficult to gauge.

To mitigate this congestion, DKI Jakarta has decided extend the 3 in 1 policy, currently only during the morning peak, to also include the evening peak. The governor is also exploring the odd-even license plate restrictions and even congestion pricing, to start in Feb 2004. Both measures are pending the Governor's signature.

In Phase I, then, it is difficult to predict in advance the degree to which the traffic restraint measures will alleviate congestion, and increase TransJakarta ridership.

Hence, it will be difficult to determine the congestion impacts and the air quality impacts.

Scenario	Dynamic Demand	Additional Demand from Integration	Income $Rp
1	2114	0	5 285 000
2	4426	0	8 852 000
3	3871	2751	2 800 000
4	3736	477	6 995 000
5	5194	2561	6 546 500
6	6399	3924	5 734 800

Figure 14. Revenue Maximizing Fare Structure

Trans-Jakarta's financial self sufficiency is maximized at a fare of Rp. 2000 with no discount for transferring passengers. (Scenario 2 in Figure 14). At this fare, some 4426 peak hour passengers would use the TransJakarta bus system in both directions. At this fare and this demand level, TransJakarta will *almost* cover its operating costs, (fuel, salaries, maintenance, etc.) but not the cost of the buses (depreciation) or the infrastructure (stations, turnstiles, road reconstruction, etc). With this fare structure, only 49 buses would be needed, they would be quite full.

Demand on TransJakarta, however, is maximized at a Rp. 2000 fare with a Rp.200 or less fare for passengers transferring at Blok M. This fare structure would minimize congestion in the mixed traffic lanes, assuming that private bus operators in the corridor reduced the frequency of their own bus trips in the mixed traffic lanes in response to reduced demand. This fare structure generates about 6400 passenger trips both directions at the peak hour. With a huge modal shift impact, there might be as many as 7000 trips, both directions. This is

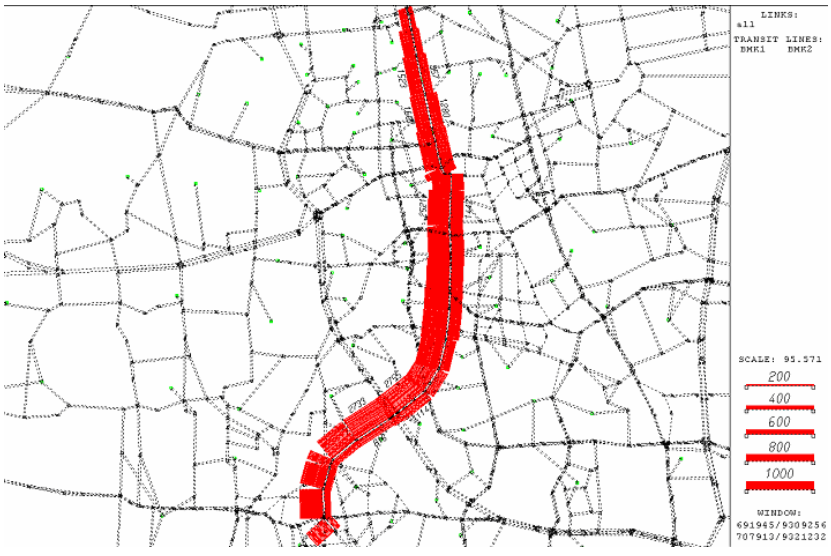


Figure 15: Projected Demand at Rp.2000 and Rp.200 transfer at Blok M

50,000 TransJakarta passengers per full working day. This figure is still only 77% of the DKI Jakarta consultant's estimate. **With a maximum peak hour per direction volume of 3317 passenger, this is the full capacity of the existing TransJakarta busway, as will be discussed.** At this level of demand, TransJakarta's busway will already be moving considerably more passengers than are currently transported in the mixed traffic lanes. **Unfortunately, it will not *look* like this is the case** to the general public.

Below are the demand calculations performed by DKI Jakarta's consultants.

	Pamintory Est
	2003
No. of Buses	*60*
Estimated RT Travel time	90
Estimated travel speed	17.2
Total Reserve buses	0
Total Active Buses	60
Bus Frequency (Bus/hr/direction)	40
total passengers per bus (capacity)	90
Headway (sec)	1.5
Static Capacity	3400
Avg. Trip Length/ Passenger (6km)	6
Seat Turnover Factor	2.15
Total Capacity Per Hour Per Direction	***7310***
Factor Between Peak Hour and Daily	8.8919
Total Capacity Per Day	**65000**
working days	291
total passengers per working day	18928004
Holidays	75
Load Factor	***78%***
total passengers per holiday	3785523
Total passengers per year	22713526
Projected Ticket Price in Rupiah	***2500***
Total Projected Annual Revenue in Rupiah	***56783815670***

Figure 16: Demand Estimate by DKI Consultants, Pamintori Cipta

The DKI Jakarta estimate differs from our estimate because it was calculated differently. Pamintori assumed that TransJakarta would be able to capture all of the bus trips that it could handle in the corridor due to its superior quality of service, regardless of the fare price. In other words, they assumed that the

demand for TransJakarta would be roughly equivalent to its capacity. While we were not able to completely replicate their results, the above table reflects our closest estimate. From this table, it is clear that demand is assumed to equal capacity during the peak hour, and somewhat less during weekends. It is also clear that demand estimates of Pamintori failed to account for the fact that demand is a function of the fare price.

If our own estimates are correct, and those of DKI consultants are incorrect, the congestion effects of TransJakarta will be worse than anticipated, the emissions benefits negative, and their economic and financial calculations will be significantly exaggerated. However, all of these problems can be quickly remedied within the 2004 calendar year.

IV.2. Demand Estimates for a Phase II Operational Scenarios

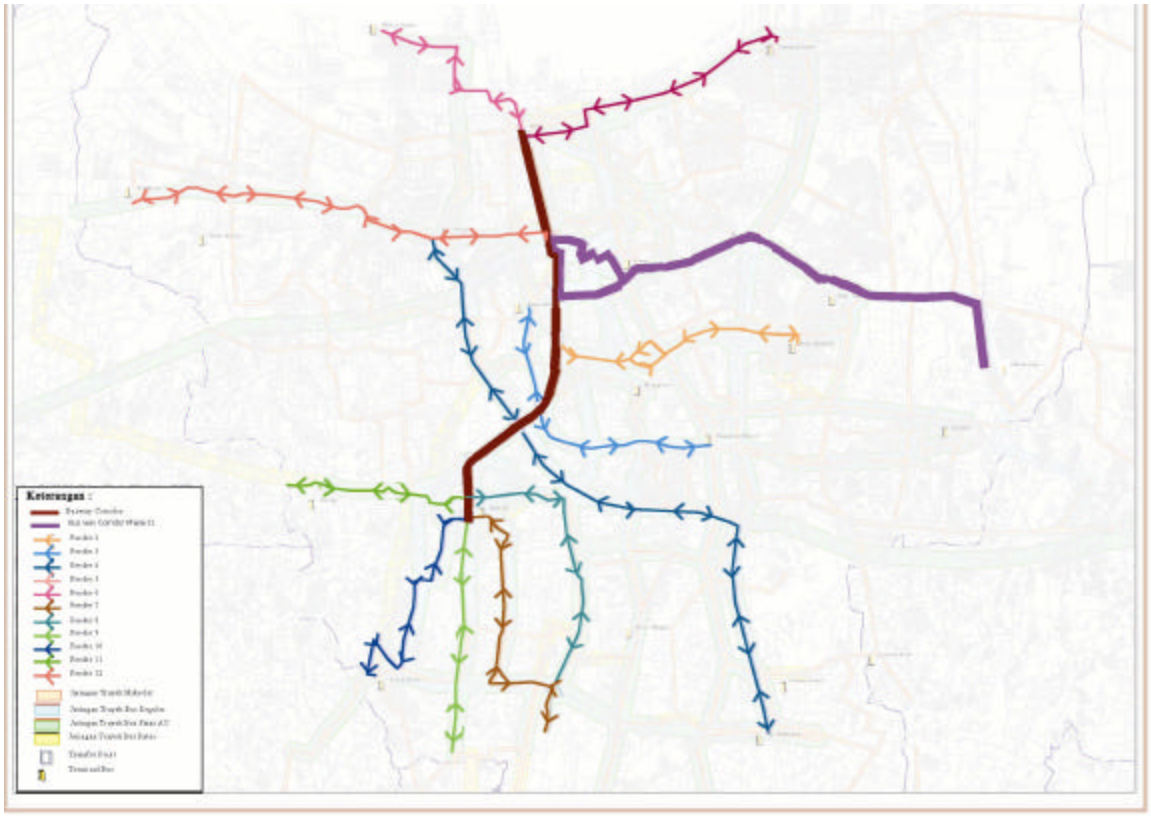


Figure 17: Scenario II; Line 2 Completed, and 13 Possible Feeder Lines

-----Feeder Buses

There is currently active discussion of putting in 16 feeder lines, (of which 13 are pictured above), and cutting all the private bus lines with more than 50% of their routes in the Blok M – Kota corridor. The private bus operators in the corridor are now involved in the discussion of being turned into operators of feeder lines.

As it has not yet been decided whether passengers transferring from feeder lines will have to pay for the full fare twice, or whether they will get some sort of a discount, we modelled some of the different scenarios to help decision makers come to a reasonable decision.

It has not yet been decided how feeder bus operators will be paid, nor how the passengers will transfer. Bogota's TransMilenio pays feeder bus operators by the passenger. The passengers do not have to pay to board a feeder bus. They pay only when they reach a TransMilenio trunk line station. As a result, passengers are only allowed to alight from a feeder bus at a TransMilenio station. In Curitiba, there was no fare integration in the early years, and passengers on feeder buses simply had to pay twice.

The best method for Jakarta would be to have feeder buses purchase special buses with platform-level left-side doors allowing these buses to operate both on and off the corridor. In this way, the feeder buses could use the existing TransJakarta stations in many locations. This would work, operationally, as shown in Figure 18. This would have the great advantage of allowing passengers the convenience of transferring inside the existing TransJakarta stations, and removing the need for passengers to pay twice or develop some complex discounted ticketing system. This would significantly increase demand and reduce adverse social impact on transit riders. It would require a representative of the ticketing company to be on board these feeder bus lines.

In the meanwhile, however, it is more likely that existing bus lines will simply be re-routed to serve as feeders. Discounts could still be offered either through the issuing of coupons by feeder bus drivers, or through smart card technology.

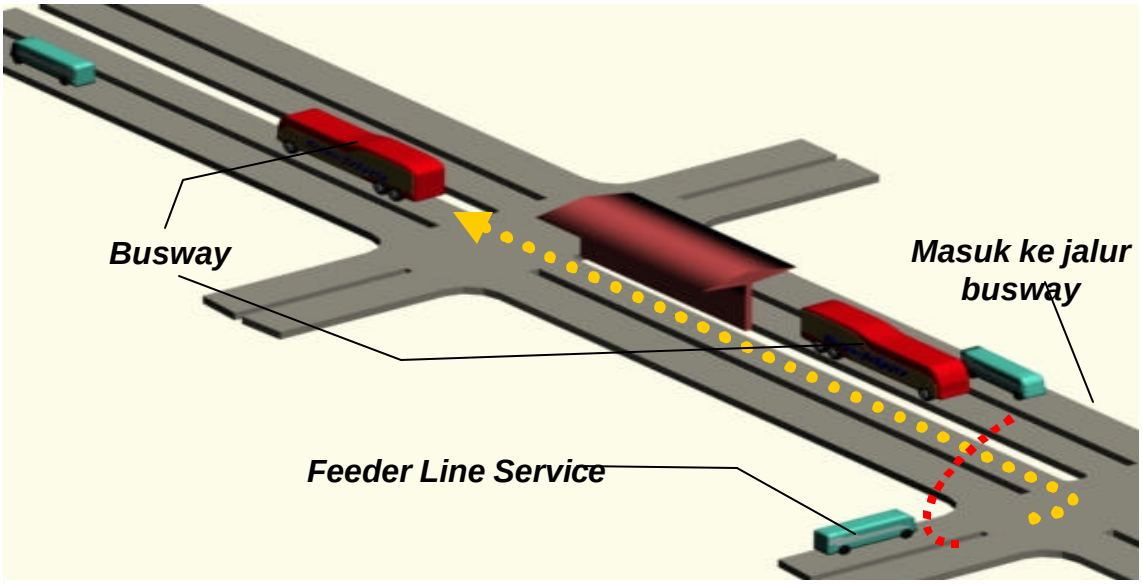


Figure 18: Feeder lines operating on and off the busway corridor.

Figure 19 shows the bus lines that are likely to be cut because their routes could be replaced by the feeder routes identified in Figure 17 above.

Lines Cut for Feeders Blok M - Kota	
P18B	PAC17
12	P127
10	P128
P42	PAC20
934	PAC22
P11	PAC86
P43	942
PAC10	P70
PAC15	P125
PAC72	

Figure 19: Bus lines likely to be replaced by feeder routes

Scenario	Description
1	BkM-Kota without integration fare 2500 Rp
2	BkM-Kota without integration fare 2000 Rp
3	Free integration at blockM corridor fare 2500 Rp
4	Fare integration at BlokM 1000 Rp with corridor fare 2000Rp
5	Fare Integration at BlokM 500 Rp corridor fare 2000Rp
6	Fare Integration at BlokM 200 Rp corridor fare 2000Rp

Figure 20: Six possible fare structure scenarios

Estimating the impact of cutting these lines and replacing them with feeder buses requires an assumption about the fare price. We tested several fare structure options, as listed above, for their impact on both demand and total revenue.

Scenario	Dynamic Demand	Maximum Volume (one way)	Additional Demand from Integration
1	3146	1802	0
2	6234	3276	0
3	5303	3020	3674
4	5702	3040	798
5	7087	3558	3441
6	8684	4372	5218

Figure 21: Demand estimates for six fare structure scenarios

Scenario	Dynamic Demand	Impact of Integration on Demand	Income $Rp
1	3146	0	7 865 000
2	6234	0	12 468 000
3	5303	3674	4 072 500
4	5702	798	10 606 000
5	7087	3441	9 012 500
6	8684	5218	7 975 600

Figure 22: Six Demand Scenarios with Bus Lines Converted to Feeders

Scenario I, where there are no discounts for passengers transferring from feeders, and the fare is Rp.2500, (Scenario I), peak hour demand (both directions) would increase to around 3200 – 3500, with a maximum one-way volumes in the 1800 – 2500 range. This would reduce the congestion impact in the mixed traffic lanes over the current situation, but would not significantly reduce congestion over the status quo.

Scenario II, which simply reduces the price to Rp.2000, and requires passengers to also pay the same price for feeders, revenue is maximized and demand rises to a decent 6250.

Scenario IV, a Rp. 2000 fare with a Rp. 1000 fare for the feeder buses, offers a good trade off of high demand and financial sustainability. This would generate more than 5700 passengers. With peak volumes at 3040, this is very close to the capacity of the existing fleet of 56 buses. This would begin to decongest the mixed traffic lanes.

Scenario VI, with a Rp.2000 fare and Rp.200 or less fare on the feeder buses, will maximize peak hour demand at 8500 – 9500 both directions. This scenario would have a maximum one-way volume of around 4500. At this demand level, 30 buses in addition to the original 56 will need to be added to the Blok M – Kota corridor. At this point, mixed traffic lanes will begin to decongest, and public reaction should turn more favourable.

-----Trans-Jakarta Line II, Harmoni to Pulo Gebang

In Phase II, in 2004, a second TransJakarta bus corridor will be constructed East to West connecting Pulo Gebang in East Jakarta with Harmoni on TransJakarta Line I.

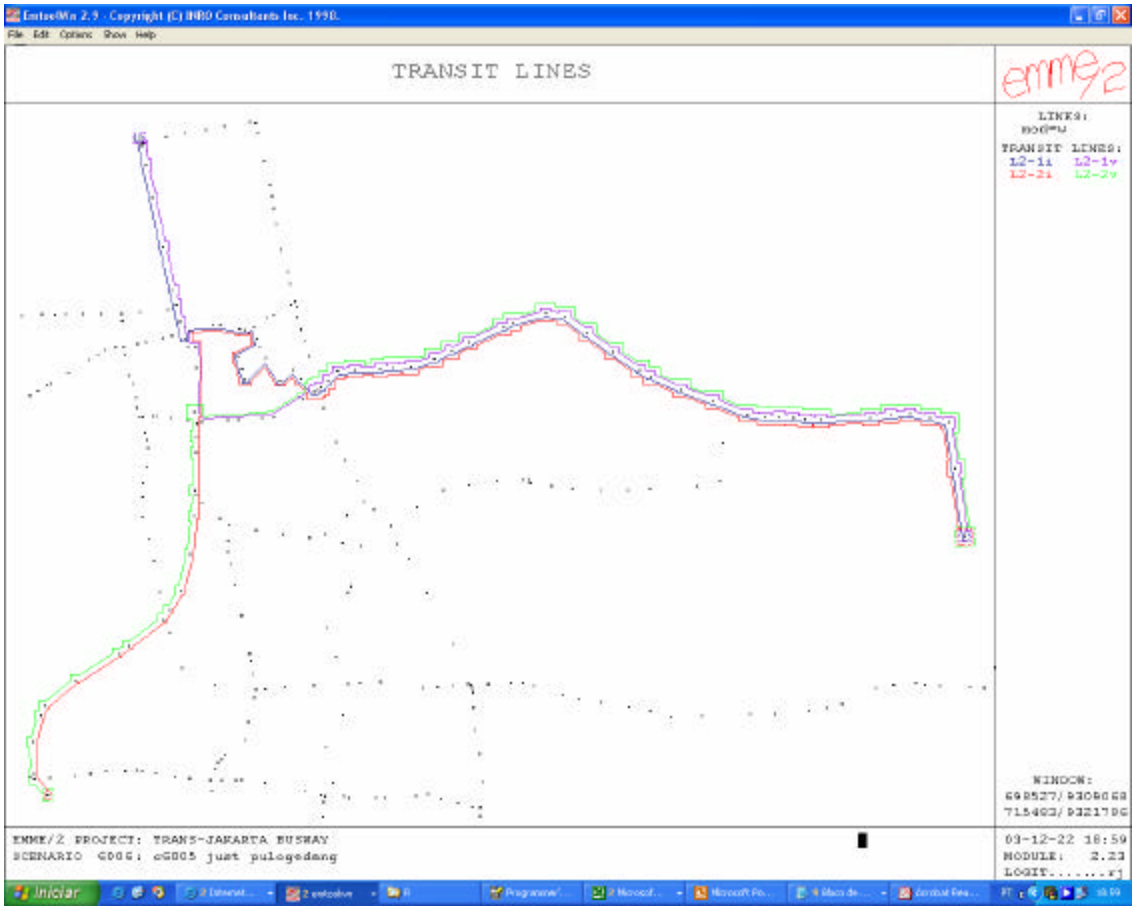


Figure 23: Phase II of TransJakarta: an East-West corridor from Pulo Gebang to Harmoni

As Line 2 will overlap with Line I at Merdeka, there will be relatively simple and possibly free transfer between the two lines. It has not been decided whether some bus routes might ride down Line 2 and then go north or south on Line 1, or

whether all passengers will have to transfer. One of the big advantages of Bus Rapid Transit technology over Monorail technology is that you can run multiple lines down the same corridor. For example, free transfer between the East-West line and the Blok M – Kota Line would be extremely easy to arrange by having some bus lines running direct between Pulo Gebang and Blok M, others between Pulo Gebang and Kota. In this way, congestion at the transfer station would be reduced, as would waiting time for passengers, and the routes could be contracted out to different companies.

In our demand estimates for Line 2, we have assumed that all of these bus line options would be available within the TransJakarta trunk line system.

Again, demand levels will be a function of the fare structure. We tested the following fare structures and routing possibilities.

Scenario 1. Line2 without fare integration to Line 1 - fare Rp2500
Scenario 2. Line2 without fare integration to Line 1 - fare Rp2000
Scenario 3. Line2 without fare integration - fare Rp2000 + feeders at Blok M
Scenario 4. Line2 with fare integration to Line 1. One Line Fare: Rp2000: Two Line Price: Rp. 2200. Integration with feeders possible at Blok M + Pulo Gadung + Pulo Gebang
Scenario 5. Line2 with integration to Line 1: One line fare Rp2000, Two line fare: Rp.2200, feeder integration at Blok M, Pulo Gadung, Pulogebang
Scenario 6. Line2 with integration to Line 1: One line fare Rp2000, Two line fare Rp.2200. Integrated at BlokM + Pulogebang but not at Pulo Gadung.

A more precise definition of these scenarios is available.

We also assumed that the following Lines were turned into feeder lines on Line 2:

Lines cut for feeders
507
52
58
906
P20
P36
P5
P68
P7
P83
PAC08
U31

Figure 24: Bus lines likely to be turned into feeder routes for second TransJakarta line

Scenario	Demand (AM peak)
1	10000
2	17000
3	20000
4	28000
5	33000
6	25000

Figure 25: Estimated demand on both lines for six fare structure scenarios

The table above yields the estimated demand for both TransJakarta Lines.

This indicates that the completion of the second TransJakarta line will dramatically increase TransJakarta's demand. If there is a Rp.200 or less transfer fare between the Blok M – Kota corridor and the Harmoni – Pulo Gebang Corridor, peak hour (both directions) demand could increase to as much as 35,000, with a maximum one-way volume around 15,000 – 18,000 for the whole corridor. This could increase maximum one-way volumes in the Blok M-Kota corridor to 8,000 – 10,000.

At this demand levels, significant decongestion of the mixed traffic lanes will occur. At this point, the sought after "win-win" situation occurs. Both motorists and bus passengers will face significant improvements in their travel times. Air pollution in the corridor would be significantly reduced as bus passengers switch from old buses moving very slowly in congestion to many fewer buses moving rapidly in a congestion free environment. Many motorists would leave their cars at home.

Therefore, from our perspective, the completion of the second line and the conversion of existing bus routes in the Blok M – Kota corridor to feeder buses are a necessary prerequisite for determining the project a success. Fortunately, the current demand problems likely to be faced by TransJakarta can be resolved very quickly, within 2004 or by mid-year 2005.

At these levels of demand, however, elements of the infrastructure and bus station design in both the first and second corridors will need to be significantly modified. The capacity issues are discussed in the next section.

V. ESTIMATING CAPACITY AND COMMERCIAL OPERATING SPEED FOR TRANS-JAKARTA

Several factors affect the capacity and the commercial speed of the busway. These factors can be broken down generally into several categories:

a) the bus technical specifications
b) the bus station design
c) the road infrastructure geometric design,
d) the intersection design and traffic signalling system, and
e) the location and design of the bus terminals and depots.

While the capacity of some busways around the world is very high, if they are poorly designed, they achieve these high capacities at very low commercial speeds. As a result, they are less successful at convincing motorists to take public transportation, and their passengers face higher travel times. Transit system supply analysis should therefore always be performed at the same time with an eye on the impact on commercial speeds.

The current design of the TransJakarta Blok M – Kota busway has a limited capacity. **The capacity is limited by the number and size of the buses being procured, as well as by the design of the infrastructure.**

VI.1 Bus Selection

TransJakarta is planning to open with 56 operational buses, and is planning to procure an additional 80 buses in fiscal year 2004. While the final design specifications continue to be modified, some information is known. PT New Armada, Magelang, and PT Restu Ibu, Bogor, who are assemblers for Hino and Daimler Chrysler respectively, were contracted. They will have some 31 seats and a standing capacity of 52 seats, with a total capacity of 83. They will have large double doors mid-bus, to accommodate right-side platforms, and a left-side platform at Blok M. There are also two smaller doors on the left (curb) side of the bus. These will be folding doors. There is also an emergency exit door on the back right side of the bus.

Figure 26: Bus Prototype

The bus prototype pictured above has been modified. Evidently, the buses will operate on diesel with engines compliant with Euro II emission standards. In order to enjoy the full emissions benefits of this cleaner engine, lower sulphur diesel has to be procured from Pertamina. While Pertamina makes a grade of diesel fuel that is low enough in sulfur they are for some reason unwilling to sell it to TransJakarta.

Figure 26: Interior view of buses

As such, TransJakarta is planning to procure this fuel from a third party, who is likely to buy it from Pertamina. This is of course increasing the fuel costs unnecessarily.

If speed can reach 20 km/hour, which is a reasonable estimate of the likely commercial speeds for the current busway design, the frequency of the busway will be 39 buses per hour. **This gives a capacity of 3230 passengers per hour per direction.** This is very close to Pamintori's estimate of 3400 (as above).

Using the turnover factor of 1.8, as indicated by recent boarding and alighting surveys, **the dynamic capacity of the corridor will be 5820 passengers per hour**. This figure is significantly lower than the dynamic capacity estimate of Pamintory mainly because they used a passenger turnover factor of 2.5.

The 56 buses include the 2 prototype buses that were made. Normally, some buses are held in reserve in case there is a bus breakdown, to avoid a disruption of the schedule. The normal ratio of reserve buses to operational buses of 1 to 15, which is used in TransMilenio. This would mean 4 buses for TransJakarta kept in reserve.

Given the estimated demand under Scenario I, even with a Rp.2000 fare and a Rp.1000 discount fare for transferring passengers at Blok M, the static demand

Figure 28: TransMilenio Articulated Bus

at peak hour per direction is still only between 1666 and 2000 passengers, **the busway as designed with the current number of buses will be able to handle the Phase I level of demand.**

However, as Phase II options for increasing demand are implemented, capacity will quickly become a problem. The simplest way to increase the capacity of the busway is to purchase more buses. Even if the additional 85 buses are of the type pictured, the capacity of TransJakarta could be expanded. **Simply increasing the number of buses will increase static capacity to about 7270 passengers per direction at the peak hour.** However, **capacity cannot be significantly expanded beyond this simply by adding more buses because the bus stops will congest.** (discussed in the next section).

If the next 80 buses procured are larger, articulated buses, with a capacity of 160, the existing bus corridor could move some 9000 passengers per hour per direction (static capacity) without compromising commercial speed. This is probably sufficient to handle most of the existing passengers in the corridor. However, if these larger buses are used, the current bus stations being built will have to be modified. The current station has one bus bay, and it would need to have two or even three. These larger buses normally have two or three large double doors in order to increase the speed of boarding and alighting from the vehicle.

As the TransJakarta buses will not have a boarding ramp to ease access to the bus station platforms, the **bus drivers are going to need to be trained how to pull the buses close to the boarding platform** quickly without damaging the buses. In TransMilenio, Bogota, several buses were damaged soon after operations began due to insufficient bus driver training, and similar problems should be anticipated in Jakarta.

VI.2. Bus Station Design

The current bus station design for TransJakarta is a modification of the bus stations designed for Bogota's TransMilenio. Like TransMilenio, the bus stations will be closed. Passengers will pay a fare and pass through a turnstile to enter the station rather than after entering the bus. In this way, passenger boarding and alighting time is minimized. The bus stations are also on a platform at the same height as the bus floor, also

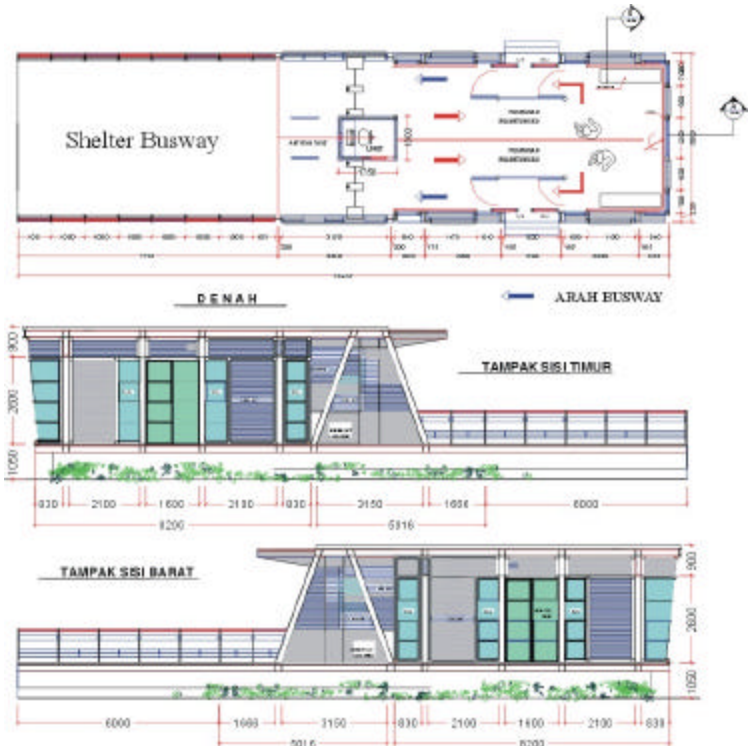


Figure 29: Typical Bus Station Design, TransJakarta

speeding boarding and alighting. The main difference between the stations and TransMilenio is that the TransMilenio stations are much larger and longer, and have multiple bays to receive buses with multiple doors. While the initial demand estimates for TransJakarta indicate that there will be insufficient demand to cause any major congestion problems within the stations at first, this could change once one of the Phase II operational scenarios is adopted.

While these stations are much smaller than the TransMilenio stations in Bogota, they are 'modular' and can be expanded without major modification. If a passing lane is built (see section IV.3 below), it might be more advisable to construct two stations, preferably with two entry doors each, rather than one large one, as explained below.

Figure 30: Bus Station Under Construction, Sarinah's

Their location in the center of the roadway, minimized traffic disruption during station construction, and facilitates free transfer of passengers from different directions. Congestion in the corridor only really began with the construction of the road separators.

Figure 31: Bus Station Under Construction, Gadjah Mada Plaza

VI.3. Road Infrastructure Design

Compared to some corridors in other cities where ITDP and its consultants have implemented BRT projects, Jakarta's north-south pilot BRT corridor is ideally suited for implementing Bus Rapid Transit. The corridor has a broad roadway, broad islands, large amounts of space used for all kinds of parking, street vendors, etc. Even with all this space, severe congestion occurs during peak hours, buses are crowded and trapped in congestion. The corridor, therefore, is ideal for a BRT project.

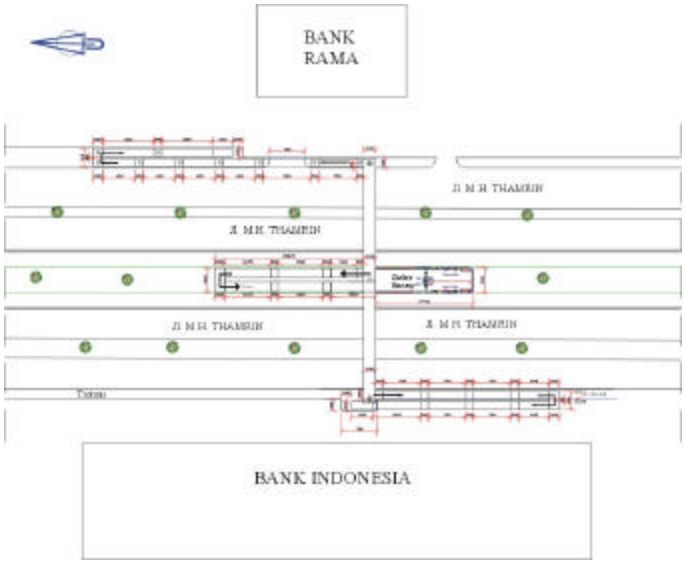
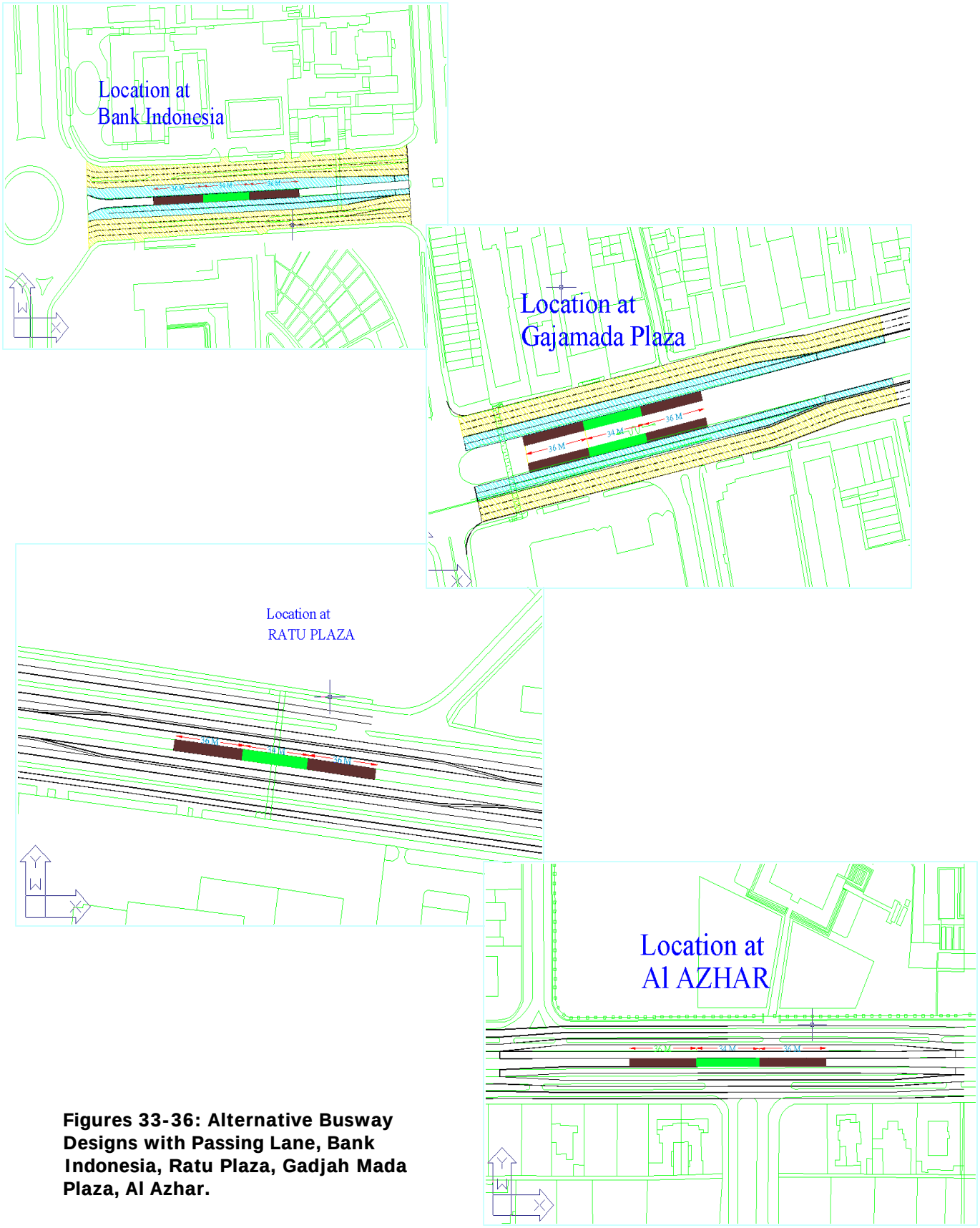


Figure 32: Current Road and Station Geometry, Bank Indonesia

TransJakarta, wisely, has elected to put their busway in the central lanes of the busway corridor. This choice will help reduce conflict with turning vehicles, stopping taxis, and street vendors. Center-lane busways are rapidly becoming the state of the art because much higher capacities and commercial speeds can be achieved. We estimate that **the current busway configuration in Jakarta should be able to manage some 15 – 20kph with as many as 7270 passengers per direction per hour**. Above this figure, adding more of the current buses will not help, as the lane will congest at the bus stops.

One could reach much higher capacities using the existing buses by adding a passing lane at the bus stops. Below is an example of how the TransJakarta busway could dramatically expand its capacity and commercial speed even if the existing buses are used.



Figures 33-36: Alternative Busway Designs with Passing Lane, Bank Indonesia, Ratu Plaza, Gadjah Mada Plaza, Al Azhar.

Evidence from other cities indicates that a passing lane at the bus station, and having two separate but connected stations where buses can stop, can dramatically increase busway capacity. With these measures, even using the current TransJakarta buses, **the capacity per direction per hour of the busway can be increased to over 18,000, at commercial speeds of over 20kph**. This is as much capacity as the corridor will ever need.

For the East-West corridors, which have much higher public transit volumes, DKI Jakarta must consider including a passing lane and larger, articulated buses from the beginning, or face serious capacity shortages from inception. **With both articulated buses, split stations, and a passing lane, capacities over 35,000 per direction per hour can be reached,** which would satisfy all the demand in even the most transit-congested corridors in Jakarta with room for growth.

Having the space available at the bus stations is very critical for implementing this road geometry, but initial evaluation shows that sufficient space exists, at least in the Blok M-Kota corridor. The 8 meters on the central island allows extra space for bus stations (4.5 metros) and an extra lane for bus overtaking (3.5 meters). This design would still require alternating bus stops, one in each direction.

Another alternative would be to cut 2 meters on each side of lateral separators, obtaining 4 extra meters of width that, added to the 8 meters of the central island would complete 12 meters of extra width. This space is enough the central bus station 5 meters wide and two bus lanes at each side of the station (3.5* 2=7 m for the overtaking lanes + 5 m for the station).

The narrowest link of the corridor, Sisingamangaraja, is 40 meters wide. This is the same width as the heaviest demand link of TransMilenio at Avenida Caracas in Bogota, which operates with 35,000 passenger/hour per direction. The following cross section can be used:

Transmilenio - Avenida lay-out			
	Direction	Lanes	Width
Walkway			4
Cars	1	2	6.5
Buses	1	2	7
bustop island	1+2		5
Buses	2	2	7
Cars	2	2	6.5
Walkway			4
Total			40

Figure 37: Layout used for heaviest demand link of Bogota's TransMilenio

From Kota station to Jl. Balik Papan intersection with Jl. Veteran signal, heavy congestion occurs every evening, even though the motor vehicle volumes are very low due to congestion. The total width of Jl. Hayam Wuruk road (from Jl. Mangga Besar to Jl. Hasyim Ashari) is 80 meters. The middle water channel has 16 meters, and could be covered and used for construction of the bus stop. The remaining 64 meters (32 meters at each side) seem sufficient for walkways, parking, etc. including 3.5 meters for busway. At the bus stop, a 4 meter pedestrian island and 3.5 m for an extra lane for overtaking, would still leave 21 meters just for the walkway and general traffic lanes. This would allow 6 meters wide walkway and 5 lanes for general traffic.

On the express link between Jl. Kebon Kacang and the Ring Road, volumes are higher, reaching an equivalent volume (pcu) up to 7500 vehicles (per direction). On the other hand, the total width is around 75 meters and there is plenty of space to accommodate BRT and all mixed traffic.

Figure 38: Busway lane dividers

The maximum volume (7500) would need around 12 meters per direction. As 22 are actually available, 10 meters can be used for BRT. The central lane, with 3 lanes (13 meters wide) could just be repainted with four lanes (9.5m for cars and 3.5 m for the BRT), without any changes in geometry.

Currently, the busway will be divided from the existing roadway by simple concrete dividers. Such concrete dividers should be sufficient to keep traffic out of the bus lane. They are also not so high that if there is a bus breakdown, the bus should be able to get out of the lane.

The separators are currently only set 5 cm into the roadbed. The original designs, by Pamintori, were for the separator to be set into the roadbed with a concrete anchor, but DisHub changed the design: sinking the separator 5 cm below the road surface but not using the anchor. Perhaps this is to ease their removal or replacement. As sometime buses will drive over them to escape a broken down vehicle, with this depth, they can become dislodged and create dangerous conditions for motorists. In addition, they can be deliberately removed by those wanting to create access to the busway for moving freight across (as has already occurred, even during construction), and for allowing private vehicles to enter and exit the busway – thus destroying the effectiveness of the busway separated lane.

Figures 39 and 40: Road Separator Being Constructed Near Blok M.

Figure 41: Hand-trucks walking through a gap created by workmen.

The busway will also be painted in red asphalt paint at intersections and at bus stops, to distinguish it from the mixed traffic lanes. Red paint has a habit of rubbing off, especially along tire tracks in intersections. When the corridor is re-paved, pigmented asphalt, tinted concrete, or modular paving should be explored.

Figure 42: Red Paint on Busway at Intersection

Using wider lane separators is advisable where possible, however, as the separator can then also serve a useful function as a pedestrian refuge island. Where the separators intersect a crosswalk they should be a minimum of 2m wide.

Currently, **there does not appear to be any discussion of reconstructing the roadbed in concrete. It is very important that concrete be used, particularly at the bus stops. Asphalt has a tendency to sink under the weight of constant use by buses**, and if it sinks the buses will no longer be level with the platform, causing entry and exit problems. Concrete should last some 10 – 15 years without major repaving requirements. Having to repave the busway usually requires shutting down the system, so avoiding frequent repaving is critical.

VI.4. Intersection Capacity Issues

The handling of intersection design and signalling will be a key determinant of congestion both in the busway corridor and in the mixed traffic lanes, the busway's capacity, and the operational speeds both inside and outside the busway.

Currently, traffic signals in the corridor limit to half or less the total road capacity. Implementation of a BRT needs to take this into account and to do careful intersection analysis to avoid increasing congestion with the project.

To date, we are aware of some limited analysis of how the intersections in the corridor could be changed to improve capacity and speeds in the corridor, although we have not seen the final plans, if they exist.

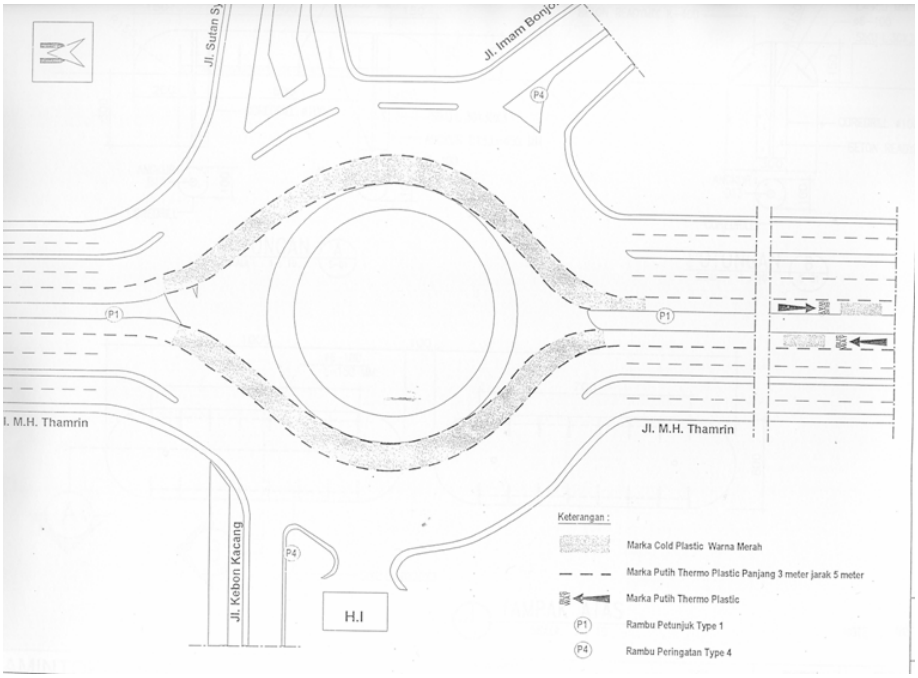


Figure 43: Busway at Roundabout Intersection

Most of the intersections do not have major capacity problems, and integrating the busway into the general intersection as shown in Figure 43 should be okay. There is enough space to allow a full extra BRT lane, so one level (at grade) solutions should be possible (ie. without flyovers or underpasses).

Some intersections, however, are going to require a more thorough analysis so that the busway does not cause serious additional congestion in the corridor. On the approach of a small number of critical intersections (100 meters before the intersection), the extra BRT lane, implemented without any care for intersection capacity analysis, will cause an extra reduction on capacity and increase significantly the congestion. The most recent designs we have seen, for example, for the Jl. Veteran/ Jl. Gajah Mada, Jl. Hayam Wuruk, intersection, would reduce capacity north-south by 33%.

At this intersection, for example, there are only 3 lanes available for the straight movement (north- south) with a green time of 1/4 of the cycle, reducing the total capacity to something like 500 vehicles per hour per lane, or 1500 for the 3 lanes, maybe up to 2200 including the u-turn allowed on the forth lane. This maximum volume of 2200 would need, 100 meters or more from intersections, just 2 lanes or at most 3, including motorcycles.

Some of the most critical points include:

-Jl. Veteran & Jl. Balik Papan
-Jl. Mangga Dua Raya and Kota station area
-Jl. Trunojoyo

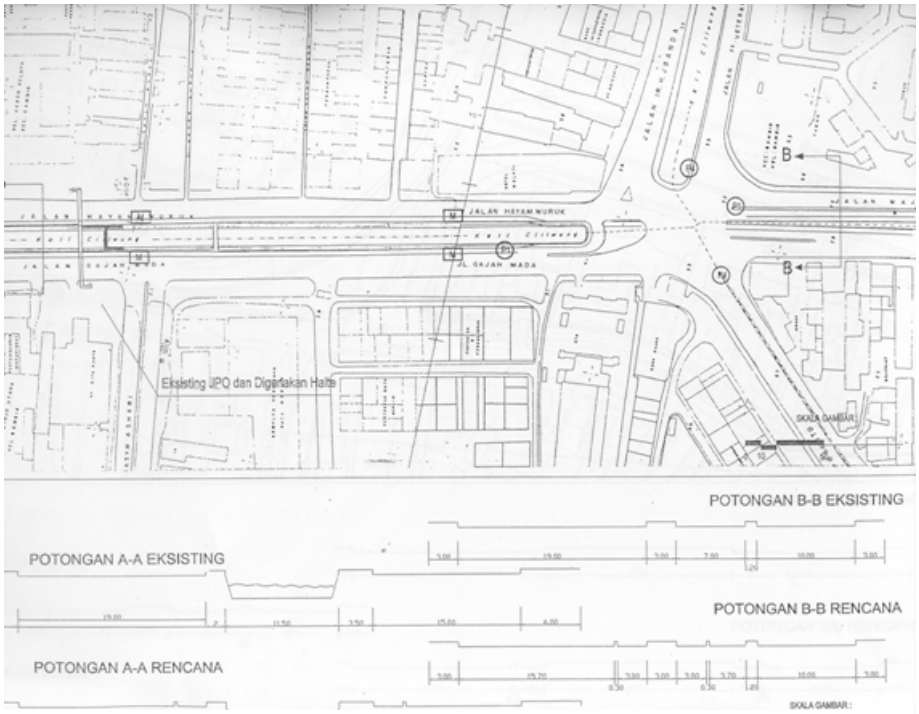


Figure 44: Problem Intersection: Jl. Veteran/Jl. H.Wuruk

Each of these requires a more careful analysis and design. They do not, however, require very complicated changes and can be fixed with relatively simple measures, while allowing the BRT system to retain its priority and its present capacity.

To avoid or minimize these negative congestion impacts, a set of measures usually can be adopted:

- Increase intersection capacity, by adding lanes on intersection approaches and restricting right turns, where necessary, noting that widening an intersection approach in one direction will degrade pedestrian safety and level of service in the other, as the crossing distance becomes longer.
- Merging BRT and general traffic on the approach (last 100 meters)
- Providing a special phase for BRT (pre-emption)
- Combination of the former solutions
- In some cases, more costly solutions like fly overs and tunnels can be feasible to implement.

On the specific case of Jl. Veteran/H. Wuruk, there is available space on the approach (the width had been reduced to adjust for the exit width and also for increasing opposite flow width), so the simplest solution would be to increase the approach from three to four lanes, the last for the BRT.

VI.5. Bus Depot and Terminal Issues

Currently, TransJakarta will not have a bus depot directly on the busway corridor. There are discussions of a bus depot at Lebak Bulus Bus Terminal, and at Pinang Ranti, and budget for their construction is included in Phase II, for 2004.

Bus depots are necessary to provide off-peak parking of buses, provide space for maintenance and repair activities, and provide a location for holding and disbursement of replacement buses in case of bus breakdown. Bus depots are usually located quite near the BRT corridor since it is best to be able to respond quickly to demand changes, or in case of a bus breakdown. If the depot is far from the bus corridor, the replacement bus will have to fight its way through congestion to reach the bus corridor. While there is space for some buses to wait in the Blok M Terminal, and near the Kota railway station, ultimately it would be better to have a full service depot directly on the corridor. Finding a location for a depot should be a consideration for the prioritisation of the extension of the next lines.

Block M terminal is very ineffective as a transfer terminal, on a number of levels. It was designed by retailers rather than transport experts, via a Build-Operate-Transfer scheme, with the intention of obliging people to pass through the shopping market area below the terminal. The result is that people cross the street at the surface level, blocking the buses, and board and alight from the buses either before or after the terminal platforms. These issues will be discussed in greater detail in the following section on pedestrians.

The entrance and egress of TransJakarta buses into the Blok M Terminal is also a matter of concern.

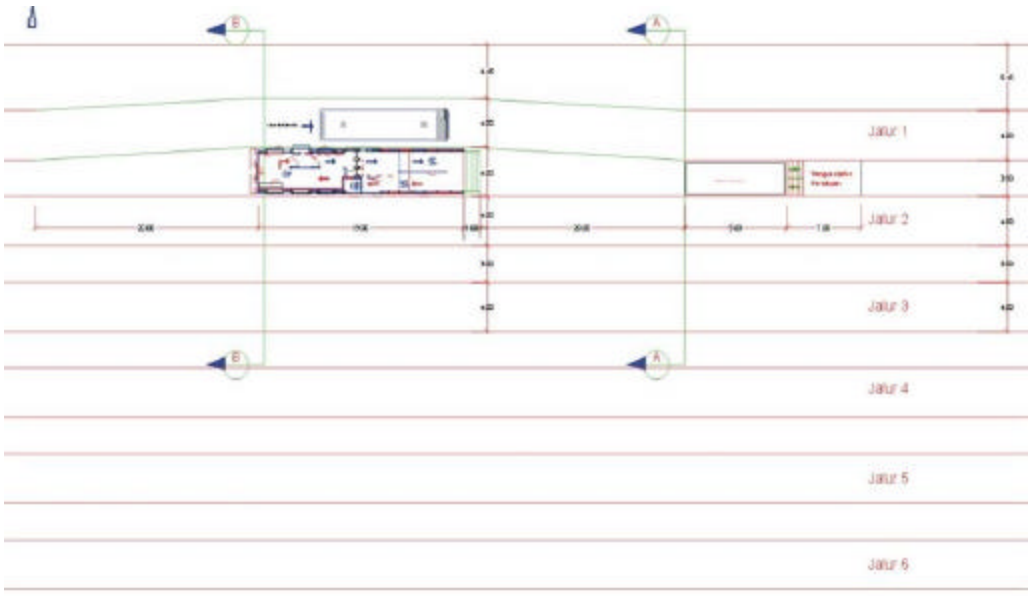


Figure 45: Blok M TransJakarta Bus Stop Design

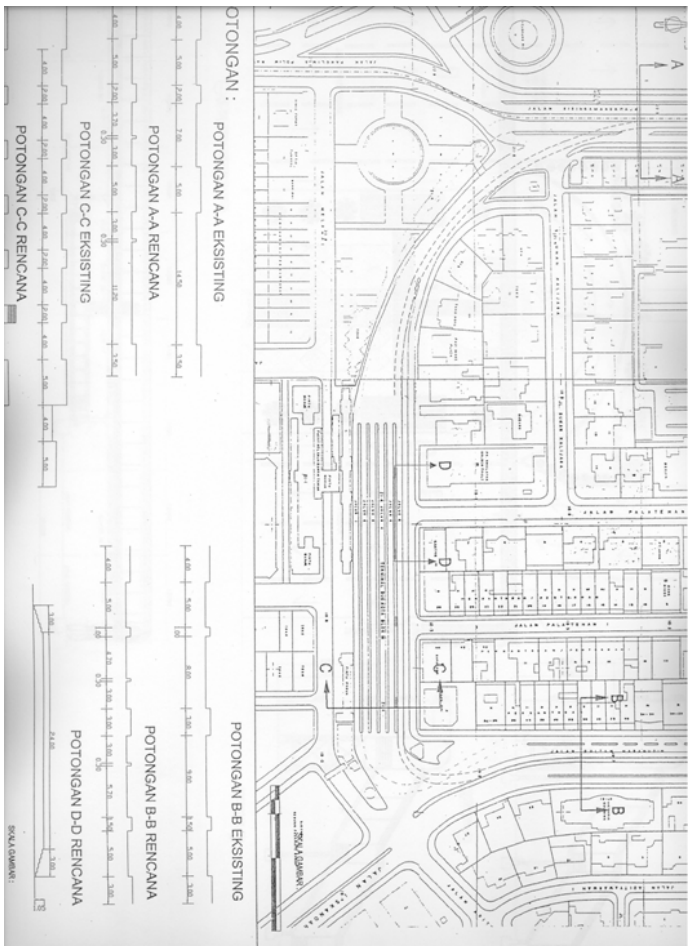


Figure 46: Blok M TransJakarta Access and Egress

We are currently unsure of the final designs, but it appears from Figure 45 and 46 that TransJakarta busway will have to cross all the lanes of the bus terminal to reach its own bus terminal. In this case, there will be considerable confusion at the terminal access and egress, perhaps causing delays in bus frequency in the corridor. Ensuring an uncongested access and egress from the Blok M terminal is all the more important given the limited number of buses available to serve the corridor. It is one of the most urgent problems that need to be addressed to allow smooth operation of TransJakarta Phase I.

VI. ECONOMIC AND FINANCIAL ANALYSIS

Because the marginal cost of adding additional passengers to a bus is minimal, a bus system operates the most efficiently when the buses are operating at or near their capacity. Our current demand estimates indicate that even at the low capacity levels TransJakarta will have during Phase I, it will still not fill this capacity. Financial and economic self-sufficiency will require increasing demand levels.

There are a range of estimates of operating costs for TransJakarta. Pamintory estimated that TransJakarta's operating costs would be Rp.4207 per kilometer, while Ernst & Young, with data from UI CTS estimated closer to Rp.6500 per kilometer. Organda suggested a figure of Rp.7500. Since we have not corroborated these cost estimates, we chose to use the more conservative estimate of Ernst & Young, but not the clearly inflated estimate of Organda. The Rp 6500 was divided into the following:

	Ernst & Young	Pamintory
Operating Cost	**Rp/Km**	**Rp./Km**
Direct Costs	4530	2470
Depreciation	1176	1182
Interest over capital	794	555
Total	6500	4207

Figure 47: TransJakarta Cost Estimates per Kilometer

This figure, then, will cover the direct cost of operating the buses in the busway, (fuel, maintenance, and personnel), and the cost of the buses themselves, (via depreciation), but not the capital costs of constructing the BRT stations, terminals, and other infrastructure. Most busway and metro systems are not expected to cover their initial capital costs.

The profit/loss estimates which follow are based on the above estimates from Ernst & Young, using revenue figures based on the demand estimates from Figure 12.

Alternative I is a Rp.2500 fare with no discounted fare for transferring passengers at Blok M, yielding a daily demand of 15,100 passengers. Alternative II is a Rp.2500 fare with a discount fare for passengers transferring at Blok M of Rp.1300, yielding a demand of 27,650 per day.

Under **Alternative I and Alternative II, demand for TransJakarta will be too low to cover the operating costs.** Alternative I will require a monthly subsidy of Rp.1.3 billion (about $153,000). Alternative II will require a monthly subsidy of only Rp.1.1 billion. (about $129,500)

Operating Cost	Rp
Direct Costs	1.595.330.100
Depreciation	414.151.920
Interest over capital	279.622.980
Total	2.289.105.000
Monthly Income	
without fare integration	981.500.000
with fare integration	1.184.170.000
Monthly Subisidy	
without fare integration	(1.307.605.000)
with fare integration	(1.104.935.000)
Percentage of coverage of direct costs	
without fare integration	62%
with fare integration	74%
Subsidy to cover direct costs	
without fare integration	(613.830.100)
with fare integration	(411.160.100)

Figure 48: Profit/Loss Estimate for Alternatives I and II

Alternative 3 considers the case where the fare price is reduced to Rp.2000, with no discount for passengers transferring at Blok M, yielding a demand of 31,614 passengers per day.

Alternative 4 considers the case where the fare prices is Rp.2000 and a transfer fare of Rp.1000 is available to passengers at Blok M.

In the case of alternatives 3 and 4, income will be enough to cover direct costs but depreciation and interest over capital will need to be subsidized. The

monthly subsidy, however, would only be some 650 thousand rupees ($75/month) which is well within the range of calculation error.

Operating Cost	Rp
Direct Costs	1.595.330.100
Depreciation	414.151.920
Interest over capital	279.622.980
Total	2.289.105.000
Monthly Income	
without fare integration	1.643.942.857
with fare integration	1.648.028.571
Monthly Subisidy	
without fare integration	(645.162.143)
with fare integration	(641.076.429)
Percentage of coverage of direct costs	
without fare integration	103%
with fare integration	103%

Figure 49: Profit/Loss Estimate for Alternatives III and IV

Finally, our analysis indicates that at the currently discussed price of Rp.2500 per trip, a dynamic demand level to make the operations of TransJakarta self financing would be 4883 passengers per direction per peak hour, or 37,565 passengers during an average working day.

In order to reach this level, we estimate that at minimum a 30km system will need to be developed, and more existing bus lines will need to be converted into feeder lines. Exactly which ones, and how many, requires a level of analysis currently impossible due to data limitations. These data limitations could be overcome with 2 to 3 months of additional work, however.

This very preliminary analysis therefore indicates that **if TransJakarta only develops the initial 12.9 kilometer system,** without cutting more parallel bus lines, **it will never be financially self-sufficient**. It further shows that the **system is closer to self-financing at the Rp.2000 fare than at the Rp.2500 fare** because of the elasticity of demand with competing bus services that will continue to operate in the mixed traffic lanes.

VII. PEDESTRIAN ACCESS ISSUES

This section will review three critical and related pedestrian issues. First, it will explore briefly whether the planned TransJakarta stations, pedestrian flyovers, and access ramps will be of sufficient size as to avoid pedestrian overcrowding. Secondly, it will review the general pedestrian conditions in the corridor. Finally, it will look in depth at pedestrian conditions in the two terminuses: Blok M and Kota Station.

VII.1. Pedestrian Level of Service at TransJakarta Stations

Figure 50 shows the level of pedestrian traffic generated on the corridor by bus passengers, based on passenger boarding and alighting counts. These counts indicate the level of crowding if all the bus passengers in the corridor were using the busway. **Given current projected demand levels for Phase I, there will be no significant crowding problems during the first year**, **except inside the Blok M Station Stop**.

However, by **the end of Phase II**, crowding levels given the existing facilities, are likely to reach a level of service of D+ (very bad), not only at **Blok M**, but also in front **of Sarinah's**, and a level of service of C at the intersection of **Sudirman and Casablanca**. Bus stations used as transfer points for feeder buses or the new crossing East-West line will also face serious crowding issues at peak periods.

Because of the center lane design of the busway, pedestrians will now be required to reach the middle of the roadway safely. However, this does not actually increase pedestrian crossings, because some pedestrians that used to cross the entire roadway now only cross half the roadway, while other pedestrians that didn't have to cross any roadway now have to cross half the roadway. In almost all locations, pre-existing pedestrian overpasses will be used. In some cases, the entry and exit ramps have been modified to have a more gradual ramp. The only two exceptions to this are in front of the Hotel Indonesia and Hyatt Hotel, and at the Kota Station. At these two locations, underpasses are eventually planned, but at-grade facilities will serve in the short term.

The main determinant of whether TransJakarta stations should be accessible only by a pedestrian overpass or also by at-grade pedestrian facilities should be the 85th percentile vehicle speed in the corridor, and the number of lanes of traffic the pedestrian needs to cross to reach the station. If the speeds are above 65 km/h, one has to cross more than three lanes without a refuge, *and* a signal is not feasible, then an overpass (or underpass) should be considered.

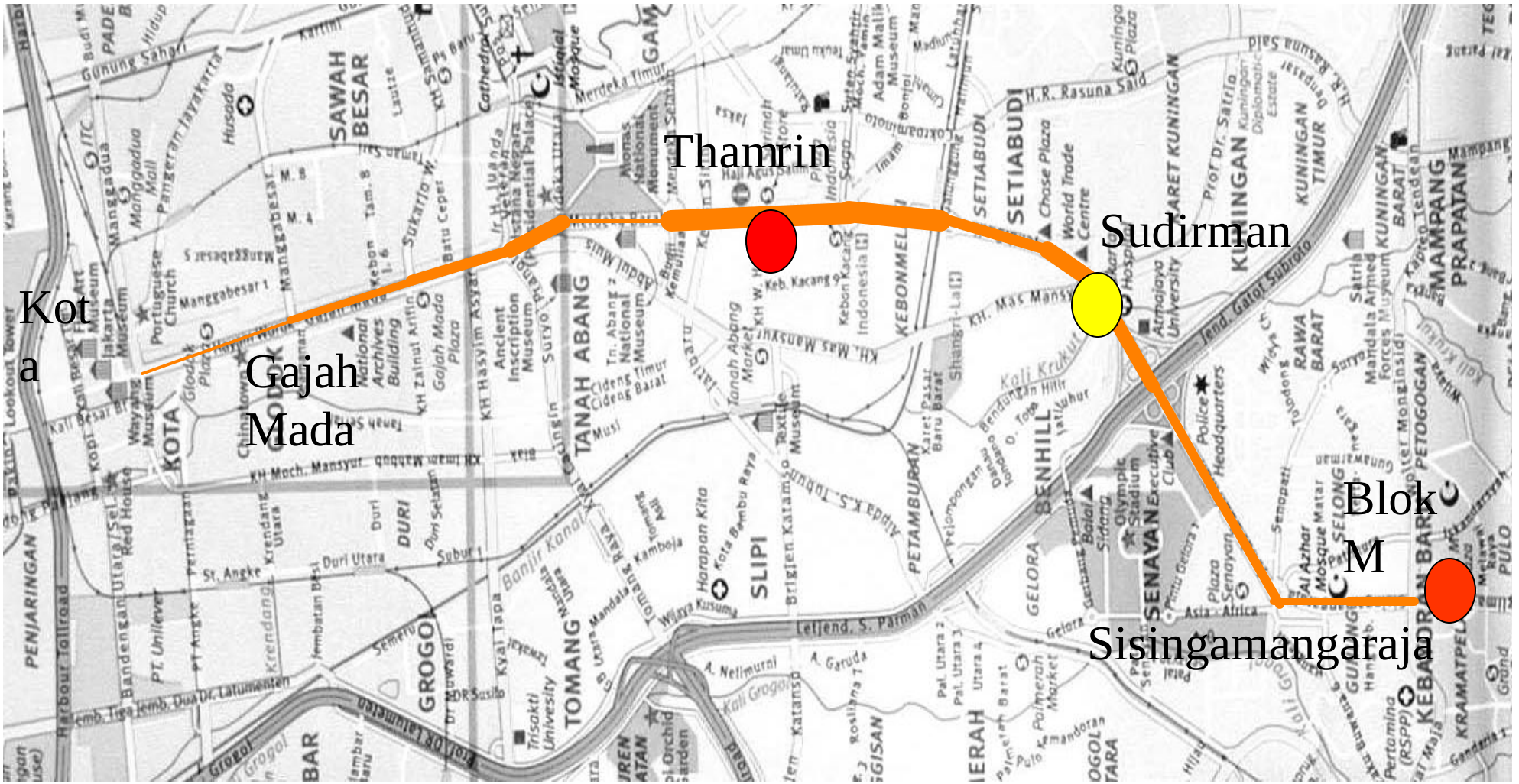


Figure 50: Pedestrian Volumes

In our opinion**, for the TransJakarta stations along Sisingamangaraja, at Sarinahs, at the Hotel Indonesia, and from Gadjah Mada Plaza north, the road network should be designed for at grade access to TransJakarta stations. This would benefit all pedestrians, not just those destined for the BRT station.**

In TransMilenio, most of the downtown stations are at grade, while those on the higher speed roads are overpasses. Figure 51 shows TransMilenio at-grade pedestrian access in downtown Bogota.

Figure 51: TransMilenio At-Grade Station Access, Downtown Bogota

The pedestrian overpass at Sarinah's is shown in Figure 52 below. The stairway in this facility is only 1.5 meters wide. A single slow-moving person can badly congest this facility for several minutes due to the steep stairs.

The current plans are to add an elevator (compliments of Sarinah's, evidently) and modify the access stairs as shown in Figure 53. While the stairs are less steep, they remain only 1.5 meters wide. This is probably because the public right of way in this location is very narrow.

Figure 52: Current Pedestrian Overpass at Sarinah's

The designs for the median ramp appear to be about 2 meters wide, which should be satisfactory most of the time.

All of the current pedestrian facilities differ from those developed in TransMilenio in that the existing pedestrian bridges being used are much higher over the roadway than those in the Bogota system, and the access ramps are narrower. While the climb has been made less steep by the replacement of the old access stairs with more gradual stairs,

the climb remains fairly steep for elderly people and small children. Steel columns and concrete blocks used to support the ramps, limiting or eliminating sidewalk space even more than the alone themselves would, as shown in Figures 56a-c. Jakarta officials explained that this was the result of an ordinance which required very high pedestrian overpasses to accommodate double-decker buses and high trucks, which are no longer utilized in the corridor.

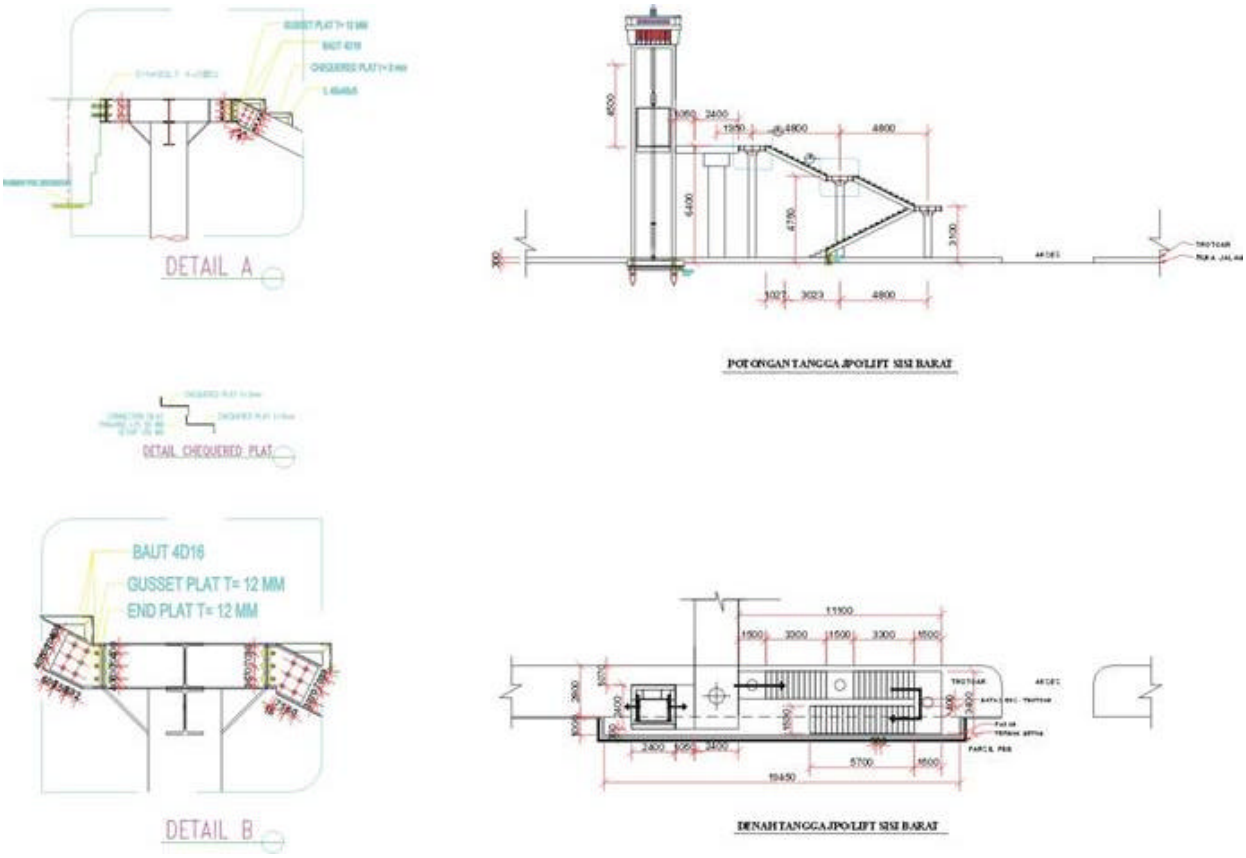


Figure 53a: Blueprint of Pedestrian Overpass, Sarinah's Bus Stop

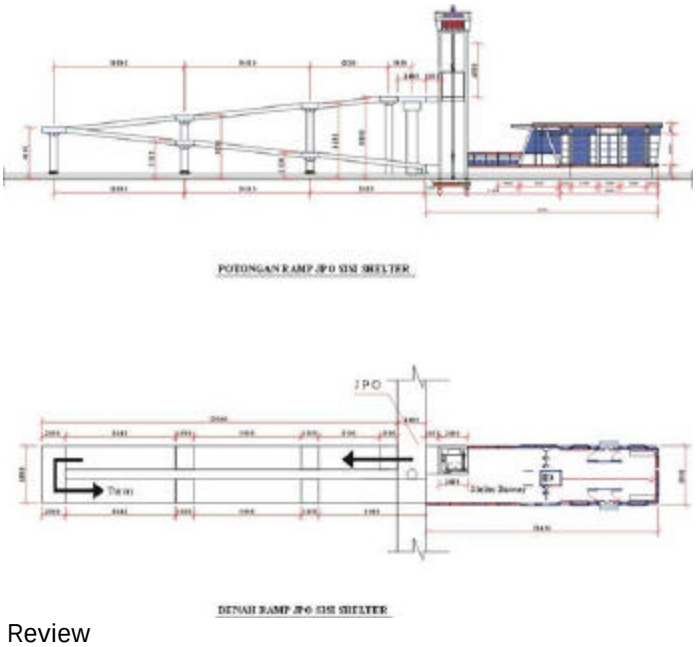


Figure 53b: Design for Median Ramp, Sarinah's.

The current pedestrian overpasses are fairly old, and little used, and it is not clear that they are physically strong enough to handle regular use by large numbers of commuters. Certainly the sheet metal flooring on some of them appears to be in need of replacement.

Figure 55: Rusty Overpass

Figure 54: Pedestrian ramp, median in front of Sarinah's

Over time, DKI Jakarta should consider reconstructing the pedestrian overpasses in the TransJakarta corridor to make them lower, more comfortable for pedestrians, and **changing the ordinance that requires such excessive height**. The designs from Bogota are pictured in Figure 57.

Figures 56a-c: Pedestrian Ramps and support structures block sidewalk space

The difference in quality of the pedestrian access ramps will affect demand for TransJakarta, though predicting how much precisely is difficult.

Figure 57: Pedestian Ramp, Bogota's TransMilenio

VII.2. Pedestrian Conditions in the TransJakarta Corridor

One of the major reasons that more people in Jakarta do not use public transportation is the poor quality of pedestrian facilities, and the danger faced by pedestrians when getting on and off buses. TransJakarta has the potential to significantly address these problems, and thereby increase its demand substantially. However, to date only minimal attention has been paid to general pedestrian conditions in the corridor.

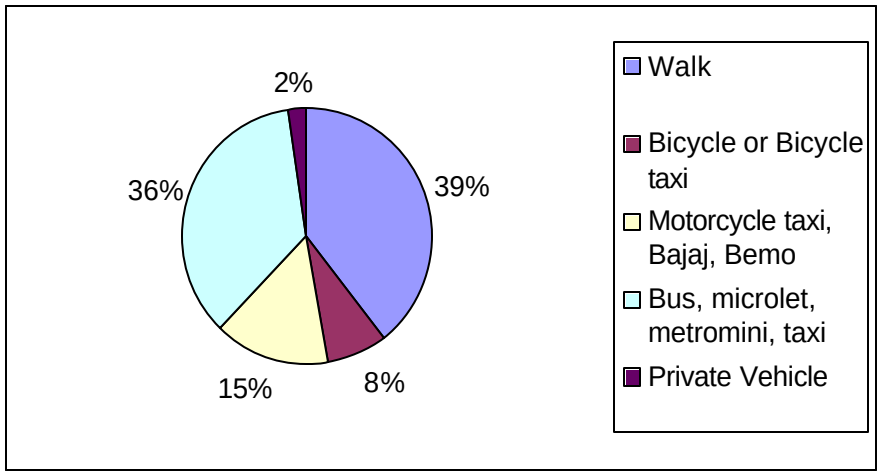


Figure 58: Mode of Access to Busway: Survey Results

According to our surveys conducted along the busway, over 39% of people entering buses along the TransJakarta busway reached the bus stop solely by walking. Another 36% reached it by transferring from some sort of transit or shared taxi. Of course, this also involved a short trip on foot. A surprising number, 8%, used normal bicycles or bicycle taxis to reach the bus stops. This indicates that bicycle parking facilities at some key TransJakarta stops could increase passengers at a very low cost.

Figure 59: Bicycle Parking at BRT and metro stations, International Examples

Most people are not walking very far to reach the bus stops. Some 58% are reaching the bus stop after a walk of less than 500 meters. This means that improving pedestrian facilities within 500 meters of the busway is most important. In the Blok M-Kota corridor, by far the most important area for pedestrian improvements is around the Kota railway station and South towards Glodok, and around Blok M.

Traffic safety remains an extremely serious concern along the Blok M – Kota corridor.

Our survey data indicates that the Sudirman section of the TransJakarta Busway Corridor is the most dangerous part of the corridor.

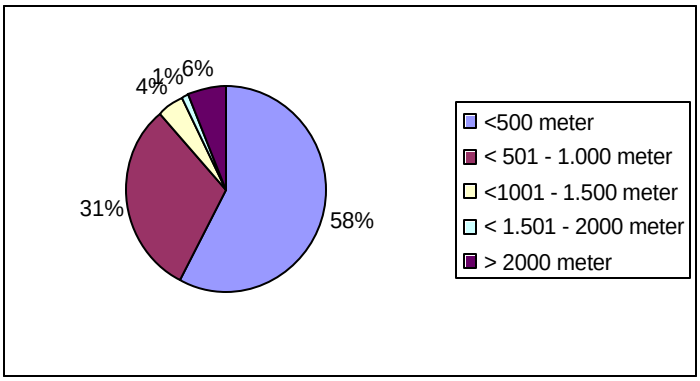


Figure 60: How Far are People Walking from the Bus Stop?

These crashes tended to occur in the slow moving vehicle lane. This is no doubt largely due to vehicle turning movements at streets and entry/exit ramps, the combination of vehicle size and types, and irregular boarding and alighting of buses and taxis. Buses currently do not stop at the bus stop, or at all. They tend to stop not only at designated stops, but at intersections and other random locations. Pedestrians then wait for buses at locations where there are no pedestrian facilities. Taxis often also drive along the curb lane, endangering bus passengers.

Figure 61: Map of Pedestrian Injuries and Fatalities Along the Busway Corridor

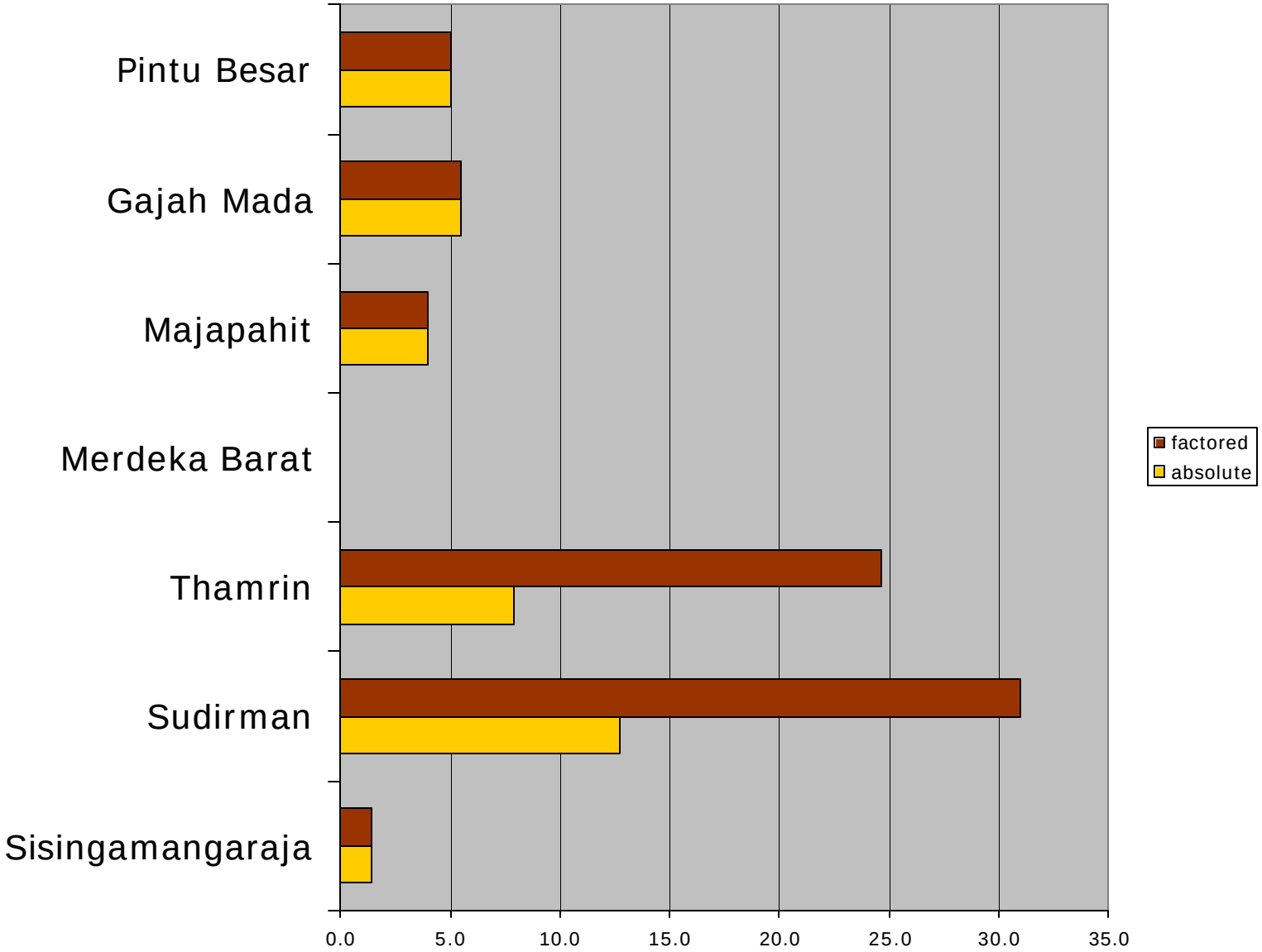


Figure 62: Location of Crashes along the Corridor

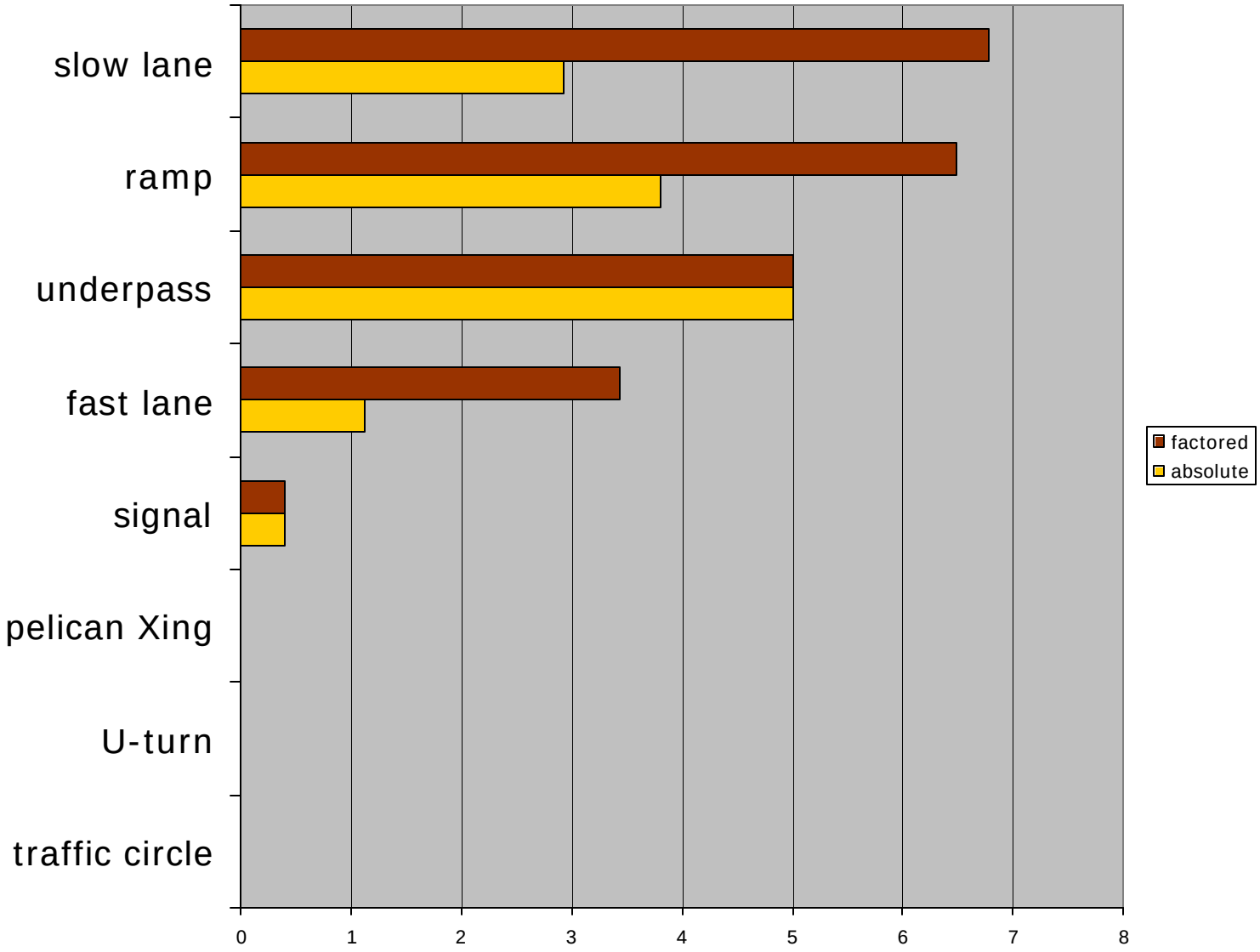


Figure 63: Type of Facility Where Crashes Occurred

The closed bus stop design of TransJakarta will greatly reduce this problem at least for its own passengers by regulating the location of bus stops. However, some buses will continue to stop in the curb lane.

Furthermore, many more pedestrians will be using the sidewalk facilities along the corridor and at intersections. Unfortunately, the existing sidewalk conditions vary widely in the corridor. Some are in quite good shape, and others almost non-existent.

Along the corridor the following problems are typical:

a. Narrow, badly maintained, or obstructed sidewalks, forcing people onto the street, and high speed turns at exit and entrance ramps
b. Lack of safe at-grade crossing facilities.

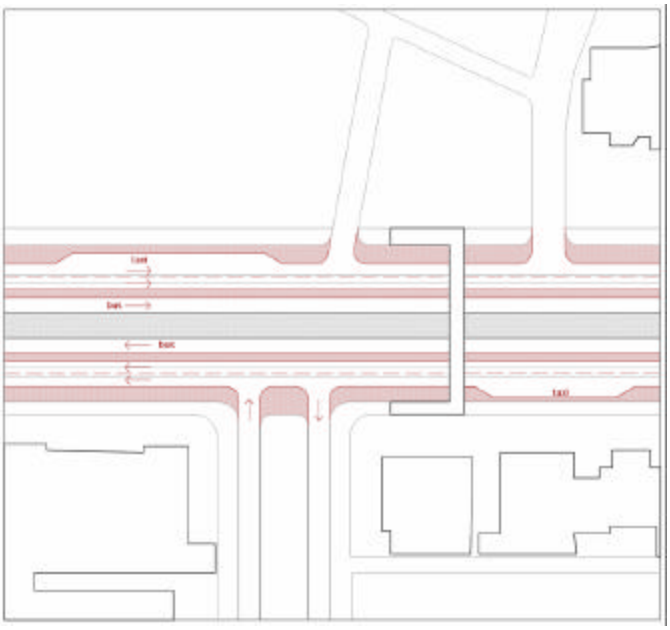
Figure 64: Passengers waiting for Buses at Intersections Rather than at Bus Stops

-----Sidewalk Problems in the Corridor

Figure 65: No sidewalk, Al Azhar Mosque

At many points along the corridor, there are no sidewalks at all, or sidewalks are only one or 1.5 meters wide. When Bogota reconstructed the TransMilenio corridor, they extended the sidewalks to a minimum of 3 meters and added a bicycle lane.

At the Al Azhar Mosque, there is no sidewalk at all on one side of the road (see Figure 65). In this case, a sidewalk should simply be constructed where there currently is none using the available space, as shown in figure 66.



In figure 67 below, at Behhil and Sudirman, the sidewalk is needlessly narrow, and could easily built out to where the dirt deposits, clearly visible on the asphalt end, with no disruption of traffic flow. Currently, parked transfer vehicles like bajaj and taxi also wait there to pick up bus passengers. A waiting area for these vehicles could be incorporated into a widened sidewalk design without interfering with traffic flow, as shown in Figures 68 and 69 below.

Figure 66: Proposed Sidewalk across from Al Azhar Mosque

Figure 67: Narrow Sidewalk, Benhil/Sudirman Intersection

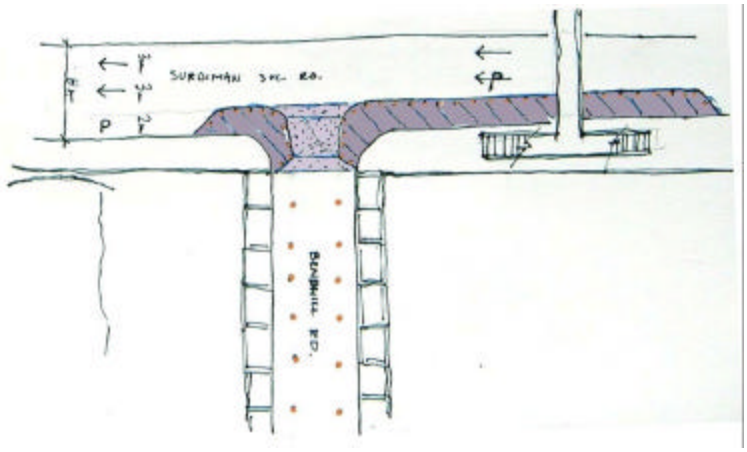


Figure 68: Graphic of Proposed Widened Sidewalk at Benhil

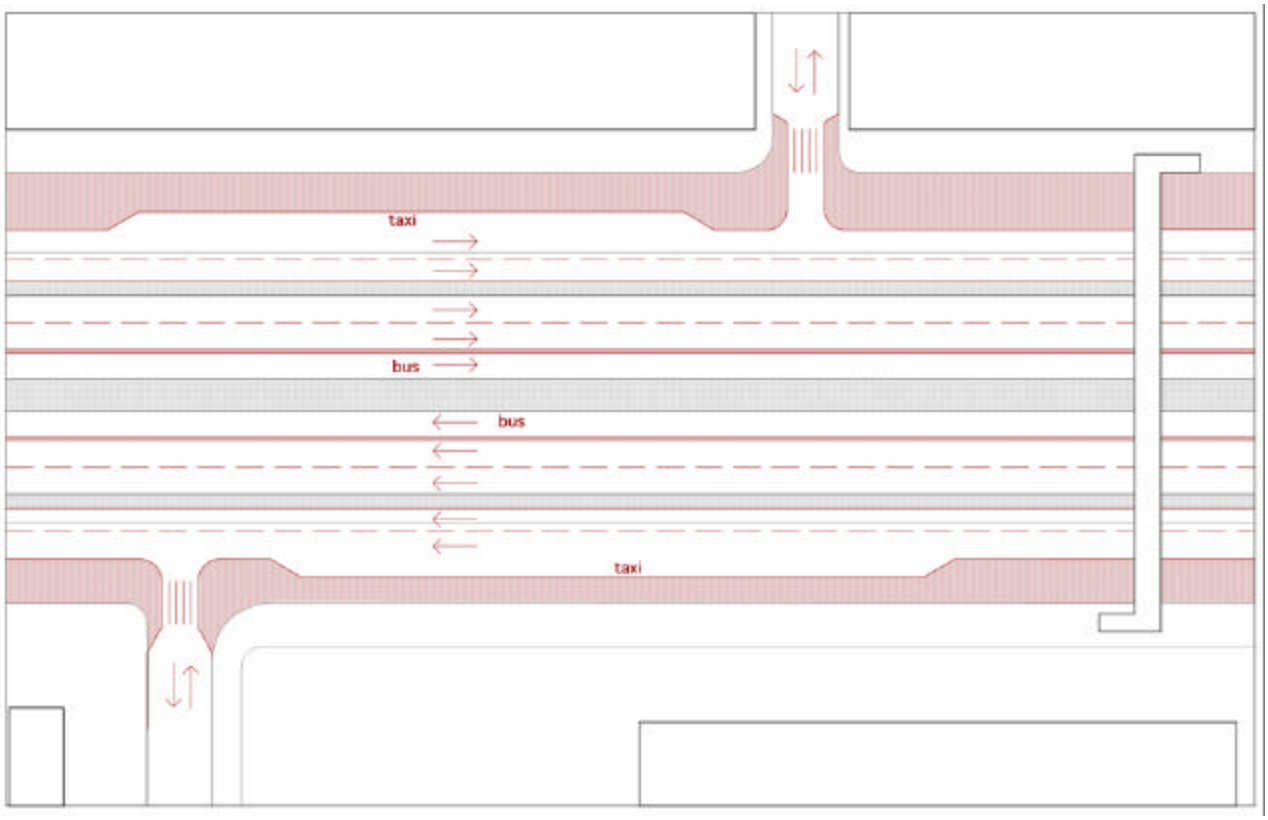


Figure 69: Proposed widened sidewalk w/ waiting area for taxi and bajaj at Benhil.

Turning speeds onto side streets are also excessive in some locations, particularly at exit ramps and entry ramps, where numerous accidents are occurring. In Figure 70, a dangerous exit ramp is shown, along with a proposed speed hump designed to slow vehicles down to safe speeds. In many cities, such as Portland, Oregon, these exit ramps would have a raised crosswalk.

Figure 70: Photo of dangerous exit ramp and raised crosswalk

Some sidewalks are obstructed by street vendors, telephone booths, improperly trimmed landscaping plants, parked cars and motorcycles, and the access ramps to pedestrian overpasses. These obstructions force pedestrians into the street, creating dangerous conditions.

The public telephone booths are all but irrelevant now with cellular phones, and rarely functional. They should be torn down or replaced with structures that do not obstruct the sidewalk. Some street vendors should be relocated. Others could be accommodated in locations where sufficient space exists for them. Recent studies in Delhi indicate that street vendors also provide useful services for bus passengers such as the availability of food and small commercial items, and their presence tends to reduce petty crime. Street vendor activity is also a direct function of the number of passengers getting on and off buses, and hence predictable. Street vendor space can therefore be incorporated into bus stop and pedestrian facility design to good effect. An example of this is shown in Figure 72 below.

Parked cars and motorcycles are also occupying considerable sidewalk space, particularly from the Glodok area north. Parked cars can be kept off of sidewalks by high curbs and bollards.

Figure 71: Pedestrians walking in the street due to sidewalk obstructions.

Figure 72: Street vendor space incorporated into bus station design, Delhi

Figure 73: Bogota before and after the reconstruction of a corridor with bollards and high curbs to widen sidewalk space.

-----Pedestrian Crossing Facilities

Not all the pedestrians in the corridor are actually using buses or the busway. Many of them are just going about their business. For these pedestrians, the existing pedestrian overpasses do not suit their needs. They might be crossing North-South, while the overpasses only cross East-West. They are far apart, far from intersections where people want to cross, much higher than necessary due to an outmoded ordinance, and seen as unsafe due to criminal activity. Long experience teaches that most people will try to cross at grade.

Figure 74: Pedestrians not using the pedestrian overpass, East Jakarta

With the introduction of TransJakarta, the pedestrian overpasses are going to become far more crowded. While the more regular use should reduce the security risks, it will not improve their utility for non-TransJakarta users.

Our statistics show that at least half of pedestrians refuse to use pedestrian overpasses due to their inconvenience and security concerns. The lowest level of pedestrian overpass use was recorded at the Al Azhar Mosque and school, with only 12% of pedestrians using the overpass. This is because there are only two lanes, which can be easily crossed except at very high volume periods. The highest level of overpass use was at Sarinah's, where still about 1/3 of pedestrians do not use the overpass.

Our statistics also show that almost no traffic

Figure 75: Pedestrians Crossing At Grade Under Gadjah Mada JPO

fatalities are occurring at intersections or at traffic circles. Therefore, even if most of the pedestrians planning to use TransJakarta will be using the pedestrian overpasses, significant pedestrian flows can be expected to continue crossing at grade at the intersections. As such, state of the art pedestrian facilities can be built at these intersections, improving the pedestrian friendliness of the corridor, without compromising the capacity of the roadway.

Gadjah Mada Plaza is a good example of where we predict there will remain a considerable amount of at-grade crossing, even after the introduction of TransJakarta. Figure 75 shows a number of people crossing at grade at Gadjah Mada Plaza intersection. Figure 76 shows how the intersection could be redesigned to make pedestrian at grade crossing much safer without compromising roadway capacity. **Before such designs are implemented, however, a systematic review of their feasibility is advised.**

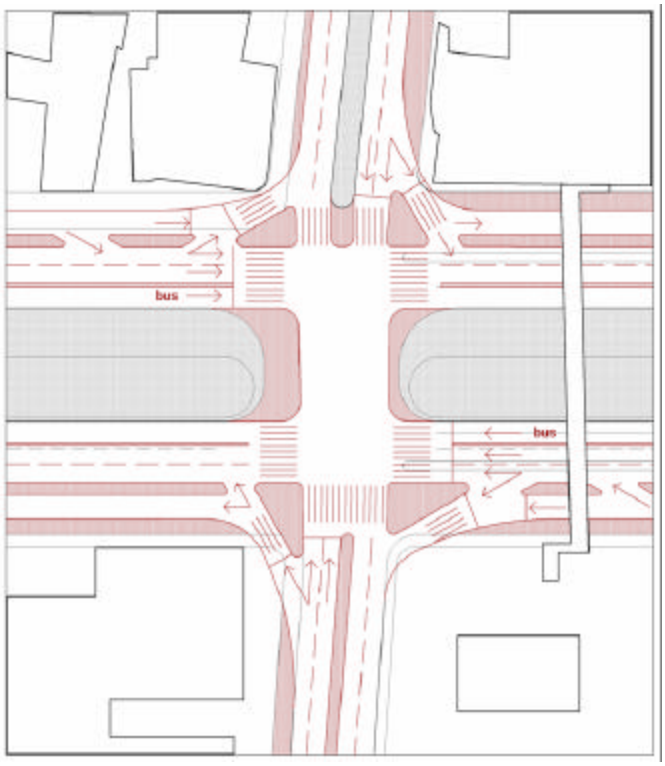


Figure 76: Re-design of Gadjah Mada Intersection, Preliminary Concept

VII.3. Pedestrian Conditions at the TransJakarta Terminus: Kota and Blok M

For typical situations, such as those described above, the standard set of pedestrian measures suggested above can be used over and over again. There are some locations, however, where pedestrian flows are so complex that no rules of thumb apply, and more detailed analysis is required. Such conditions exist at both the Blok M Bus Terminal, and at the Kota Station Plaza.

For some locations, particularly north of Merdeka, and at Blok M, improved pedestrian facilities for at-grade crossing should be explored. At Kota Station and Blok M terminal in particular, the pedestrian movements are far too complex to be served by a single linear pedestrian overpass or underpass. Thus, even if pedestrian underpass is built, and entrance to the busway is restricted to the pedestrian underpass, there will still be a large number of pedestrians crossing at grade to go to non-busway locations.

The following details of the Kota Station and Blok M Terminal illustrate the point.

-----Kota Station

The Kota Railway Station currently has extremely complex pedestrian movements. These movements are complex because a variety of bemos, bajaj, buses and taxis will stop almost anywhere in the roadway to pick up and discharge passengers.

Figure 77: Kota Station Photos

Initial thinking of the DKI Jakarta busway team was to develop a pedestrian overpass that would help pedestrians cross the street without disrupting the heavy traffic on the roads surrounding the station. The primary reason for the pedestrian bridge was to avoid conflicts between crossing pedestrians and traffic, slowing and reducing traffic flow.

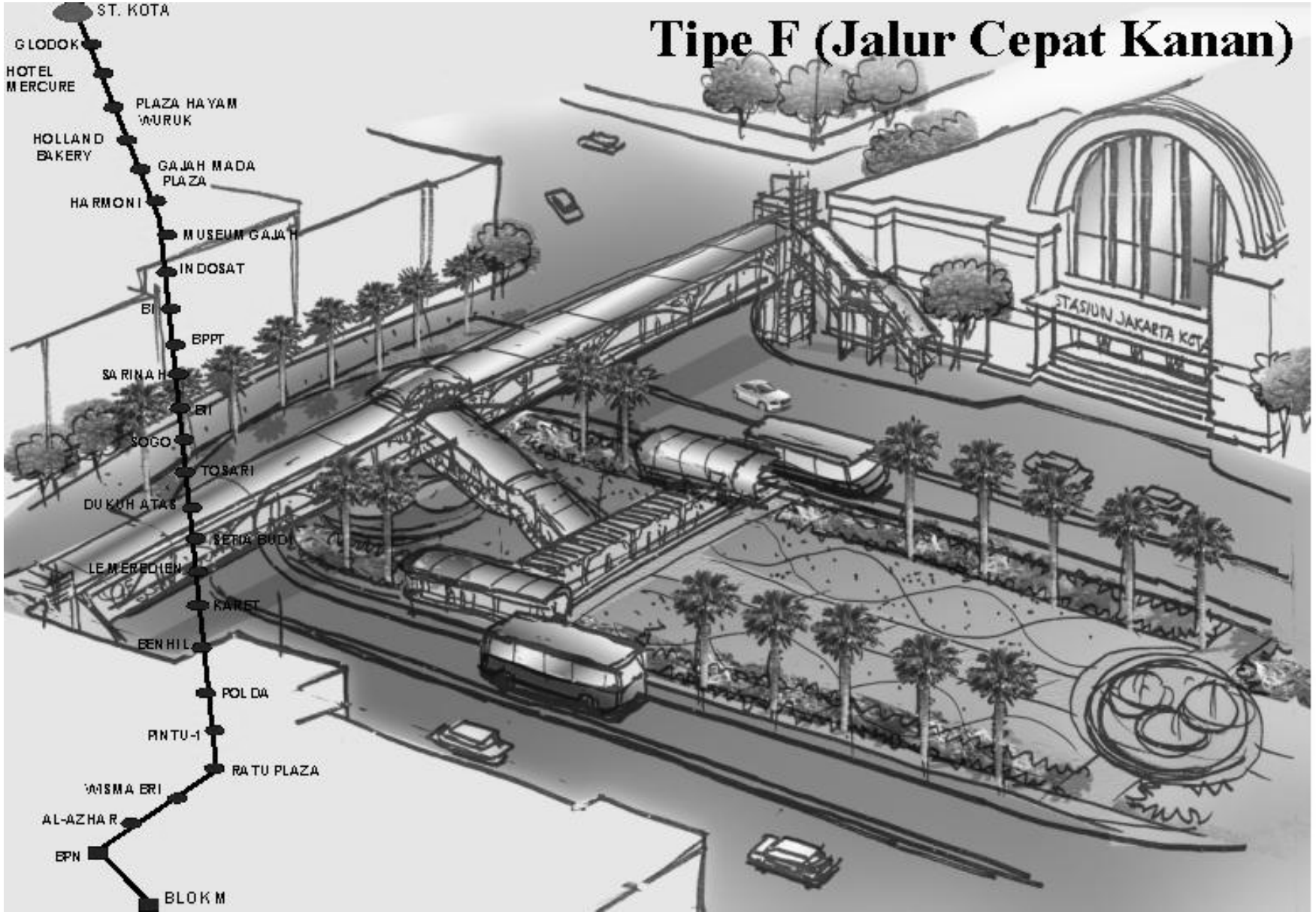


Figure 78: Original Kota Station Pedestrian Bridge Design

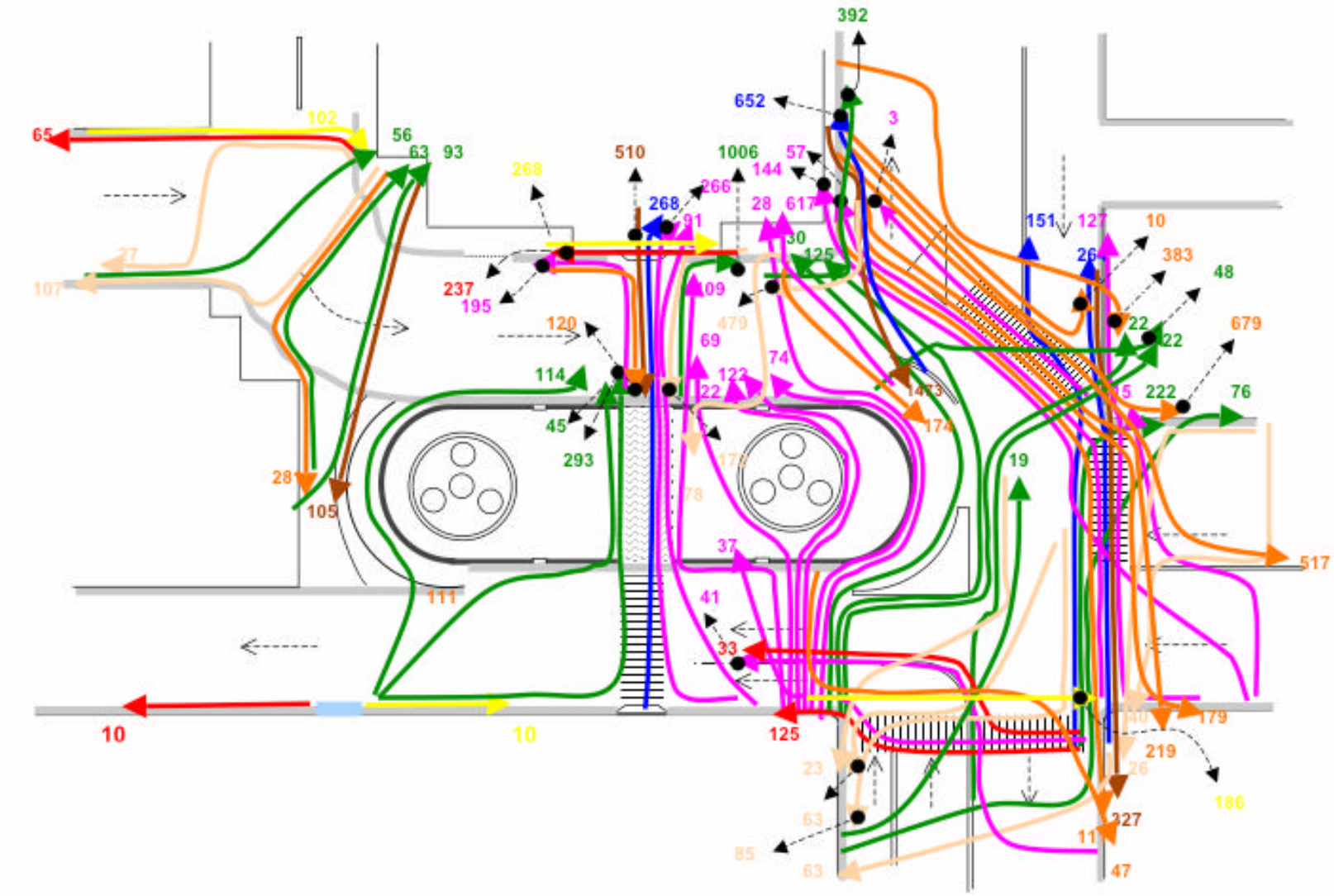


Figure 79: Mapping of Kota Station Morning Peak Pedestrian Flows

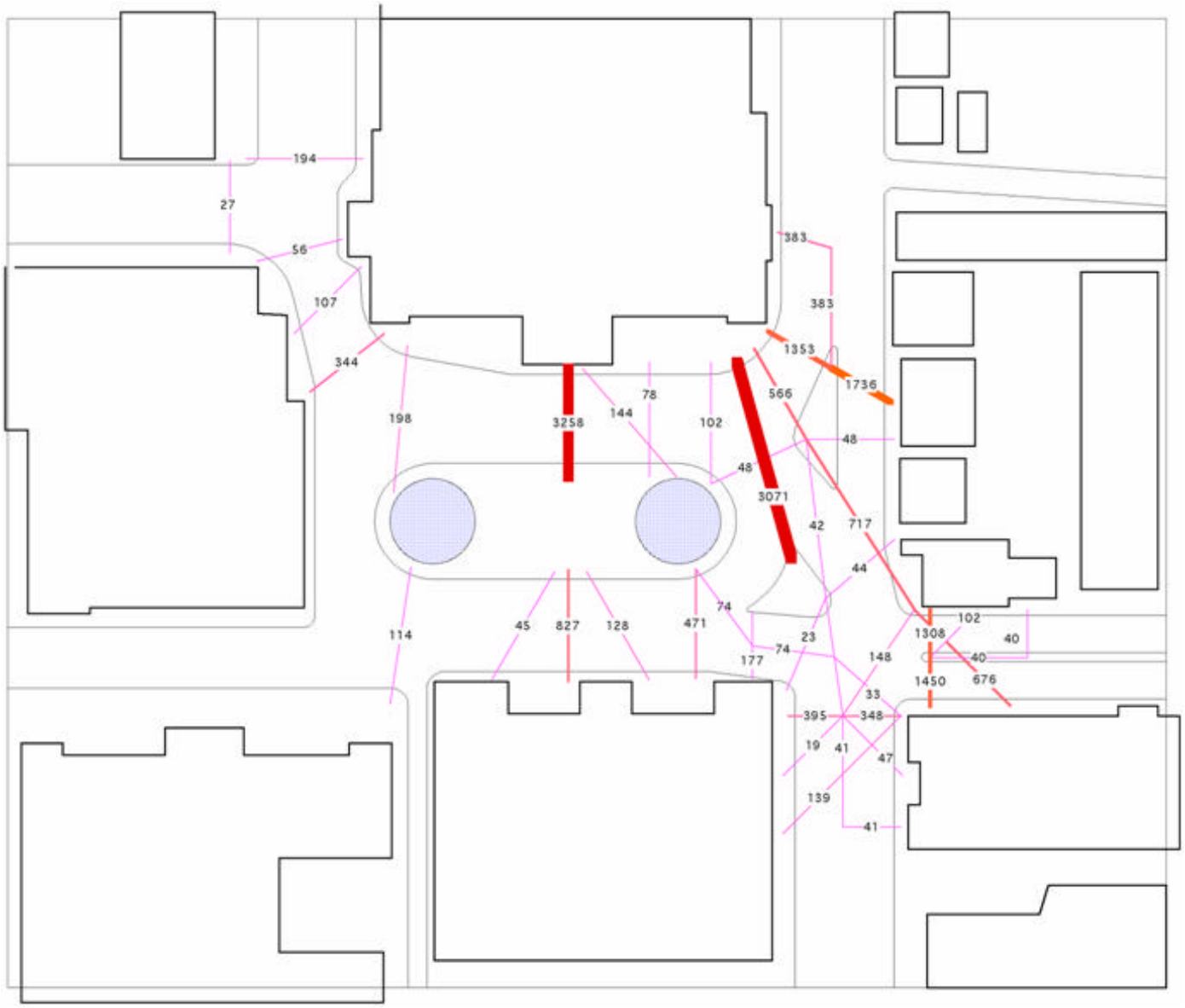


Figure 80: Morning Ped Flow Diagram

After mapping the pedestrian flows in the Plaza area, however, it became clear that the pedestrian movements were highly non-linear and complex. Figure 79 shows the morning peak, and Figure 80 shows the same diagram consolidated.

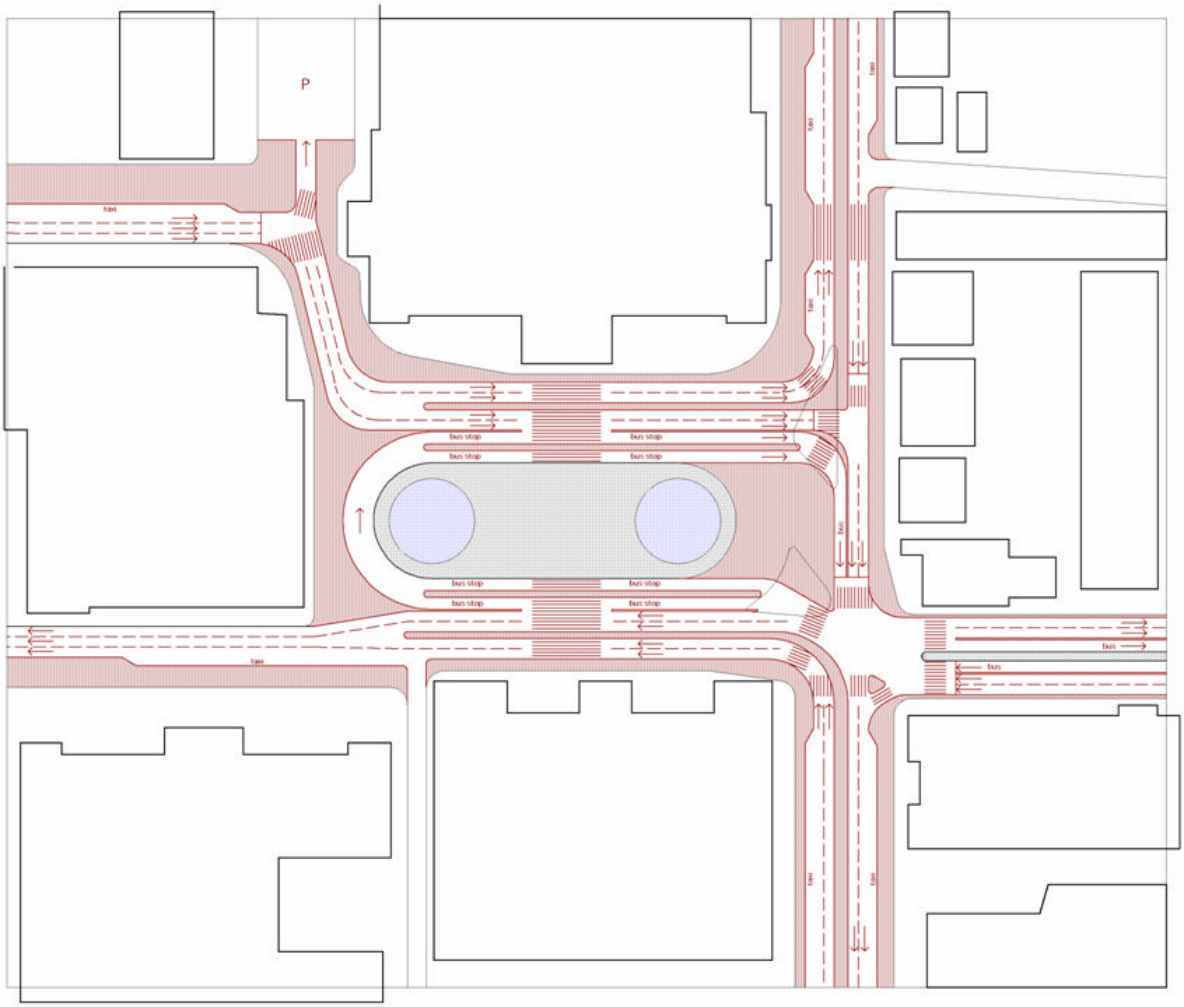


Figure 81: Preliminary Suggestions, Kota Station, Diagram

These pedestrian flow diagrams indicate that the construction of an overpass or underpass would not be effective from a traffic management or a safety point of view unless it provided relatively direct passage not only for people crossing from the Kota Station to the new TransJakarta bus station stops, but also serving the large numbers of people passing under Jl. Jembatan Batu. If the pedestrian underpasses are inconvenient, it is unlikely that they will be used, and hence the investment will be wasted. There are also far more people crossing Jl. Pintu Besar Selatan at the J. Jembatan Batu intersection than directly in front of the train station. Until the stopping and boarding locations of bemos, other buses, taxis, and other vehicles are regulated to special locations, passengers will still be crossing these roads in random locations. Furthermore, due to the lack of sidewalk facilities, many people are simply walking in the road. As such, the functional road capacity is reduced, so the sidewalks might as well be widened.

We would suggest improving the at-grade crossing in front of Kota Station by building out extensively the sidewalks, pedestrian-refuge islands, and pedestrian space, as depicted in Figure 81. This is a very preliminary design concept intended to give Dishub an idea of what is possible without compromising traffic flow, rather than a fully developed design. If DKI Jakarta decides to construct pedestrian underpasses, they will need to connect all of the locations on Figure 81 where crosswalks have been provided. This should not be done at the exclusion of expanding sidewalks and other pedestrian refuge space, but could be done ***in addition***.

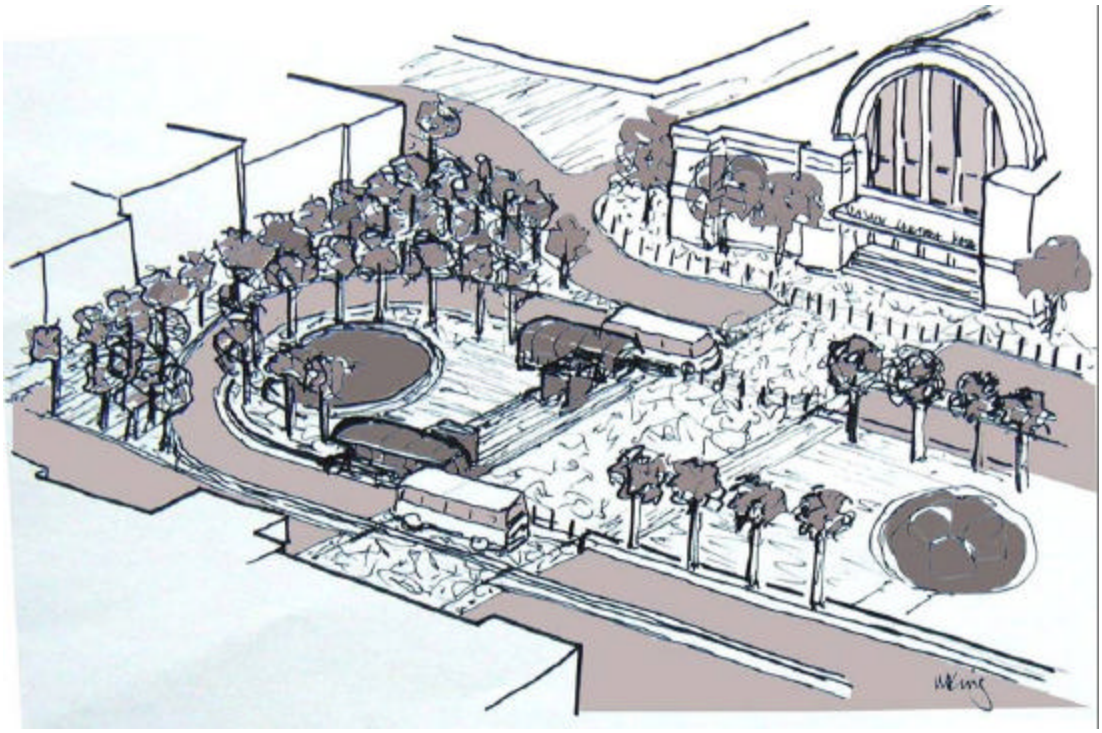


Figure 82: Graphic Representation of Improved Surface Crossing, Kota Station

As Kota Station Plaza is an incredibly important historical location in Jakarta, it should be designed with top urban design experts. This urban space needs to be re-captured from poorly managed traffic congestion, re-dignified as one of the most important and pleasant public spaces in Indonesia. There is no reason this place could not rival some of the most beautiful urban plazas in Asia, Europe and the Americas. It could become a destination in its own right.

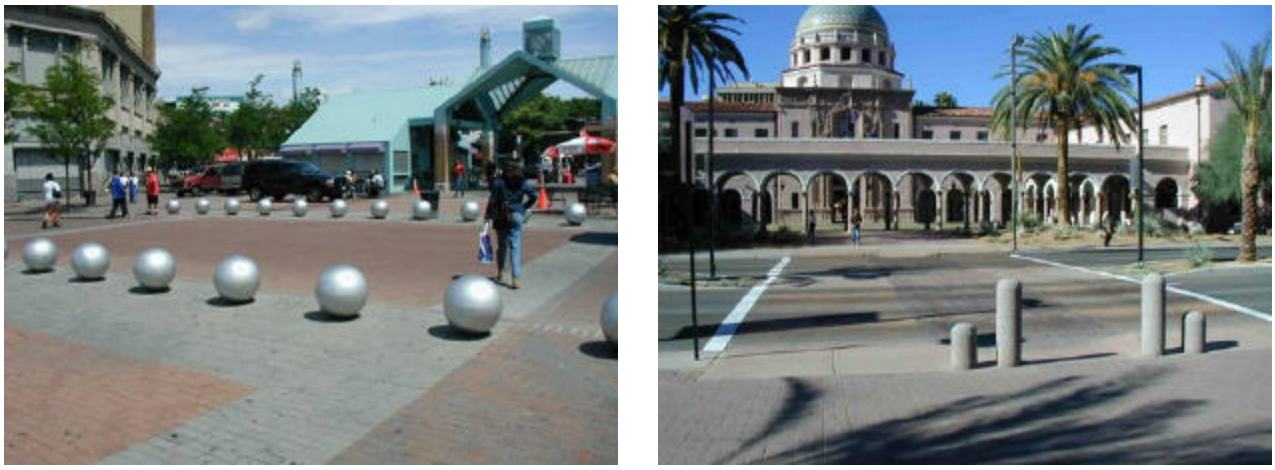


Figure 83: New Pedestrian Crosswalks at Major Plazas, Tuscon, Arizona, and Bronx, New York.

By channelling more and more of the existing traffic in front of the Kota Station to the TransJakarta BRT system, the re-construction of this plaza with much more public space and public amenities should be possible.

-----Blok M Terminal

The Blok M bus terminal is dysfunctional for the vast majority of bus operators and bus passengers, largely because pedestrian access was designed not to facilitate access to the buses, but to force passengers to pass through the market below the station before boarding their bus. As this Terminal was built as a Build-Operate-Transfer private concession, it may be contractually difficult to change the Terminal's design, but even for the owner the current design is dysfunctional, producing lower revenue than would be possible with a more optimal design.

Figure 84: Passengers entering buses before the Blok M Terminal. Passengers entering the terminal at grade.

Figure 84 illustrates the problem. The Bus Terminal was not designed for at-grade pedestrian access, but most pedestrians enter the terminal in this way in any case, blocking the buses. Furthermore, because passengers don't

want to walk a long way out of their way to walk through the shops under the terminal to get to their buses, all the buses accept and discharge passengers both before and after the actual terminal platforms. As a result, the efficiency of the entire terminal is significantly compromised. This affects the profitability of the private bus operators who have to spend more time idling at the terminal than they should. With a limited fleet of buses, such as those owned by TransJakarta, there could be significant delays in getting buses in and out of the terminal, which would significantly affect speeds and the frequency of service.

Figures 85 & 86: Pedestrian flows at the exit of Blok M Terminal

Figures 85 and 86 above show the complexity of pedestrian movements at the exit of Blok M Terminal.

The terminal should be redesigned to perform its function. People that do shop at the shops in Blok M are not predominantly terminal users, so redesigning would

not significantly impact shop revenues. It could even improve revenue as people would be more willing to shop between trips.

Redesigning Blok M Terminal should be done seriously and is beyond the capacity of this report. Nonetheless, the intersection at the exit of the Blok M Terminal could be significantly modified to enhance at-grade access to the Terminal.

Figure 87 & 88 show the complexity of the pedestrian flows at the exit of the Blok M terminal. There is a pedestrian overpass, visible on Figure 88. However, due to its inconvenient location, less than 5% of pedestrians actually use the overpass. Given the slow signal phasing at the intersection, we believe the intersection would actually have a higher capacity, yet slower and safer crossing speeds, if the intersection were turned into a wide roundabout where the roundabout itself could serve as a pedestrian refuge.

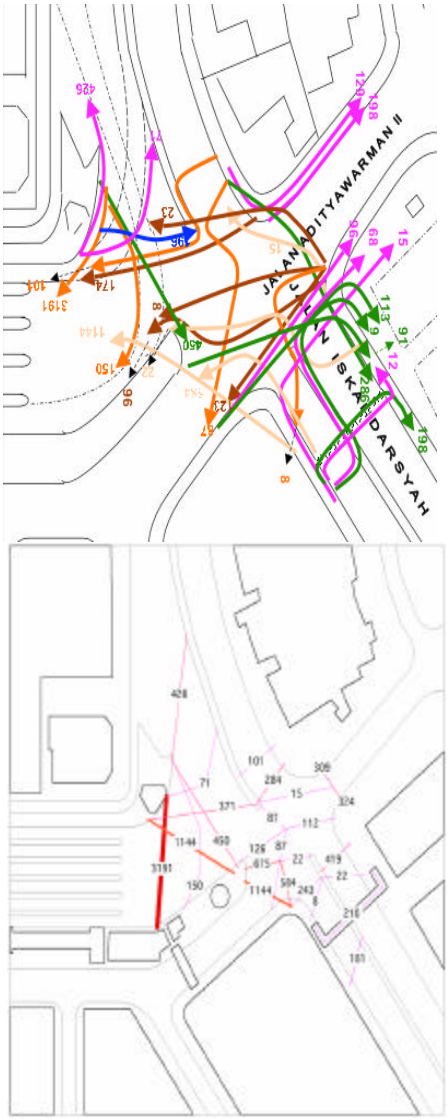


Figure 87 & 88: Morning Peak Hour pedestrian flows, Blok M Terminal Exit

Figure 89 is a very preliminary concept of what might be done in this intersection. While this design has not been fully analysed for the intersection capacity vis-à-vis current capacity, has not yet incorporated a waiting location for taxis and bajaj, and was developed before the final designs of the TransJakarta busway routings were available, this diagram nonetheless is a good illustration of just how much additional space could be captured for pedestrian safety and landscaping without disrupting -- and perhaps even improving -- traffic flow.

In conclusion, a systematic analysis of how to redesign the Blok M terminal, and the intersections at both the entrance and the exists of the Terminal, would quickly pay for themselves in terms of bus operational efficiency. Ensuring smoother and safer pedestrian access is the key to a more successful design.

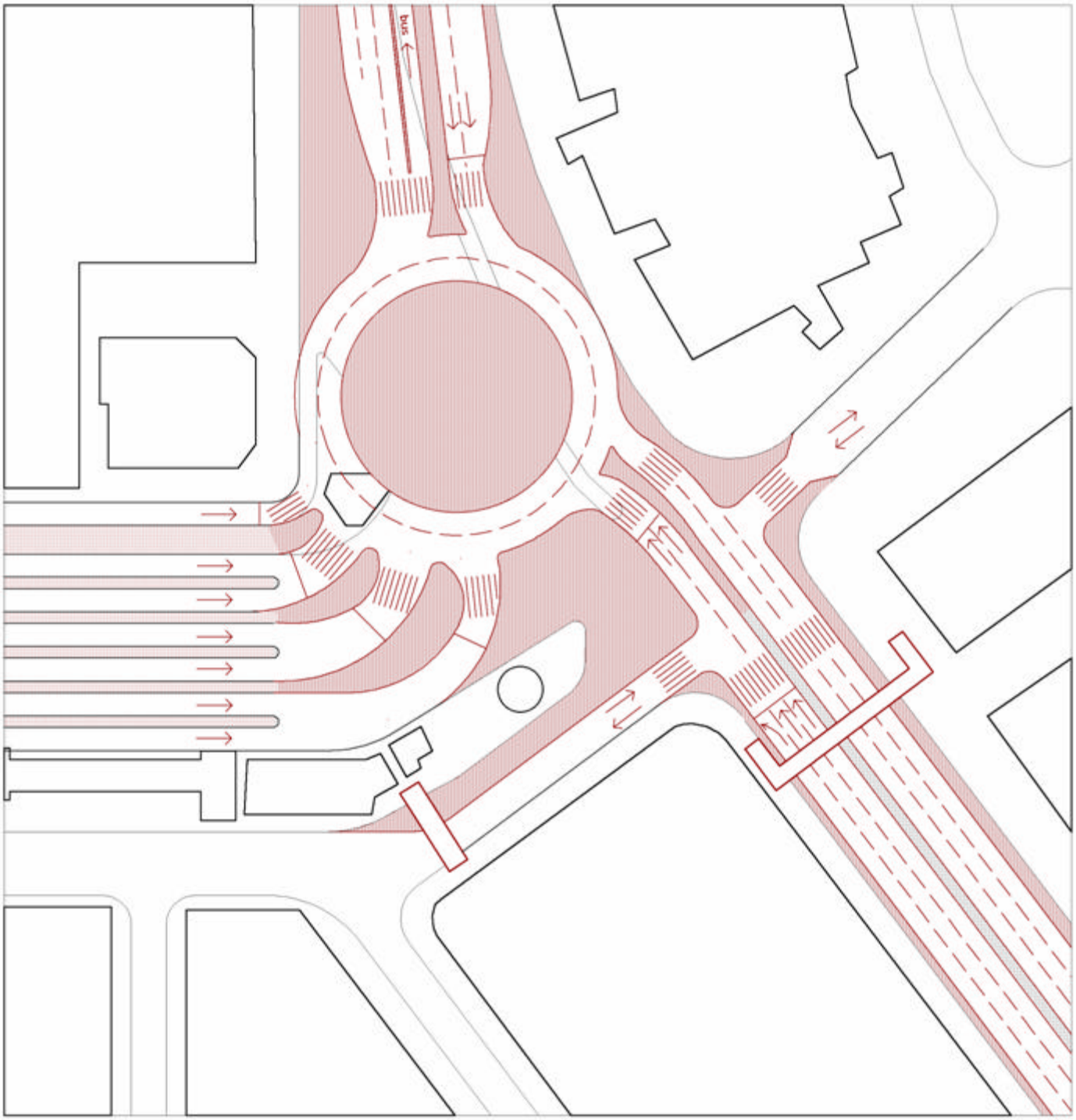


Figure 89. Preliminary Concept, Blok M Terminal Exit Intersection

VIII. PROJECT MANAGEMENT AND INSTITUTIONAL ISSUES

Current Status

The institutional structure of TransJakarta has yet to be fully established. Currently, while ostensibly overall project planning and coordination is under the direct authority of the Governor and the responsibility of Assistant Secretary for Development Irzal Jamal, as the coordinator of the busway project, in practice many of the key decisions are being determined by the Director of Dishub, with little specific information being made available to other parties involved in the project. This has at times resulted in poor coordination between the various sub-teams. The tendency to date has been for Dishub to make incremental decisions on project components and the busway design is later fit around these decisions. This reflects a frustration with waiting for decisions on the overall design, while pressed with the need to meet deadlines. A project timeline could order the decisions and prioritize information needs.

Very often decisions are made not based on a sound technical, financial and social/economic assessment of various alternatives. The decisions made are then presented to the key decision makers as a fait accompli for approval. The key decisions makers are not made aware of other alternatives.

Current plans are for TransJakarta to be created as a public agency through a decree of the Governor rather than as an act of the Regional Parliament, and little information about the nature of this decree has yet been disclosed. Nevertheless, the plan is for TransJakarta to act as a contractor of bus operations rather than as a direct bus operator. This is an improvement over the original plan to have the bankrupt and mismanaged public authority, PPD, operate the busway. Our technical advisors were unanimous in encouraging the contracting out of operations. The operator of the first trunk line of the busway is likely to be a consortium between Ratax, a company that currently operates radio taxis, and some combination of the existing bus operators. Nothing has been finally settled yet regarding the fare or the payment mechanism, or how revenues would be divided among consortium members. It does not appear that the operating contract will be submitted for competitive bid. We still feel a competitive bid would ensure a better contract. The operation of the feeder lines, meanwhile, is almost certain to involve the existing bus operators, though almost nothing about the feeder lines has been worked out to date.

At least the process has improved. All existing operators in the proposed 16 feeder lines have had meetings with the sub-committee on operations. Of the operators with routes in the corridors, only PT. Metro Mini, which operates the small buses, has opted out of the meetings.

The first 56 buses have been procured directly by Dishub. The procurement does not appear to have been subjected to a competitive public bid. Roughly half of the vehicles will be procured from Hino's local partner, PT New Armada, Magelang, and Daimler Chrysler's local partner, PT Restu Ibu, Bogor. Whether this is a violation of the law remains murky, since the laws on administrative procedures allow a certain amount of latitude for the Governor to bypass competitive bidding under certain circumstances. How these assets will be transferred to the operating company and on what terms, will be determined by the outcome of negotiations with the operating company.

The ticketing system is also likely to be contracted out. The ticketing system is being procured from the Colombian firm Medina-Sinox, again without a competitive bid. Medina-Sinox provided only the turnstiles for the TransMilenia system, under sub-contract to Angelcom SA. Angelcom SA used a different sub-contractor, from France, for the software, and other suppliers for the other IT technology components, such as computers, telecommunications, etc). The smartcards were procured by TransMilenio from various card makers such as ACG, Gemplus, Schlumberger, Card USA and American Pacific at a cost of about US$1.7 per blank card, while the coding/encoding of the smart card was done by Anglecom SA.

It is likely that a further subcontract will be issued to another private company to manage the stations and the collection of revenue. The awarding of this contract is pending, and we do not believe that it has been submitted for a competitive tender. The coding/encoding of the smart cards will be done by Medina Sinox.

Extensive NGO concern about this element of the project exists, as this firm will control the revenue from the project. Normal, internationally recognized conflict of interest rules should be used, such as all decision makers with direct family relationship to any of the bidding firms should recuse themselves from the contracting decision, or the firm should be disqualified.

In the case of TransMilenio, TransMilenio's Finance Department contracted out a University to do periodic passenger counts at each of the stations to reconfirm the numbers that were being submitted by the contractor. If discrepancies were found, the contract could be revoked. TransMilenio itself is then audited annually. It is also important for TransJakarta to note that the TransMilenio fare collection system is complex and required extensive testing before implementation, as well as error-correction after implementation.

Expert advice should be solicited when designing the contracts. Transmilenio had big problems with the subcontractors for the fare system. At first, big queues formed at the stations because of problems with the system and due to shortage

of card vendors and turnstiles. The terms of reference did not give TransMilenio any recourse in the case of poor quality service provision. Recommendations by the operating design consultants that cards should be also sold outside stations and that the number of turnstiles would be insufficient to handle the projected demand were ignored by the technology consultants, leading to serious continuing problems of congestion at the entrances of Transmilenio stations.

Until budgetary authority and hence contracting authority is removed from the direct control of Dishub and placed under the auspices of a more independent authority such as TransJakarta itself, which is then given professional management, the development and operation of TransJakarta will suffer from serious coordination problems and a tendency to make sub-optimal technical decisions based on political and other considerations that do not take the public interest into account. We recommend that the Governor establish TransJakarta as a managing authority for the bus rapid transit system immediately, and vest in TransJakarta both the independent budgetary and contracting authority to manage, regulate, and plan the expansion of TransJakarta busway, and give it a talented, professional staff. TransJakarta would then be responsible for coordinating needed input – on road design, traffic management, and other topics – from the relevant agencies.

We also recommend that TransJakarta submit all future contracting to full competitive bidding so as to improve public confidence that contractors are being chosen based on their capabilities rather than other motives.

An independent accounting firm should be hired through competitive bidding that would be responsible for auditing the company contracted to collect the ticket revenues. This would address a major concern of the NGO community, the bus companies, and the press. Any public officials with any personal interest in any of the companies bidding on any of the contracts should recuse themselves from the decision-making process, and a comptroller should be asked to review the contracting for any possible conflict of interest.

IX. CONCLUSION

It is our firm conviction that TransJakarta is the best hope for solving Jakarta's growing traffic congestion and air pollution problems. It is our honor to be a part of this project.

Phase I, connecting the Blok M Bus Terminal to Kota Station, is only the first phase of a likely ten-year project. When fully implemented, TransJakarta has the potential to fundamentally transform Jakarta from a city with serious traffic problems and deteriorated public space, to a city with an excellent, modern mass transportation system serving an increasingly liveable city.

ITDP, with the help of the Municipality of Bogota, McKinsey, and other partners, hosted the visit of Governor Sutiyoso and sent many of Jakarta's leading decision makers and experts to visit the city of Bogota, Colombia, currently the world's best Bus Rapid Transit system. We then sent to Jakarta some of the world's leading experts in Bus Rapid Transit systems: experts who designed the state-of-the-art TransMilenio system in Bogota, and other systems like Curitiba, Brazil.

All the experts agree that Jakarta's wide boulevards, large number of buses, and scarcity of intersections, make Jakarta an ideal city for Bus Rapid Transit. Jakarta has the opportunity to build the best Bus Rapid Transit system in the world.

The experts also agree that because Jakarta is fairly dispersed, and many of its people's incomes are modest, that none of its main corridors have enough transit passengers to justify more expensive higher capacity rail metro systems. All of the problems that will be discussed below regarding TransJakarta would have been true also for a Jakarta Metro. The difference being that TransJakarta will be able to resolve these problems very fast, and can be profitable within the first two years. A Metro in this corridor would never be self financing and would require permanent subsidies. This is also true of the proposed monorail project. People lack the income to make the extremely expensive monorail project viable. Like the metro, the monorail would require huge government subsidies, diverting scarce public resources from projects that could more quickly and directly address the needs of the vast majority of Jakarta's people, like the rapid expansion of the TransJakarta system.

Because of the serious congestion in the Blok M – Kota corridor, and the travel time benefits that BRT enjoys over standard bus service, **TransJakarta passengers will be able to make the trip between Blok M and Kota 59 minutes faster during the peak period, and 26 minutes faster even during the off peak.**

However, when Phase I of TransJakarta first opens in early 2004, it is probably not going to be politically popular. This is because**, *initially*,** far fewer people will benefit from these increased travel speeds than will suffer in worse congestion in the mixed traffic lanes and on the cross streets. However, **this problem is temporary.** Problems of this sort are common in any project of this scope and complexity. Even in Bogota, when TransMilenio was first being constructed, traffic congestion was terrible and some groups tried to impeach the popular Mayor, Enrique Penalosa, who is now a likely candidate for President of Colombia.

The public needs to be reassured that the problems they will observe in Phase I were anticipated, and a plan exists for their resolution in a short period of time. The full plan for an extensive, integrated TransJakarta Mass Rapid Transit system should be unveiled to the public immediately so that the popular imagination can be captured, and the public becomes willing to put up with the early problems that are inevitable with any new system.

This report is an effort to provide the necessary technical support to DKI Jakarta to quickly resolve the most serious of the numerous problems they will soon face. It is also intended to help inform decision-makers, the press, stakeholders, NGOs, and the public, to give them a clearer understanding of the issues with TransJakarta that have yet to be fully resolved, and to show them how they can be easily resolved in a short period of time.

The most immediate problem will be that **traffic congestion in the mixed traffic lanes is going to get much worse for at least six months, maybe a year**. Fortunately, there will not be much congestion due to the construction itself, unlike in Bogota where traffic was snarled up for more than a year.

The congestion will occur for several reasons. First, **at a fare price of Rp.2500 without discounted transfers**, and with most private buses competing for passengers in the corridor, **TransJakarta will only attract about 2200 - 3000 passengers per peak hour in both directions**, **and will not be able to cover its operating costs.** This is fewer passengers than currently used the mixed traffic lanes. Because only 7 bus lines will be cut in the corridor, most passengers will prefer to continue to take their old bus, so that they don't have to transfer and pay again. Because most of the old buses will still be operating in the mixed traffic lanes, but will now have one fewer lane, congestion will get worse. Because the old buses stop and start all the time, at random locations, and they compete for passengers, they cause a lot of congestion and they kill a lot of pedestrians.

If TransJakarta lowers the price to Rp.2000, however, demand would increase to 4500 per peak hour both directions, and almost cover its operating costs. This would be enough to ensure that as many people are

using the TransJakarta BRT lane as are currently using the mixed traffic lane. However, congestion will still get worse in the mixed traffic lanes, because the old bus lines will continue their old routes in the mixed traffic lanes.

Ultimately, the Blok M – Kota corridor alone is too short to be financially or economically sustainable and self-financing. Our analysis shows that **TransJakarta will need a system of at least 25 km to give the necessary productivity and performance to be financially sustainable.**

Within one year, however, **most of the buses** in the mixed traffic lanes, and many more bus routes, **could be modernized and moved into the TransJakarta BRT lane**. There, they will no longer congest the mixed traffic lanes, and they will behave in an orderly fashion, reducing pedestrian fatalities.

For this to happen fast, however, many of **the existing bus lines operating in the corridor should be converted to some 13 – 16 feeder bus lines**. Many of these lines could be eventually upgraded to full trunk line service. We estimate that converting these bus lines to feeder buses would increase demand in the corridor to from 3200 to 9000 for the peak period both directions, depending on the fare and the cost of the transfer.

Furthermore, the second TransJakarta line, East –West from Harmoni to Pulo Gebang, needs to be constructed as quickly as possible. While the operational scenario for this line has yet to be fully developed, a crude estimate is that TransJakarta's total demand for both lines could reach between 10,000 and 35,000 for both directions at peak hour, depending on the fare pricing structure.

At these levels of demand on TransJakarta, the mixed traffic lanes along the Blok M – Kota corridor will begin to substantially decongest, as more and more of the existing buses in the corridor are removed from the mixed traffic lanes and replaced with TransJakarta buses.

Until this happens, however, congestion will get worse. The congestion problem will be further aggravated unless some of the key **intersections and traffic lights to deal with the more complicated signalling needs of a busway**. Until they are fixed, the intersections are likely to be more congested.

To mitigate these problems, DKI Jakarta will be implementing an extension of the Three-In-One vehicle restriction in the corridor to also include the afternoon hours, to help alleviate the short term congestion. Congestion charging and odd-even license plate restrictions are also being considered.

Once the changes recommended in this report are made, however, not only will TransJakarta be able to fully cover its operating costs, it will be

profitable and should be able to operate without subsidies even for the bus procurement. This could all easily be done within six months to one year.

If feeder bus lines are merely cut and passengers have to transfer, many public transit passengers will have to pay two or even three times for a trip they used to only pay once for. This problem can easily be solved by creating TransJakarta feeder buses that operate on and off the bus corridor and discharge passengers into the pre-paid TransJakarta bus stations. It could also be solved with a smart-card ticketing system, or other measures. **The problem has not yet been resolved, however.**

If the demand for TransJakarta can be increased to successful levels, then the current infrastructure design of the corridor will be unable to handle the demand. The **maximum volume of passengers per direction per peak hour of the currently designed busway is less than 3400. By adding more buses, the maximum capacity of the currently designed busway can be increased to about 8000 passengers per direction per hour at a reasonable operating speed of 15kph. Above this level, operating speeds begin to fall dramatically, and the advantages of the busway are lost.**

In order to handle the level of demand that will be generated with the recommended modifications for Phase II, **TransJakarta should consider the following recommendations:**

- **constructing a passing lane at each bus stop**. There is sufficient right of way to do this all along the corridor without further restricting capacity on the mixed traffic lanes.
- **having two adjacent bus stops at each bus stop location, rather than just one**. This is because capacity restrictions in busways are always at the bus stops, and because overcrowding at the bus stops will occur in some locations otherwise. This would generate enough capacity for all the transit trips in the corridor.
- **As an alternative to having two bus stops, consider procuring larger, articulated buses, and extend the existing stations to have two bus bays instead of just one**. For this option, the capacity will be lower, but perhaps sufficient. Combining both larger buses, larger stops, a passing lane, and two bus stops, would give the corridor as much capacity as it will ever need.

Other problems also will need attention in 2004. If the busway is successful, there will be a lot more pedestrians walking along and to the Blok M- Kota TransJakarta bus corridor. Yet the pedestrian facilities in the corridor are still of fairly poor design from a safety point of view. Most serious are the pedestrian conditions at the Kota Station and at the Blok M Bus Terminal, but along the corridor there are many problems as well. Some of the pedestrian overpasses

are still quite narrow, fairly old, needlessly far off the ground, and may not be strong enough able to handle large numbers of pedestrians. **Jakarta should change the ordinance requiring such excessive height in its pedestrian overpasses, and construct lower overpasses.** Furthermore, the access ramps will obstruct the sidewalks in places, requiring the **widening of sidewalks**. Plenty of right of way exists to do this without disrupting traffic flow in most locations.

Jakarta could benefit from changing the TransJakarta pedestrian access from pedestrian overpasses to at grade in some locations, particularly for the Glodok area to Kota Station, and at Al Azhar Mosque. The entire streetscape from Glodok to Kota Station could be completely reconstructed with dramatically improved pedestrian space, tightly controlled parking, and world-class landscaping, in an effort to revitalize this badly deteriorating urban corridor.

Reaching the busway will still remain a problem for many people. Incorporating secure bicycle parking at some TransJakarta stations on an experimental basis should be tried, to help increase accessibility. Designing waiting locations for Bajaj, taxi, and other forms of paratransit, and designated locations for vendors, into the sidewalk/streetscape, will improve pedestrian flow, pedestrian safety and traffic flow.

Finally, there are some critical institutional issues. **DKI Jakarta needs to establish TransJakarta as an operating agency with planning and contracting powers**. Right now, separate work done under various municipal government departments is sometimes poorly coordinated, and contracting decisions are made by those with control over the budget rather than those with the clearest understanding of the technical needs of the project.

The procedures in which TransJakarta contracts out trunk line bus operations, feeder bus operations, construction contracts, planning contracts, public relations contracts, and legal **contracts should be made transparent and subjected to competitive bidding.**

While existing private bus operators should have a chance to benefit from the superior profitability that TransJakarta offers, and encouraged to participate fully in order to avoid their opposition, they should also be expected to reach quality performance standards, and their rights to operate in a specific corridor should not be permanent but should be revocable for non-performance.

The public continues to distrust the motives of the Government. Until clear contracting rules are established, and a transparent competitive bidding process is established, and it is clear that the revenues from the project will be used for the public good, the public is going to mistrust the motives of the DKI Jakarta

government. Until these rules of the game are clearly established, the public is not going to fully support the project or believe that it is truly in their interest.

This report, which compiles the opinion of some of the leading international transportation experts, finally wishes to emphasize that while there will be significant problems when the system first opens, they can all be readily resolved. The Governor and all people who care to see Jakarta's traffic problems solved need to move quickly to address these problems, firm in their resolve to move boldly forward.

ANNEX I: Methodological Review of Current Traffic Modelling at UI CTS for Busway Operational Design, and Required Next Steps

Currently, there are, to our knowledge, two sources of existing traffic modelling capacity in Jakarta. One is at the University of Indonesia's Center for Transportation Studies (UI CTS). The other is at the consulting company Pamintory Cipta. From our understanding, Pamintori has a functioning traffic model (TranPlan) with extensive traffic counts based on their traffic impact assessment work done for various developers, but this data is treated as proprietary by Pamintori's clients, so we have not seen it. TranPlan was developed primarily for analysis of private vehicular traffic and road system planning, and is fairly limited in terms of public transit modelling capacity. Their traffic model was also based on a very old origin-destination (OD) survey data. UI CTS had access to recent (2000) OD data collected under JICA's SITRAM project, as they were a subcontractor to both Bappenas and to DKI Jakarta's DisHub for the development of the Jakarta Transportation Network Plan. They were also using EMME II, which is much better for multi-modal traffic analysis. For this reason, we worked more closely with UI CTS. As such, we have a much clearer idea of their modelling capacity than we do of the capacity of Pamintori. The review below is only focused on the status of modelling at UI CTS, using EMME II, a good model for use with transit modelling.

1. TRIP MATRIX

All available data right now are from the JICA origin and destination home interview survey, completed in 2000.

The data has some important irregularities which have not yet been fully explained or corrected with field measurements.

This matrix shows a total of 37 million trips per day for the entire Greater Jakarta region. From these trips 18 million are trips that begin or end in Jakarta with 16 million internal to (both beginning and ending in) Jakarta. The cities that interact more with Jakarta are Bekasi (566 thousand trips), Tangerang (555 thousand trips) and Depok (355 thousand trips).

The majority of the trips are internal to each region as shown in the following:

	Destination						
Origin	Bekasi	Bogor	Depok	Jakarta	Tangerang	Others	Grand Total
Bekasi	4784536	29904	20743	571420	17344	26807	5450754
Bogor	29209	5460562	95237	146661	30531	23021	5785221
Depok	19729	95305	1588946	357895	28532	7076	2097483
Jakarta	566438	141097	354562	16400461	555046	56410	18074015

Tangerang	16726	29372	28067	561387	5144016	14945	5794512
Others	24662	21713	6590	51513	13688	5687	123853
Grand Total	5441299	5777952	2094145	18089338	5789157	133947	37325838

Figure 90: Origin and Destination Matrix for Greater Jakarta Region

According to data from the University of Indonesia, the population of the Greater Jakarta Region is 18 million inhabitants. Using these data, rate of mobility is 2.07 trips per person. This is reasonable.

Income Group	Population	%
<1000 Rp	6687055	37,14%
1000 to 4000 Rp	9581618	53,21%
>4000 Rp	1629827	9,05%
Unknown	108815	0,60%
Total	18007315	100,00%

Figure 91: Population by Income Group

Looking into the sample, indicators of number of trips per person surveyed also seem reasonable as shown in the following table:

Number of Households Surveyed	133955
Number of Persons Surveyed	279738
Total Number of Trips	627953
Average Number of Trips per Person	2,24
Average Number of Trips per Household	4,69

Figure 92: Number of trips per person, Greater Jakarta Region

Buses are the main mode of transportation in the Great Jakarta region. Data from JICA Origin and Destination matrix show that 52% of the trips in the morning peak are made by bus, although buses use less than 5% of the road space for circulation.

Numbers like this and the characteristics of the main streets show a high potential for implementing bus rapid transit corridors with very low investment as compared with other high capacity systems as monorail, light rail or metro.

Mode	Trips/1000 AM 2 hours peak period	%
Motorcycle	1358	22,9%
Car	664	11,2%
Taxi	10	0,2%
Bajaj	339	5,7%
Bus	3091	52,2%
Company Bus	158	2,7%
Rail	117	2,0%
Others	189	3,2%
Total	5926	100,0%

Figure 93: Trips by mode in the AM Peak Period (6 to 8 AM)

Trips by purpose in the morning peak, however, show an inordinate number of trips to school. Generally trips to work outnumber trips to school in the morning. This indicates a probable error.

Purpose	Thousands of Trips	%
Work	1322	43,0%
School	1338	43,5%
Others	415	13,5%
	3075	100,0%

Figure 94: Trips by purpose in the AM peak period (6 to 8 AM)

Trips in the AM peak hour are 17% of the total daily trips. This is very unusual, and does not correlate with some sport surveying. Normally peak hour trip volume is between 10 and 13% of the daily total. This needs to be verified very carefully because it can lead to false assumptions about the level of daily demand.

It was noted also a high number of small length trips in the matrix. It needs to be studied very carefully in order to assess what the pattern of the trips is actually.

When we ran a trip assignment, the projected traffic volumes are much higher than the ones observed in direct traffic counts. There could be two reasons for this. First, it could be that the number of origin destination trips is exaggerated in the matrix, or it could be that the base road network in the traffic model does not include all the important roads, so an accurate number of trips are being assigned to a more limited base road network than actually exists.

Until these problems are fixed, the demand estimates of the traffic modeling will be open to serious question.

A comprehensive validation study of the matrix needs to be done considering the following:

1. Check OD totals
2. Check OD expansion factors
3. Daily distribution of trips
4. Trip generation by income level
5. Trip generation by purpose
6. Trip generation by mode
7. Number of home based trips per person by zone in the morning peak and in the evening peak by purpose
8. Do the same by mode and income level
9. Test the structure of the matrix
10. Check number of intrazonal trips (they should be around 10% unless the zones are too big)
11. Check time distribution
12. Make comparisons of trip assignment with traffic counts

All these analysis will conduct to corrections and adjustments on the matrix. But to do the adjustments it is necessary to have a calibrated network first.

2. NETWORK DATA AND MODELING PROCESS

i. Actual Network

The base network model is still in a phase of development. Our consultants found several serious mistakes in the network, such as incorrect link lengths, incorrect positioning of zone centroids, incorrect speeds, and lack of link connectors where they exist.

Several tasks need to be performed to correct the network:

- Check and redefine links length with the help of GIS software
- Relocate the zone centroids with help of the GIS considering population density
- Increase the number of link connectors according with the size of the zones

ii. Transit lines definition

Transit line definitions are not complete in the model. Small bus lines were not considered and itineraries did not consider independently

the two directions of the lines. Frequencies were just general data and do not have anything to do with observed frequencies. Our consultants were told that small bus lines were excluded from the model because they are not very important, but data show that more than 70% of the trips are made in small buses as shown in the table below.

Bus Type	AM peak Thousand of trips	%
AC Bus	109	3,4%
Long Bus	312	9,8%
Medium Bus	514	16,2%
Small Bus	2244	70,6%
Total	3179	100,0%

Figure 95: Number of trips made in small buses during the AM peak (6 to 8 AM)

Considerable work remains to be done before a proper network can be completed:

- All transit lines have to be recoded with each direction coded independently
- All bus lines including for small buses need to be coded into the network
- Transit lines that are not operational need to be excluded from the network
- Observed bus line frequencies need to replace scheduled line frequencies, based on survey data.
- Total frequencies need to be checked against observed data
- The connectivity of the network needs to be checked.

iii. Calibration

After performing all tasks listed above, it is necessary to calibrate the network.

The assignment procedure has been defined in the macro assignment

The value of time is 1/3 of the mean income by category weighted by the corresponding demand. The mean value of time is then 3531 Rp per hour, which is equivalent to 16.99 minutes per 1000 Rp.

	Rp/hour	1/3 value	Demand 2h	%
Income1	3500	1155	1405476	44.7%
Income2	14800	4884	1597767	50.8%
Income3	35500	11715	143826	4.6%

Figure 96: Estimated value of time by income

This value is considered in the assignment to calculate the generalized cost of trips.

To calibrate the network we need more data:

- Bus frequencies and volume of passengers by type of bus in points of the structural network where no data are available
- Observed bus speeds in the main network (do new surveys to complement available data)
- Passenger counts on railway stations (boarding and alighting passengers per station)
- Represent the fare structure by distance for the railway
- Represent the location of existing bus terminals

It is advisable to calibrate the network with capacity restraint assignment.

Calibration is done by comparison with model volumes with traffic and passenger counts.

iv. Future network

Future network must be coded only after having the present network calibrated.

It will be necessary to check:

- Busway continuity
- Link length for the busways
- Link coordinates in the model
- Intersection between corridors
- Exact location of busway stations
- Define connections to centroids
- Define transfer links
- Represent adequately fare structure alternatives

The representation of the proposed busways in the model need to be defined considering the different fare systems which are to be tested, according to scenarios.

The best way is to adopt a more complex representation for the base network which can easily be used for other alternative scenarios.

Globally, fares cannot be defined on nodes of future busways because of the free transfer system. Fares should be included on access links of the system and/or transfer links on the actual network, defining a specific mode with a time equivalence of fare that can vary automatically changing attributes in macros.

Proposed location of stations have to be identified in the model, to permit boarding & alighting only in those points, considering the characteristics for accessibility.

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ANNEX II: Letter to Governor Sutiyoso – August 31, 2003

H.E. Governor Sutiyoso
Governor of DKI Jakarta

Re: Recommendations of Consultants Custodio & Szasz

Dear Hon. Governor Sutiyoso:

One month ago, we had the pleasure to send the two most highly experienced bus rapid transit consultants in the world to review progress on the Jakarta busway. Their findings are hopeful, but also raise some serious concerns.

On the positive side, the physical dimensions of Jakarta's busway corridor are excellent for an express busway corridor. By adding a passing lane at the bus shelters, TransJakarta's single lane busway can handle all of the bus passengers in the corridor, without compromising mixed traffic lanes. Because of the serious traffic jams in the corridor, great potential exists for dramatically reducing congestion for motorists while also dramatically improving bus service. In other words, TransJakarta has the potential of being one of the best bus rapid transit systems in the world.

In order to achieve this success, our experts felt it critical to draw attention to a few key issues. First, for the project to be a success, most of the bus passengers in the corridor need to use the busway. If most buses and bus passengers continue to use the mixed traffic lanes, they will make congestion worse that it currently is.

The current plan, to cancel only 7 bus routes in the busway corridor and to allow the remaining existing buses to operate in the remaining mixed traffic lanes, will not work. More than ¾ of the bus passengers using Sudirman/Thamrin are neither stopping nor starting their trip on the bus corridor. They are not likely to willingly change to special buses on the busway, because they will have to pay twice or even three times, and wait for another bus. This means that only ¼ of bus passengers will enjoy the benefits of the busway, while the remaining buses will be making congestion worse for the rest of the

motorists. As a result, the busway, as it is currently designed, is likely to be highly unpopular.

If TransJakarta does put almost all of the bus passengers in the busway, however, it will need to increase the number of buses using the corridor and change the type of bus that will use the corridor. The current plan to use only 60 special buses will not be enough to handle even ¼ of the total public transit trips in the corridor.

Our experts recommend the following measures:

First, Jakarta needs to develop a detailed operational design to identify those bus routes that operate a key portion of their route in the new busway corridor. All these bus routes should be allowed to operate inside the busway corridor. Some bus routes may also need to be changed. This means that a lot of bus routes will operate on the busway for part of their trip, and off the busway for part of their trip. Otherwise, passengers will have to make a lot of transfers, which will be expensive and inconvenient.

For this to work, the private operators will have to procure buses that have doors that can be operated both in the busway and on normal streets. Ideally, the buses that run on the corridor should be at least a 12 m buses, or articulated buses, with 3 doors on the right hand side and two doors on the left hand side. It would be best if these buses were primarily procured by the bus companies selected to operate in the bus corridor, though some form of subsidy could be developed.

For this to work, three things need to be done right away. First, Jakarta needs to develop immediately a detailed operation design. This design must settle the question of which are the best bus routes to allow to use the busway corridor, and to determine if some bus routes might need to be changed.

In order to do this, Jakarta will need more data about existing bus routes and stronger modeling capacity than exists. The University of Indonesia has a good model, but it needs to be upgraded with more detailed data. ITDP is willing to cover the costs of upgrading their computer software, but we do not have funds for the additional data collection. This can be done quickly, within three months. This would also be best done in close cooperation with the private bus operators.

When this is completed, a financial analysis/business plan will need to be completed quickly based on its results. This is critical if the bus operators are to get involved in any investments. The bus operators will not be willing to invest if they do not have a credible financial analysis, and a financial analysis will depend on the operational design being completed.

Secondly, the technical specifications of the bus to be procured need to be changed, and the number of buses matching these specifications needs to be increased. This has to be

done in cooperation with potential private operators. We understand that this will cause delays, but we feel delay is better than project failure.

With this type of busway, the system will work well from the beginning but can be gradually upgraded and made an enclosed system like TransMilenio as more corridors are implemented with transfer terminals and more control over the system develops.

Finally, the experts felt that the management of the project still needs to be strengthened. Because a secretariat for the busway project has not yet been established, Assistant Secretary Irzal doesn't have the necessary support to coordinate and to monitor the preparation of the project on a daily basis. Jakarta still has no employees dedicated to developing this busway full-time with no other administrative tasks. This resulted in poor cooperation and communication within the busway team which is slowing down progress.

While we understand that the administrations intention is to implement the busway by end of 2003, we feel, given the remaining obstacles, that to rush ahead in an attempt to meet this deadline without having settled properly the above mentioned issues, will result in project failure.

However, if these matters are properly addressed, our consultants have emphasized that Jakarta has the potential of developing not only the best corridor but the best bus system in the world, much better than Transmilenio.

Our Institute, the Institute for Transportation and Development Policy, continues to provide technical help to DKI Jakarta as a result of support from US AID. Our credibility as technical experts depends on the fact that we have no vested interest in your decision other than project success. The US does not manufacture buses, nor are the technical experts we have sent primarily from the US, and our program officers have emphasized that they are only interested in the project's success, as a gesture of goodwill between the US and Indonesia.

Our ability to continue to provide technical support to this project depends, however, on your willingness to make a decision regarding the above matters. We hope to hear a decision from you shortly so that we can continue to bring you the best technical expertise available worldwide.

Sincerely

Dr. Walter Hook
Executive Director, ITDP

ITDP
Institute for Transportation & Development Policy

ANNEX III: Letter to Gov. Sutiyoso, Feb. 17, 2003

Hon. Governor Sutiyoso
Governor of DKI Jakarta
Re: Outcomes of Visit to Bogota and Quito by Jakarta Technical Team
Date: February 17, 2003

Dear Hon. Governor Sutiyoso;

On behalf of the Institute for Transportation and Development Policy, I would like to thank the Municipality of Jakarta for sending several of its personnel to study the bus rapid transit systems in Bogota and Quito.

Based on this visit, ITDP would like to clarify its recommendations to the City of Jakarta in terms of developing its own BRT system. This letter is also intended to serve as input into a report being prepared by the representatives of Dinas Perhubungan regarding the results of their Bogota and Quito site visits. We would also like to identify in this letter the minimum level of commitment from DKI Jakarta that ITDP feels is necessary for a positive outcome in the BRT project, and hence for continued technical support from ITDP.

Staffing

The development of a successful Bus Rapid Transit BRT system can be done quickly, but not without a large number of people working extremely hard all the time. This could be done by government employees or can be contracted out to private firms, or both, but either way the numbers must begin with at least the full time work of half a dozen staff members, and must rise quickly over the course of the first year to perhaps as many as 50 people to cover all aspects. International consultants with experience are likely to do the best job, but are also more expensive. Bogota Municipality spent several million US on the planning and design of TransMilenio in the first year. They began with four high level people to work full time for the Government on the BRT, and full time dedicated government staff rose to over 20 after the first year. The team was appointed and worked directly under the Bogota mayor and was empowered to have access to all resources and institutions necessary

for successful development of the BRT. These government employees in turn subcontracted large areas of work to private consulting firms, including:

a) a management consulting firm (McKinsey & Company), which had initially a staff of 12 that also rose to 20.
b) An engineering firm (Steer Davies Gleave) who assigned a team of similar size,
c) A legal consulting firm, hired domestically, and
d) A marketing firm, also hired locally.

In Quito, the planning, engineering, and legal work were conducted primarily in house under the aegis of the City Planning Office. The marginal cost of re-assigning existing government employees to work on the BRT system was much lower than would have been the case had international experts been hired, but the results are also less impressive.

Given the lack of BRT expertise and the lack of inter-departmental coordination in Jakarta, the Governor would be well advised not to try and save money on consultants.

It should first assign at least four persons of high status and quality to function as the de-facto bus transit authority, and these four persons should be given responsibility for the planning and contracting of the BRT systems development. The public agency responsible for implementing this project should be created as a legal entity allowed to enter into contracts. The creation of this legal entity should begin now, but the work on planning the BRT system should commence now also, prior to the creation of any new legal entity.

Second, Jakarta should plan and design a high quality BRT system using the best people that it can afford. We would suggest either assigning existing government staff and departments the following work, or drafting a terms of reference for four separate contracts to private entities:

a. A business plan for the Jakarta BRT. (McKinsey, TransMilenio, and others should be considered)
b. Engineering and design of at least three pilot BRT corridors (Steer Davies Gleave, TransMilenio, and Ceasar Arias of Quito should be considered, along with a local partner or partners)
c. A legal study (hired locally)
d. A marketing and public relations campaign (hired locally)

Based on International Experience, ITDP is prepared to help draft the by-laws of this new public agency, help draft the Terms of Reference for these sub-contacts, help identify possible bidders for these sub-contracts, and help judge the bids on their merits, as satisfies your wishes. ITDP is also willing to partially contribute to the costs of these consultants, within the limitations of our budget.

Institutional Structure

Based on our visits to Bogota and Quito, it is clear that the success of TransMilenio is not only because the system is well engineered and constructed, but also because the operation of TransMilenio is structured to minimize graft, to avoid the creation of powerful private monopolies, to ensure the system provides incentives for good quality service and system maintenance, minimize pedestrian injuries, and to minimize the expenses to the government. While Jakarta need not copy exactly the structure of TransMilenio, we recommend it adopt the following:

a. Bus operations in the BRT corridor should not be done directly by the government or PPD, but should be contracted out to private operators. These private operators should be selected from consortiums which include existing private operators in the corridor. Only in this way will the existing bus operators support the BRT system.
b. The concession for operating in the corridor should not be given to only one bus operator, but should be given to two or three consortiums.
c. The collection of the farebox revenue should be done by a separate contract with a private fare collection company who will be responsible for managing the trust fund. Mechanisms for ensuring transparency of this process must be put into place to safeguard public confidence in the project.
d. The public authority should pay the private bus consortiums based on the number of kilometers they have traveled rather than based on the number of passengers to avoid dangerous competition for passengers. Only this structure will allow competition between more than one operator in the same corridor. This can be verified by a GPS system or by manual verification methods.
e. The procurement of buses should be done by the private concession bus operators in line with technical specifications developed by the public transit authority. Government control over the bus concession process will dramatically increase bus cost, and will open the door to corruption.

ITDP is currently translating all of the tendering and concession agreements from the TransMilenio system into English for your review.

System Design

a. A minimum of 70% of the existing public transit trips in the Blok M-Kota corridor should be diverted to using the BRT system. This will require a system of much higher capacity than is currently planned.
b. The buses selected will need to be large, articulated buses at a minimum.
c. If there is only one exclusive lane for the busway, there should at least be two lanes at the bus stations, allowing express bus routes to bypass local bus stations. Two full bus lanes in each direction would be ideal.

d. The stations and pedestrian overpasses must be designed to accommodate a much larger flow of passengers than current designs allow.
e. Careful integration with much improved pedestrian facilities for reaching the station must be integrated into system design. Access by bicycle should also be considered.
f. Traffic signal prioritization for the buses at the intersections should be considered. Bus-only tunnels under major intersections might also be explored.
g. The roadbed should probably be reconstructed out of durable concrete as asphalt will tend to sink under the weight of heavier articulated buses. Roads in Jakarta already must be reconstructed every other year, and if a bus corridor needs to be reconstructed so frequently it will have enormous costs in terms of disruption of service. As a minimum, the surface adjacent to the stations should be rebuilt out of concrete.
h. If 70% of the trips in the corridor are going to be diverted to the busway, a system of free feeder buses will need to be integrated into system design. Free feeder buses should be also contracted out to private consortiums but paid on a per passenger basis.
i. The bus stations should be physically closed and passengers should pay their bus fare when entering the station, not when getting onto the bus. The design should allow for the passage of cool air through the station while minimizing noise.
j. The articulated buses should have at least four pairs of large double doors that open simultaneously.
k. The buses should have emission standards of at least Euro II, or preferably Euro III. We suspect Jakarta will save itself a lot of headaches by going with diesel.
l. A location for bus terminals at either one end or both end of the corridor where BRT buses can be parked, serviced, cleaned, and fuelled, needs to be identified and funds made available for its development.
m. Bus operators, citizens groups, and the press should be involved in a transparent and flexible planning process.
n. The system should be designed to ensure that ongoing operating subsidies are not necessary.

Inter-Institutional Issues

There is already a considerable amount of research that has gone into the Blok M-Kota corridor. The BRT team needs to be empowered to have access to all of the data they need. This requires the BRT team to have access to all of the relevant studies done thus far, including all planning documents for the MRT previously planned in the same corridor, the JICA OD surveys and other related surveys in the corridor, existing base maps for the corridor, police accident data in the corridor, available information on parking availability in the corridor, and other basic information. The BRT team will need the full support of the governor to consolidate access to all the necessary information for finalizing the plans.

The above represents the recommendation of ITDP. We are prepared to continue to support DKI Jakarta in the development of their busway system regardless of the

decisions that it may make regarding the items listed above. However, without adequate staffing and inter-agency coordination, we do not see how the project can have a positive outcome. As we would not ultimately want to involve the US Government in a project for which we lacked technical confidence in its success, we reserve the right to withdraw our project support should substantive progress towards the creation of the necessary project staffing not be in place prior to May 1, 2003.

Sincerely,

Dr. Walter Hook,
Executive Director, ITDP