Better CHEAPER *Faster*

PENANG TRANSPORT MASTER PLAN

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Penang Forum
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Contents

Executive Summary

Penang state government working in partnership with civil society commissioned the Halcrow Transport Master Plan in May 2011 to develop a holistic transportation plan for the state of Penang. The main purpose of the TMP is to shift demand for transport from car traffic to public transport. All strategies and measures should be guided by this overall objective.

However, in moving towards implementation, in what has been termed the 'Big Bang' approach, both South Reclamation Scheme (SRS) and Zenith BUCG have to come to the table with their differing expertise. As a result we are losing sight of the aims of the original plan and it is time now to return to first principles.

Shortcomings of SRS/Zenith BUCG proposals

- Lacking a vision for the future of Penang and are trapped in an old paradigm;
- Based on questionable population and ridership projections;
- Proposes too many and poorly integrated modes of public transport;
- Under-emphasises short-term & more cost effective measures;
- A distinct lack of transparency; on the part of the government
- Questions need to be asked about conflicts of interest.

We need to ask ourselves why have we deviated so much from Halcrow's Transport Master Plan?

- Why has the state not implemented Halcrow's Short Term Strategies?
- What happened to the Halcrow Highway Improvement Plan?
- What happened to the Traffic Reduction Strategy?
- What happened to the funding proposed by Halcrow for pedestrian & cycling infrastructure, water transport, feeder buses and taxis?
- Why has there been no follow-up of recommendations to improve technical competence in government?

What are the financial implications of the 'Big Bang' approach?

The SRS/Zenith proposal today is projected to cost RM46 billion, up from RM27 billion in the Halcrow Plan. These are only the construction costs. It is easy to build but difficult to successfully manage projects financially. The yearly annual operating and maintenance costs have not been taken into account and they can make or break a project. Taking the George Town – Bayan Lepas LRT line alone, as an illustration, we project the state can face huge financial deficits depending on the level of ridership compared to trams that are cheaper to operate. If we add up the annual operating costs of all the other proposed monorails, LRT, tram, BRT and highways, we could be staring at several hundred million ringgit of financial deficits for the state. The question is, what are the short-term and long-term financial implications of this 'Big Bang' approach for Penang? We should learn from the financial difficulties of the KL LRT and monorail projects.

What's the alternative?

We propose a holistic-incremental approach based on the following 5 principles:

- Principle 1: Cut your shirt according to your cloth;
- Principle 2: Adopt a sustainable financial model;
- Principle 3: One step at a time - an incremental approach;
- Principle 4: Prioritise public transport;
- Principle 5: Evidence based policy and far sighted leadership.

Better, cheaper, faster

Our Better, Cheaper, Faster strategy returns to the recommendations of Halcrow and proposes a combination of modern trams and Bus Rapid Transit.

Our fundamental premise is that the main purpose of the TMP is to shift demand for transport from car traffic to public transport. All strategies and measures should be guided by this overarching objective.

On the island a single, integrated modern tram based public transport system will allow vehicles to travel anywhere on the network, thereby increasing connectivity and accessibility. A system of mixed grade and elevated running rail would keep the large scale infrastructure to a minimum, significantly reducing construction cost and time along with the associated negative impacts (social, economic). A much more comprehensive BRT system is proposed for the mainland, linking the major urban areas of the mainland with key connectivity points in the system, strengthening linkages between the island and the mainland. By creating an exclusive, segregated right of way for the BRT, it becomes very simple in the future to expand the tram network onto the mainland, giving Penang one single public transit system. So eventually one could board a tram in Butterworth and alight in Tanjung Tokong, or board a tram at the airport and alight in Raja Uda.

Better

- Because it is more accessible for all;
- Has a smaller footprint and is friendlier to the environment;
- Is quieter and produces less vibrations;
- Is flexible and much easier to expand in the future.

Cheaper

- A modern tram and BRT system is no more than half the price to build, saving up to RM16bn of our money;
- A modern tram and BRT system is two to three times cheaper to operate and maintain, saving your children from having to bail it out in the future;
- The network will be cheaper to expand on the island and to the mainland.

Faster

- A modern tram and BRT system is twice as fast to construct and can be built on the island and the mainland at the same time; [1]
- A system built twice as fast means half the disruption to daily life;
- A system which is half the price can be built far quicker, meaning no need to wait until 2030 for SRS to get round to completing their proposal.

[1] Neither the Raja Uda to Bukit Mertajam Monorail or the Butterworth to Simpang Ampat BRT have any committed timeline in the SRS RFP proposal.

Introduction

The people of Penang have been presented with the South Reclamation Scheme (SRS) proposal and the Zenith BUCG plan that will change our lives in a big way. Investment in transport infrastructure, if conceived and carried out well can have significant positive impacts, if done badly can have hugely negative and irreversible consequences.

The Penang state government is proposing to reclaim over 4,000 acres of land in order to finance the RM46bn Penang Transport Master Plan (PTMP) (however land sales after reclamation costs are only estimated by the SRS Consortium to generate RM28bn). It is touted as the 'Big Bang' approach to solving Penang's traffic congestion woes. It combines seven modes of transportation – roads, LRT, monorail, tram, Bus Rapid Transit/feeder buses, cable cars and water transportation.

To its credit, the Penang state government has made effort to engage the public through a series of briefing sessions and has created a public information website,[2] however actual information is very limited, and access to the extensive studies conducted remains inadequate. Civil society has urged the government to release as soon as possible the full reports produced by the SRS and Zenith BUCG Consortiums to allow more in-depth analysis and discussion with the public.

Penang Forum has taken the initiative to produce this report with the purpose of encouraging greater public discussion on a topic of utmost significance.

This report is structured as follows:

- A brief history of the PTMP;
- Returning to basic principles of sustainable mobility;
- Shortcomings and flaws of the SRS proposal;
- Elements of the Halcrow plan have been neglected or cast aside;
- Financial implications of the 'Big Bang' approach;
- An alternative vision: better, cheaper and faster.

A brief history

It must be made clear from the start that civil society is not against the concept of a transport master plan for Penang. In fact it was civil society that recommended this idea to the newly elected Pakatan government. In January 2009, the state government established the Penang Transport Council (PTC) consisting of about a dozen professionals from civil society. The PTC among other things worked on the terms of reference for engaging a transport consultant to produce a comprehensive transport master plan.

In May 2011, Halcrow, a consultancy specialised in the provision of planning, design and management services for infrastructure development were appointed to deliver a RM3.2m study[3] (in partnership with AJC and Singapore cruise consultants) to provide a transport plan to cover a period of twenty years (2010-2030). However before the Halcrow Plan even began, Penang state government signed a Memorandum of Understanding (MOU) with the Beijing Urban Construction Group Co.Ltd (BUCG) on 28 April 2011, to build a package of three roads and an undersea tunnel worth about RM6.3 billion. BUCG joined with Zenith Construction Sdn Bhd and Juteras Sdn Bhd, to form the Zenith BUCG Consortium.

[2] See http://pgmasterplan.penang.gov.my/

[3] Penang Transport Master Plan tender awarded, http://anilnetto.com/society/public-transport/penang-transport-master-plan-tender-awarded/

The Halcrow report was completed in December 2012 and officially adopted by the Penang state government in March 2013 as the blueprint for implementation (referred to from here on as the Halcrow Plan).

In August 2014, a Request for Proposal (RFP) was called for a Project Delivery Partner (PDP) to submit proposals for the delivery of the Halcrow Plan. The role of a PDP is to manage the implementation of the master plan and to guarantee its timely and acceptable completion, for which a fee as a percentage of the total project is paid.

In February 2015, six bidders submitted their proposals using the Halcrow Plan as the basis. In August 2015, the SRS consortium who submitted an alternative proposal was selected to be the prospective PDP. The SRS Consortium is made up of Gamuda (60%) an engineering, property and construction company, Ideal Properties (20%) and Loh Phoy Yen (20%), both local developers.

Starting in December 2015, the state government and SRS Consortium began giving a series of briefing sessions to stakeholder groups and members of public on the alternative proposal. The Penang state government plans to sign the PDP agreement with SRS by the end of 2016.

Returning to first principles

The Halcrow Transport Master Plan began life as a holistic transportation plan for the state of Penang. It was however only a conceptual plan. In moving towards implementation, both SRS and Zenith BUCG consortiums have to come to the table with their differing expertise. We are however losing sight of the aims of the original plan.

The Halcrow Transport Master Plan was commissioned to:

- Adopt a holistic and balanced approach to resolving transportation issues, adopting a paradigm shift towards “moving people not cars”;
- Build a well-connected road network for efficient vehicular traffic dispersal, bearing in mind the need to also implement measures to reduce vehicular traffic activities in urban centers;
- Integrate the different public transport modes and improve accessibility and provide users a seamless travel experience;
- Make roads safe and user-friendly for all (pedestrians, cyclists, motorcyclists, the elderly and disabled community);
- Identify public transport projects to move towards a modal split of 40 percent for public transport usage and 60 percent for private car usage in urban areas, in line with the national aspiration;
- Ensure transport needs are well planned and integrated with current and future land use;
- Improve water transport connectivity between the island and mainland.

We should return to these fundamental principles in our consideration of both SRS and Zenith BUCG consortium proposals, assessing to what extent the current proposals address the needs that were set out.

Shortcomings of the SRS/Zenith BUCG proposals

1. Lacking vision and trapped in an old paradigm

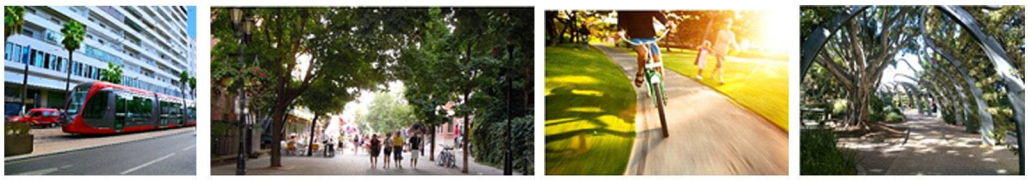
Our first concern is that the SRS/Zenith BUCG proposals lack vision and are still car-centric. These proposals are being touted as a plan for Penang until 2065 - the next 50 years. Yet they are trapped in 20th century technology and approaches to planning. They propose obsolete solutions to Penang's transport problems, while simultaneously ignoring the latest developments in mass transit planning around the world which are addressing carbon reduction targets in the context of climate change.

Progressive cities are now taking steps to constrain rather than cater to private vehicles entering into cities, greening and removing highways, aiming to drastically reduce if not achieve zero carbon emissions and investing in new technologies for electric and automated shared transport. Yet, our priority seems to be building more roads and tunnels to cater to 20th century model of everybody owning private vehicles.

The purpose of building public transport is to reduce, not encourage, private vehicle usage. Even the new mayor of a car-centric city like Houston, Sylvester Turner, recently acknowledged that widening one of the city's main highways to 26 lanes at a cost of RM10bn (US$2.6bn) only increased traffic and made congestion worse! He, and many others have called for a paradigm shift – away from road building towards public and sustainable transport modes with a need to discourage single-occupancy polluting vehicles. Close to home, the Deputy Director of Singapore's Land Transport Authority (LTA), Ong Eu Gene said:

> *"In 15 to 20 years, our transportation mobility will be very different. The car dominant transportation model will become irrelevant…Thus, we want to create a working network that is safe and comfortable."*

Penang, which proudly declares it wants to lead, appears to be demonstrating a total ignorance of current world concerns and trends.



Road to Folly: Will building more roads solve traffic congestion

Conventional belief that widening roads will reduce congestion is wrong. The counter-intuitive is correct. The supply of more roads only creates demand for their use.

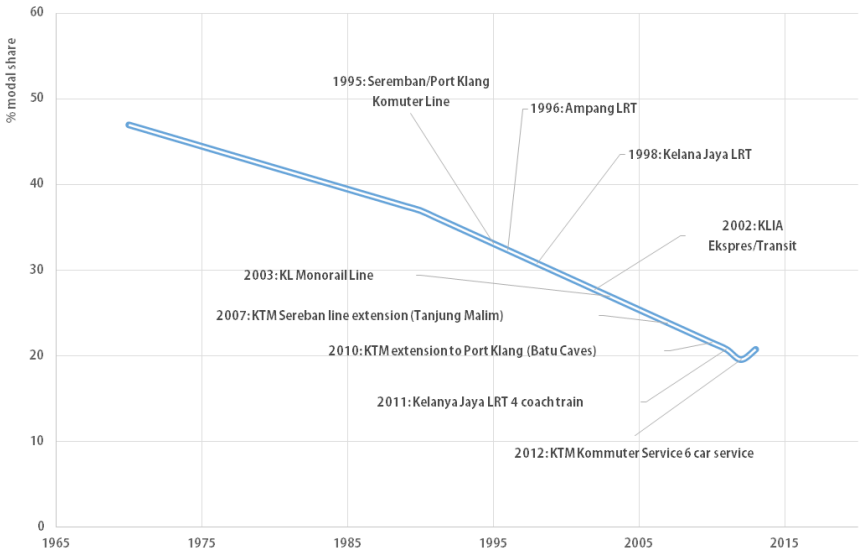
Two things happen, motorists who have taken alternative routes now converge on the new roads leading eventually to congestion. Second, people who would have used alternative transport modes now opt to drive as it's more convenient. This has not only been proven theoretically by the mathematician Braess decades ago, it is factually evident from Bangkok to Beijing that have countless miles of highways and ring roads with worsening traffic congestion.

The present strategy of the Penang state to prioritise and provide far higher investments in highways only serves to encourage motorists to drive and use the roads particularly when they are free of charge. This will discourage public transportation use. The SRS proposal is to spend RM6 billion to build the Pan Island Link (PIL 1) to the airport cutting north-south travel time to 15 minutes. And no tolls will be collected. This whole strategy is fundamentally flawed from the start. If it is cheaper and faster to use the PIL to get to the airport, people will shun the LRT for cars. This will lead to financial disaster as public ridership will be reduced. For example, the actual ridership of the KL PUTRA LRT line reached only 3% of its projected ridership in 1999 and 44% four years after starting operation.

We are not suggesting a total moratorium on road building and improvement. What we say is that it be selective and limited to improving local connectivity and feeder routes to complement, not to compete, with public transport priorities and systems.

The experience in the KL-Klang region clearly demonstrates the folly of such a failed strategy where despite the provision of 2 LRT lines and 1 monorail line, with dozens of competing highways, the transport modal share dropped from over 40% in 1970s to 20% in 2013, as shown in below graph.

Figure 1: Public transport modal share in KL 1970-2014



Sources: Jeff Tan (2008); SPAD; Wikipedia

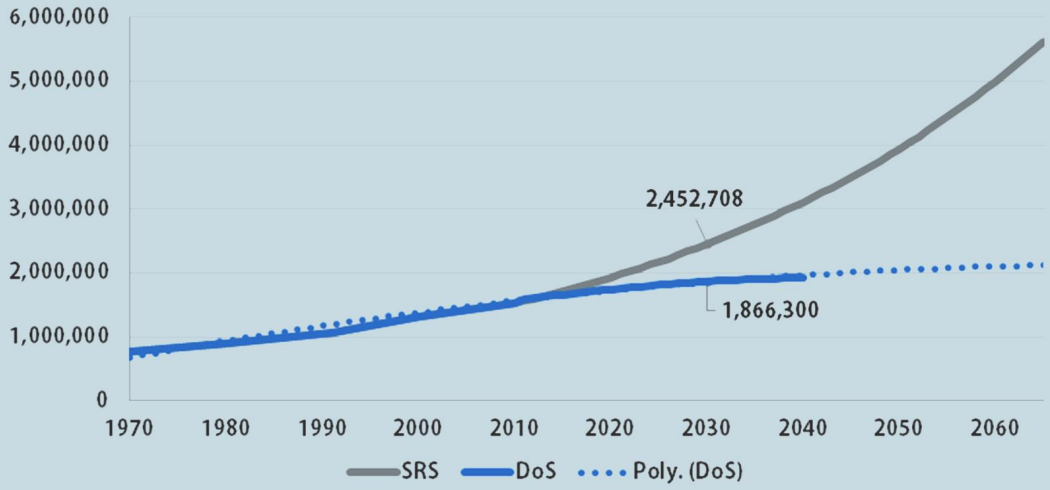
2. Questionable population projection and ridership

Population

Do our population projections warrant such a massive scheme at such tremendous costs? SRS projects a Penang state population of 2.45m people by 2030 while the Malaysian Statistics Department projects 1.94m by 2040. Penang currently has negative natural population growth and the only way SRS's projected figures can be achieved is if there is a massive net in-migration of over 50,000 people every year - something that is highly unrealistic, given in 2013 net migration was only 1,300 and in the past twenty years net migration has averaged 9,400 a year. To reach the SRS projection for 2030, our net migration would need to grow by over 3,700% from 2013 and be maintained at 5 times the average of the past two decades!

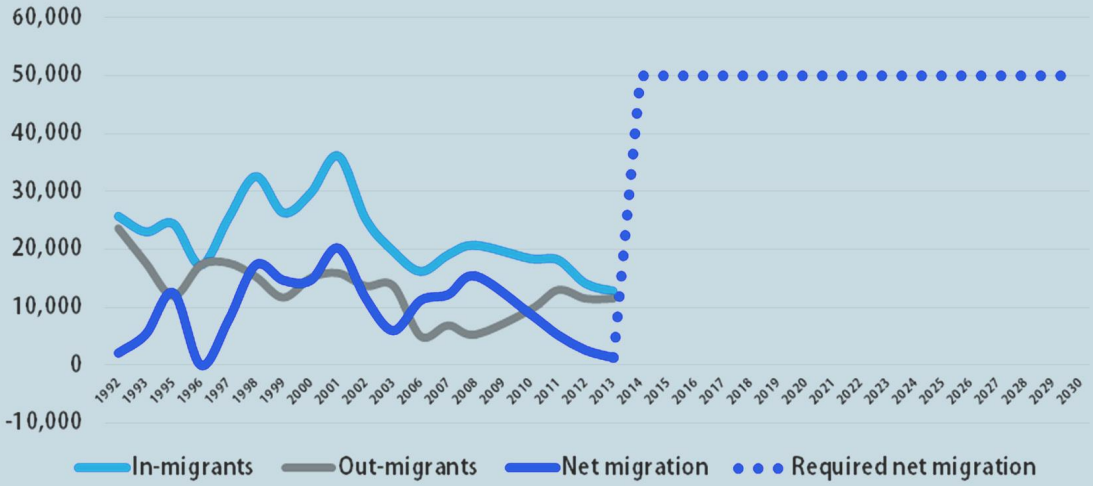
Such massive and sustained increases in migration only generally occur in response to famine, war or internal displacement of people.

Figure 2: Population projections: SRS vs DoS



Source: Department of Statistics Malaysia, SRS Proposal

Figure 3: Penang migration 1992-2030



Source: Department of Statistics Malaysia, SRS Proposal

A letter of concern

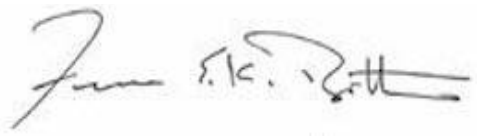
1. Halcrow is a competent international consultancy with recognized international credentials and a long track record in the fields of transportation systems analysis, forecasting, modeling, simulation, testing, traffic and parking strategies, street layout, signage and signaling systems, transport infrastructure planning, impact analysis (local and city wide), public and shared transport systems, freight and goods delivery, civil and traffic engineering, economic instruments for regulating traffic and parking, operations and maintenance, legislation and enforcement, participatory planning and review, ports and water transport, construction supervision, global planning and public policy, including in-depth familiarity with practices and experience in leading edge cites in the allied fields of pedestrianization, public spaces and city cycling.

2. The State and local government in Penang have no record of experience or competence in the following critical technical areas: transportation systems analysis, forecasting, modeling, simulation, testing, traffic and parking strategies, street layout, signage and signaling systems, transport infrastructure planning, impact analysis (local and city wide), public and shared transport systems, freight and goods delivery, civil and traffic engineering, economic instruments for regulating traffic and parking, operations and maintenance, legislation and enforcement, participatory planning and review, ports and water transport, construction supervision, global planning and public policy, including in-depth familiarity with practices and experience in leading edge cites in the allied fields of pedestrianization, public spaces and city cycling.

3. The State's chosen project delivery partner, led by SRS, is composed of property developers, with Gamuda as the only one with infrastructure building experience. They have yet to demonstrate their experience or competence in the following critical technical areas: transportation systems analysis, traffic forecasting, global modeling, simulation, testing, traffic and parking strategies, street layout, signage and signaling systems, global transport infrastructure planning, impact analysis (local and city wide), public and shared transport systems, freight and goods delivery, traffic engineering, economic instruments for regulating traffic and parking, operations and maintenance, legislation and enforcement, participatory planning and review, ports and water transport, construction supervision, global planning and public policy, including in-depth familiarity with practices and experience in leading edge cites in the allied fields of pedestrianization, public spaces and city cycling.

We take note that the Halcrow reports were very clear on this matter of a critical competence deficit in 2012. Today, four years later it is little changed. Next step: Forget the SRS recommendations, find new team with the necessary qualifications, get back to the best of Halcrow' s recommendations and update them to reflect current conditions, stress practical problem solving hand in hand with civil society for period 2016-2020 and on this firm base move on to develop a new master plan, working with outstanding groups and experts who have the necessary levels of competence.

Professor Francis E. K. Britton
Institut Supérieur de Ges tion, Paris



Concurrent positions:
Professor. Sustainable Development, Institut Supérieur de Gestion, Paris
Managing Director. EcoPlan International. Association Loi de 1901, Paris
Founding Chair. Giant Carrots. Inspiring Change (Start-up) London
Founding Editor. World Streets: The Politics of Transport in Cities
Seminar program. Sustainable Development, Economy and Democracy

Ridership

In response to questions in the May 2016 Legislative Assembly, YB Chow announced that the LRT line is anticipated to carry 116,000 passengers per day in its first year of operation, 2022/23. This would be equal to an annual ridership of 42m a year, something that is unrealistic! Assuming current tourist arrivals into Penang airport double to 12 million by 2022 and half (i.e. 6 million) use the LRT, local ridership would have to make up the 36 million trips per year. This works out to 99,000 trips per day on just this one line. Put into context Rapid Penang carries 93,000 passengers daily across 42 bus routes for the whole state, [4] the KL monorail carries 75,000 per day and the KLIA Express service carries less than 30,000 per day. [5]

The financial viability of a public transport system is critically dependent on its ridership and fare structure; otherwise, it ends up as a white elephant waiting to be bailed out by the people of Penang. Will our projected ridership ever materialise? If it does not how will we be able to support such costly projects as the LRT and monorail?

3. Too many and poorly integrated modes of public transport

The success of a public transport system hinges on its level of accessibility, connectivity and intergration, and as far as possible, there should be a single integrated transport system. London, Tokyo and New York are large cities that require multiple modes of well integrated public transport systems. Furthermore, many of these modes were built historically over time. Penang, however, is only a small city and is starting from scratch. So why is SRS proposing four different systems? -LRT, monorail, tram and bus rapid transit- which will be difficult and more costly to coordinate, maintain & upgrade? Seamless connectivity will be difficult to achieve and Kuala Lumpur's failures should not be repeated. The monorail is eminently unsuitable for the Penang landscape, being elevated, unsightly and intrusive. Even the present chief minister of Penang rejected the monorail system in 2013 as being unsuitable for the city.

'No To Monorail Yes To Tram'[6]

> *"BN's monorail is inappropriate for a world heritage city like Penang, as its elevated structure will destroy Penang's charms. As a tram system on level ground would match Penang's heritage, new alternative roads are required so that existing roads can make way for tram lines."*
>
> Lim Guan Eng
>
> 15th March 2013

Transport experts tell us monorail is used most successfully for short sectors at theme parks and is hardly used anywhere in the world for public transportation. Sydney has dismantled its monorail, Mumbai's monorail is in financial difficulty, Las Vegas monorail went bankrupt and Malacca's monorail is non-functional and a visual and economic blight on its city. Do we want to go down this treacherous route?

Why is the tram system proposed by SRS limited to the World Heritage Site? Modern generation trams are used in many cities. These modern trams are more manoeuvrable, flexible and much less costly to build and operate and their carrying capacity can match LRT.

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[4] See http://www.myrapid.com.my/media-centre/media-releases/2016/one-million-daily-ridership-now-and-growing-fast-prasarana

[5] Express Rail to KLIA targets 11mil ridership this year, up 20%
http://www.thestar.com.my/business/business-news/2015/01/09/erl-targets-11-million-riderships-this-year/

[6] See http://limguaneng.com/index.php/2013/03/15/to-win-the-future-the-penang-state-government-must-boldly-invest-in-the-future-so-that-our-young-do-not-become-a-traffic-jam-generation-enbmcn/

4. Lack of transparency

For a government committed to CAT governance (Competence, Accountability and Transparency), there is a lack of clarity with regard to the financing of the entire scheme. What are the people of Penang being committed to? How will payment via reclamation work? Will they implement roads first and public transport last? When is the public transport on the mainland going to be built? What happens if we run out of funds after the initial stages? Will the public be subjected to unaffordable fares, thereby making them return to their cars? Questions are being asked, but few answers are being provided.

Basic information is being withheld.....

- Why are only selected, and not all, Halcrow reports available on the Transport Master Plan website? [7]
- Why are the voluminous studies prepared by SRS Consortium not available for the public to view?
- Why is the Zenith BUCG feasibility study available for Barisan Nasional to view, but not the people of Penang?

Why are there no visualisations of the projects being proposed?[8]

- How is the layman supposed to understand the impact of a project from a line on a map?
- What will the elevated highway along Gottlieb Road look like?
- What will the Sia Boey transport hub look like?
- What will the elevated highway over the youth park look like?
- What will the underground and elevated sections of the Penang Inner and Outer Ring Road, and the North Coast Paired Road look like?
- What will a double deck highway along Jalan Perak look like?

Why no information on the financing....

- What are the costs of each component proposed by the SRS and Zenith BUCG consortiums?
- What are the operating and maintenance costs for each component?
- How has the budget gone from RM27bn to RM46bn before it's even started?

Why can the Penang state government not supply a detailed breakdown of the entire Transport Master Plan budget, including both the SRS and Zenith BUCG components, outlining to what extent the projected costs are covered by projected land sales and land swaps, and if there is any projected shortfall, what is the current plan to fill this gap. Do the Penang public not have a right to know how thier money is going to be spent?

5. Potential conflict of interest

SRS Consortium, a joint venture of Gamuda Berhad (60%), Ideal Property Development Sdn Bhd (20%) and Loh Phoy Yen Holdings Sdn (20%) is seeking the role of the Project Delivery Partner. The role of a PDP is to manage the implementation of the master plan and guarantee its timely and acceptable completion. According to World Bank Procurement guidelines, any member of the SRS Consortium cannot tender for any work package of a plan they have developed, without creating a conflict of interest. So therefore Gamuda cannot bid to build the LRT or the Penang Island Link, and Ideal and Loh Phoy Yen cannot bid for any of the reclaimed land without creating a conflict of interest.

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7 See http://pgmasterplan.penang.gov.my

8 See Penang Forums visulisations of the SRS elevated highway over Youth Park (page 22) and the double deck highway along Jalan Perak (page 21). See the Penang Forums alternative view of what Sia Boey transport hub could look like on page 49.

World Bank Procurement Guidelines

Conflict of interest[9]

1.7 A firm shall be considered to have a conflict of interest in a procurement process if: (a) such firm is providing goods, works, or non-consulting services resulting from or directly related to consulting services for the preparation or implementation of a project that it provided or were provided by any affiliate that directly or indirectly controls, is controlled by, or is under common control with that firm.

Despite this, representatives of Gamuda said the following in a press conference on the 4th May 2016:

> *"If we participate, we won't be the PDP so there is no conflict of interest. For that component the state will engage another consultant to supervise the thing, so there is no conflict of interest" Gamuda, 4th May 2016* [10]

Mr. Koon Yew Yin, a respected businessman and philanthropist, and one time owner of Gamuda has the following to say on the PDP arrangements in Penang: [11]

- The consulting company responsible for the tender process should be **independent** and should have no interest whatsoever in the project implementation;
- The whole procedure of prequalifying contractors, calling tenders, evaluating and awarding the contracts must be carried out in a **transparent** way to avoid any suspicion of corruption;
- They are not (even) engineering consultants. **They are construction contractors.** Gamuda might have constructed the tunnel in Kuala Lumpur but they did not design it;
- Penang state government opted for the Project Development Partner (PDP) structure of the Klang Valley MRT which has been heavily criticised for cronyism and abuse. From the rakyat's experience... (this) will definitely be unpleasant and **disastrous for the public.**

9 See http://siteresources.worldbank.org/INTPROCUREMENT/Resources/278019-1308067833011/Procurement_GLs_English_Final_Jan2011.pdf

10 See https://youtu.be/_Vsr2h31WB0?t=55m3s

11 See http://www.themalaymailonline.com/print/what-you-think/follow-the-world-bank-procurement-guidelines-to-prevent-corruption-and-abus

Tony Pua Kiam Wee, DAP Member of Parliament for Petaling Jaya had the following to say about the Gamuda's PDP arrangement for the Kuala Lumpur MRT:

> *"First of all, a 6% project fee is almost unheard of in a project of this scale…. The reason why the fee is so high is simple – not only was there no competitive tenders, which would surely have brought the fees down, the Government has chosen to award the contract and commenced work… before the fee was even agreed upon. Such recklessness on the part of the Government has resulted in it being beholden to the PDP with little room to manoeuvre or negotiate… Any ordinary man on the street will know that it is ridiculous to ask a contractor to start the kitchen renovation without first agreeing to the cost.*
>
> *Secondly, and perhaps more critically, not only has the PDP contract been awarded with no open or competitive tender, the structure of the agreement is such that the overall cost of the project is incentivised to be inflated.*
>
> *The entire MRT project has been awarded and structured in such a reckless manner that the consequences in a few years' time may have a devastating impact on the KVMRT's viability. The higher than necessary cost for the project would necessitate the imposition of higher MRT fares on the Klang Valley commuters, which will in-turn negate the intention of shifting the population to public transport"*

Media statement by Tony Pua Kiam Wee in Kuala Lumpur on Monday, 13th February 2012 [12]

Both the SRS and Zenith BUCG Consortiums have appointed numerous consultants and commissioned numerous studies in the formulation of their proposals. However to ensure no conflict of interest arises, the state government should not allow consultants for key studies such as Environmental Impact Assessments (EIA) and Heritage Impact Assessments (HIA) to be appointed by any client that has clear vested interest in their outcomes.

If these studies are commissioned by the state, but paid for by the developer, no undue pressures can be placed on the study process and its findings can be argued to be truly independent. In order to be seen to be doing this in a most transparent manner, the state will have to rely on independent reviewers and referees to recommend qualified consultants based on clear terms of reference. The state should also establish a process of peer review to ensure that the public interests in environment and heritage are fully considered in the EIA and HIA.

12 http://anilnetto.com/society/public-transport/penang-transport-masterplan-rm27bn-rm/

Why Such Deviations from the Halcrow Plan?

The Halcrow Plan made reference to a number of items required to deliver a 'holistic approach to resolving transportation issues', many of which no longer appear to be being discussed. These items, do not appear to be part of the current contract holders' scope of works and do not appear to have any funding reserved from the proposed land reclamation.

Why did the state not implement any of the Halcrow short term strategies?

These following strategies were to be completed between 2012 and 2015:

- Public Transport Pilot Schemes > Re-organise Bus Services in Air Itam Corridor in Core Route and Feeder Services;
- Traffic Signal Operations Improvement Sub-Strategy;
- Highway Enforcement Sub-Strategy;
- Road Safety Improvement Sub-Strategy;
- Highway Directional Signing Sub-Strategy.

What happened to the Highway Improvement Plan?

The Halcrow Highway Improvement Plan included almost RM7bn worth of highway improvements: issues of highway functionality, highway standards, modifications to highway intersections, traffic signal operations, regulation, enforcement and direction signing strategies required to develop an effective, functioning highway network with roads that are safe and user friendly for all. These investments are also critical for ensuring that our pedestrian realm is accessible and the first and last mile connectivity required for successful public transportation is in place. These critical improvements are apparently no longer costed and are no longer discussed.

What happened to the Traffic Reduction Strategy?

The ambition is to move towards a 40%/60% public/private transport modal split by 2030, from a base of just 3%/97% public/private modal split in 2010. However, this is most unlikely to be achieved given the state's priority for road building which in the Zenith-BUCG and SRS proposals will cost of over RM12 billion in the first phase. The LRT line to the airport is slated for completion in 2022 and the monorails on island for 2030. Mainland public transport does not even have a stated schedule. While both Halcrow and SRS agree that increasing public transport modal share will not be achieved simply by providing better public transport facilities, only Halcrow recommended measures for reducing private transport.

For a public transport system to succeed, you need both pull and the push factors. The pull factors are providing convenient, punctual, frequent, affordable, accessible and well-connected public transport system. But this alone will not do. The government must have the political will to implement push factor policy measures to discourage the use of private vehicles, such as higher parking charges, restricting parking spaces, and road congestion charges as advised by Halcrow. One without the other will not do. In the short to medium term, action will need be taken to extend on street parking controls and parking charges will need to be significantly increased; while in the longer term it is envisaged that a private vehicle access charge for vehicles entering George Town and Butterworth during the morning peak period will need to be implemented.

Changes will need to be made to urban plans and the way in which development applications are considered and progressed so as to encourage developers to site new developments in locations that are accessible by public transport.

What happened to the funding for pedestrian & cycling infrastructure, water transport, feeder buses and taxis?

The Halcrow Plan budgeted allocations for pedestrian and cycling infrastructure, water transit, feeder buses, school buses, factory buses, taxis, and park & ride facilities. The original RM27bn budget had everything in, however the budget has now ballooned and massive infrastructure projects proposed, without funding for the necessary elements that contribute to a holistic transportation system. How is this approach going to ensure a paradigm shift towards "moving people not cars", ensuring accessibility to public transport and integration between transport systems? Something has gone terribly wrong.

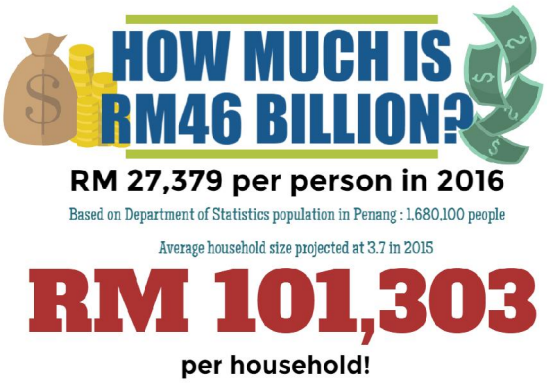
13

13 Brisbane city centre, https://aliwyllie.files.wordpress.com/2013/12/brisbane-049_shaded_walkway.jpg

We do not have a clear idea of how much each part of the project will cost in terms of construction, much less the annual cost of operating and maintaining (O&M) the proposed roads and public transport systems. The SRS proposal reportedly estimates the annual O&M for the George Town-Airport LRT line at RM170m per year, however no details are given on how they arrived at this figure. We know from KL's experience that it is the O&M costs that will make or break the financial viability of a project, and so this must be based on the best available evidence.

RM46bn is such an astronomical figure it is hard to comprehend, but it's equal to RM100,000 for every household and if RM46bn was stacked in a pile of RM100 notes it would be 6 times higher than Mount Everest, and outside the stratosphere! Literally astronomical.

Figure 4: How much is RM46 billion?



These numbers are too vast for us to comprehend. So let us focus on the more immediate planned expenditure. The SRS proposal has prioritized two major projects for the first phase (2017-2022) – the construction of the Pan Island Link (PIL 1) costing RM6.1 billion and an LRT line from George Town to the airport at a cost of RM6.3 billion, while Zenith BUCG are proposing to build the 3 roads between now and 2021. As we earlier argued, it is folly to adopt a strategy of building roads that will compete with public transport, encouraging private car use while attempting to build up a viable public transport system. For example, if you can drive on PIL 1 from Tanjong Tokong to the airport in fifteen minutes and free of toll, what incentive is there to take public transport?

Have detailed studies been done for each and every project proposed? If they are, they should be made available. If they are not, this is a serious flaw. It is not acceptable for the State to argue that an open tender will be called for the managing the projects after they are completed. This is putting the cart before the horse. We must know in advance what kind of financial situation we are getting into before deciding on a project. A major reason for the financial failure of the KL LRT and monorail projects is the poor or inaccurate information given to the government, preventing it from making the correct decisions.[14]

According to a study by Jeff Tan (2008), the KL system was privatized through a build-operate-own (BOO) concession based on grossly inflated passenger projections presumably to justify financial viability to secure financing. The actual ridership was way below projections and insufficient to cover operating costs, let alone interest and principal repayment. It is important to note that the SRS population projections for Penang state for the year 2030 are highly inflated - 500,000 more than that of the Department of Statistics of Malaysia.[15]

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14 Jeff Tan (2008) Privatization in Malaysia
Regulation, rent-seeking and policy failure, http://www.untag-smd.ac.id/files/Perpustakaan_Digital_2/PRIVATIZATION%20Privatization%20in%20Malaysia,%20Regulation,%20rent-seeking%20and%20policy%20failure.pdf

15 See http://pqi.stats.gov.my/searchBI.php

The table below shows the big gap between projected and actual ridership with the Ampang LRT projecting a daily ridership of 170,000 when it opened in 1996, only achieving this by 2014, 18 years later than projected. The Kelana Jaya LRT on the other hand projected a daily ridership of 360,000, but after 18 years in operation is yet to reach 225,000, and the KL monorail which projected 86,000 daily riders in 2002, achieved 75,000 by 2015, 12 years and it is still to reach its original ridership projection. We are told the stand-alone LRT line from Komtar to the airport will carry 116,000 a day in its first year of operation!

Figure 5: Over estimating ridership

Operator	Projected ridership	Daily ridership	Difference
Ampang STAR -LRT 1	170,000 (1999)	65,000 (1999) 125,005 (2005) 173,343 (2014)	-105,000 -45,000 3,343
Kelana Jaya PUTRA –LRT2	360,000 (1997)	12,000 (1999) 160,000 (2003) 224,000 (2014)	-348,000 -200,000 -136,000
KL Monorail	85,900 (2002)	11,000 (2003) 39,000 (2004) 66,584 (2014) 75,000 (2015)	-74,900 -46,900 -19,316 -11,900

Due to massively over estimated ridership in KL, both LRT companies ran into financial difficulties and could not service their debt. The federal government had to issue RM4.5 billion in bonds for the debts of these two companies while the KL Monorail was provided with a RM300 million soft loan. In November 2001, the Ministry of Finance purchased the outstanding debts of the two LRT companies totalling RM5.5 billion via another bond issue (Jeff Tan, 2008: 114).

Kuala Lumpur has the Federal government as sugar daddy. But Penang state will have no such luck. Each and every Penangite will have to bear this financial burden!

ERL says KLIA Express fare increase needed to keep company afloat [16]

Express Rail Link (ERL) announced that fares for its KLIA Express and KLIA Transit rail services were set to be increased on January 1 2016 to RM55 for a one way trip, an increase of RM20 from the previous rate. ERL has said that the fare hike for one-way trips between KL Sentral and KLIA1/KLIA2 is necessary to keep the company "sustainable in the face of rising operating costs".

The company added that the ERL project was implemented at a cost of RM2.4 billion, and it had been suffering losses over the years amounting to RM671.7m. The 57% price hike was publicly criticised, even though ERL claims it is still offering the ""second lowest dedicated air-rail link fare per km in the world".[17]

[16] See http://paultan.org/2015/12/03/erl-says-klia-express-fare-increase-needed-to-keep-company-afloat-hike-to-mainly-affect-foreign-visitors/

[17] See http://www.freemalaysiatoday.com/category/nation/2015/12/02/erl-apologises-for-error-in-statement/

Kuala Lumpur experience

The Kuala Lumpur experience on the vast gap between actual and projected ridership is instructive. The average actual ridership for the three lines is 18% of their projected number. If we use KL as a rough guideline, we project local ridership to be 12.5 million in 2023 (inclusive of 2.5 million airport ridership).

Figure 6 shows three financial scenarios (based only on farebox revenue) with different ridership projections – 12.5 million, 25 million and the SRS projection of 42.3 million (116,000 per day). It is projected that the Bayan Lepas LRT will be operating at a loss of between RM23 million to RM126 million under the three scenarios (in the 'Cheaper' section on p34, we show that a modern tram option will be financially more viable.)

Figure 6

Scenario	Cost In Ringgit million	LRT
	Annual Operating & Maintenance*	170
1	**Farebox -Ridership 12.5m @RM3.5**	44
	Surplus (Deficit)	-126
2	**Farebox -Ridership 25m @RM3.50**	87.5
	Surplus (Deficit)	-82.5
3	**Farebox -Ridership 42m @RM3.50**	147
	Surplus (Deficit)	-23

*for LRT from SRS; Tram from Halcrow

The state has said that it expects to make up the difference from advertising and property related businesses and points to Japan as an example. However, the Japanese experience is not easily replicable for historical and cultural reasons. Again, it is more relevant to look at Prasarana's experience where its non-farebox revenue is only 15% of total revenue after 15 years of operation!

Putting these deficits into perspective, Penang state's budgeted revenue in 2016 is RM700 million. Assuming the revenue doubles by 2023, RM126 million deficit on this one LRT line is about 10% of the state budget. What about the financial costs of all the other LRT, monorail, tram, BRT and highways?

- Why is the state not presented with the financial projections and options of the different alternative modes of public transport – LRT, monorail, tram and BRT?
- Why is SRS proposing and the state agreeing to an LRT system that not only is more expensive to build but costs two to three times more to operate and maintain?
- Is the state able to afford to such high deficits from these projects? Will they impair the financial stability of the state?
- What if the state is unable to finance the deficit and no financial help is available from the federal government? Will the project be stopped? Who will bail out the projects?

Putrajaya experience

The Putrajaya Monorail is an incomplete monorail system. Putrajaya was originally set to have a modern tram system, and construction of tunnels was ongoing, when plans were changed, and a SCOMI monorail plan was selected with two lines; Line 1, a 12 km monorail route with 17 stations and Line 2, a 6 km monorail route with 6 stations. These structures have now been abandoned for 12 years as construction was halted in 2004. It is now revisiting plans for a modern tram and SPAD has commissioned a study to develop modern tramways in KL and Putrajaya.

Jakarta experience

Penang should learn from, and not repeat, Jakarta's 'Big Bang' experience. It launched too many mega transport projects at one time – building highways, monorail, and waterways at the same time, only to see some of them running into difficulties, delayed or abandoned. Jakarta started its monorail construction in 2004, ran into trouble, aborted it in 2008, resumed in 2013 and finally abandoned it in 2015 despite some groundwork already laid. Urban planners have advised that Jakarta should focus on one public project at a time.

Figure 7: Putrajaya and Jakarta

Penang could end up like Putrajaya or Jakarta if it is not careful.

Abandoned monorail suspension bridge in Putrajaya

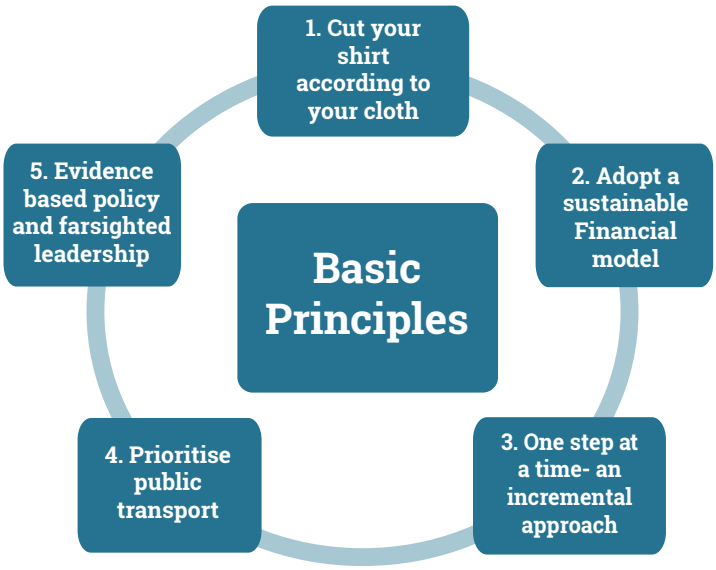
Abandoned monorail in Jakarta

An Alternative - The principles of a holistic-incremental approach

Penang's NGO's are advocating a return to the Halcrow Plan, rejecting the SRS and Zenith BUCG proposals which are riddled with flaws as well as potential conflicts of interest.

The alternative we propose is a **holistic-incremental approach** to addressing Penang's mobility and transport problems, taking into account the limited resources of the state. This alternative is based on a few basic principles.

Figure 8: Holistic-incremental approach



Principle 1.... Cut your shirt according to your cloth

The first principle is to tailor our investments according to our resources. It is foolhardy to overreach and embark on mega projects that could be financially unviable and plunge the people of Penang, of this and future generations, into debt and financial distress. The Penang state government's budgeted revenue for 2016 is slightly less than RM700 million, yet it is planning to spend RM12 billion for the PIL and the LRT in the next six years for capital construction and it has not yet taken into consideration the yearly subsidies needed for O&M expenses that can run to hundreds of millions.

By withdrawing public funding from the PIL1, the state immediately saves RM6 billion in construction costs, plus the annual operating and maintenance costs that could run up to RM50 million (7% of revenue in 2016). The next step is to see how to cut down on costs for the public transport system, while achieving maximum coverage for the least investment.

Principle 2.....Adopt a sustainable financial model

Penang state government plans to pay for this infrastructure via land sales from reclaimed land. What happens if there is a downturn in the land/property market? We are already seeing a softening of house prices. What would happen in the event of a house price correction? Land reclamation should be a policy of last resort, not first resort, because it also has significant and irreversible impacts on coastal environment, livelihoods of vulnerable fishing communities, and seafood supply to local population. Massive land reclamation is not an environmentally sustainable policy.

The state has also committed to spend over RM6 billion to build the third link tunnel plus three major highways (although an alternative bridge is now being considered). Zenith-BUGG consortium will be paid via land swap plus toll collection on the tunnel. If the State is able to persuade Zenith-BUCG to replace these highway projects with public transport projects, there would be no need for any immediate land reclamation.

Principle 3....One step at a time - an incremental approach

The state must prioritise what is necessary, affordable, and financially viable and adopt an approach of incremental implementation of the transport master plan. Incrementalism is a development watchword. Deng Xiao Ping described finding the right development path as like crossing a stream by feeling the stones and stepping on them carefully. While we must have a long-term, comprehensive and holistic vision and plan, the implementation must be carried out step by step, programming systematic review and fine-tuning, learning from successes and mistakes.

Penang state should start with just building one public transport system which can be incrementally expanded in an integrated and responsive manner. The Halcrow Plan has identified a few main arteries for tramlines and a thorough technical and financial feasibility study must be done by a truly independent transportation consultant (not a construction company). Halcrow estimated the building costs of a tram line between George Town and the airport at under RM2 billion, a number that is more realistic and affordable. We can embark on this and then move forward incrementally.

Principle 4....Prioritise public transport

We should prioritise building a robust public transport system over road expansion. The latter only serves to undermine the former. For a public transport system to succeed, we need both the pull and the push factors. Both Halcrow and SRS agree that reaching a 40% public transport modal share will not happen by building public transport alone, however only Halcrow came up with suggestions for limiting the future growth of traffic, while SRS is planning for our traffic to continue growing at 3-4% per year until 2030. New road-building should be extremely selective and cautious to improve local connectivity and feeder routes but should not compete with public transport priorities.

Imposing charges on private vehicle users is a well-tried market-pricing mechanism. In fact, the charges imposed on people who still prefer to use roads can be transferred to subsidise public transport travel. Contrary to the argument of Lim Guan Eng, the chief minister of Penang, that such a policy is undemocratic and elitist, the opposite is true. The rich and those who choose to use private vehicles contribute more to pollution and carbon emissions than the masses who take public transportation. Imagine, a tram carrying hundreds of passengers will remove hundreds of single-occupancy vehicles from the road, reducing carbon emissions. Private vehicle users generate higher external costs for society and should pay for their actions. This is eminently democratic and fair. Climate change is upon us and Penang should be setting its own carbon emission targets and streamlining development and transport policies to achieve them.

Inclusive transport planning does not privilege car owners/users, but prioritises public transport that is more comprehensive in coverage and more accessible to a wider population, including the low-income, the elderly, and people with disabilities.

Principle 5....Evidence-based policy and far-sighted leadership

Good policies should be evidence-based and analytically, not politically, driven. The crux of the problem in Penang, like many other small cities, is there are too many cars, with inadequate public transportation, competing for scarce resources. Improvement of public transportation must be accompanied by proven means to decrease the number of LOVs (low occupancy vehicles), increase HOVs (high occupancy vehicles), and public ridership. Such a strategy requires our leadership to adopt a new paradigm and then to communicate and educate our public so they understand this is the only possible way out.

Reclamation - Policy of last resort

Penang has embarked on reclaiming the sea for coastal land expansion in modern times, but scant attention has been paid to the ecological and environmental impacts of such reclamation.

First and foremost, the south of Penang island is one of the last few marine areas where sensitive marine species such as seahorse, turtles etc. are found. This rich marine biodiversity will be negatively affected.

Secondly, reclamation causes marine sedimentation that results in water quality deterioration. This reduces the production of phytoplankton and disrupts the entire marine food chain, leading to a decline in fish stock. The effect of sedimentation from reclamation not only affects the livelihood of coastal fishermen on Penang Island and the mainland, but also the aquaculture industry as fish farms rely on good water quality for its stocks to thrive. This threatens Penang's aquaculture industry which happens to be an important economic generator for the State and declining local catches are reflected in higher prices for all.[18]

Thirdly, reclamation impacts the physical environment. Changing currents lead to sedimentation in some areas and erosion in others. The transformation of what was once a beautiful sandy beach along Gurney Drive into an ugly and smelly mud flat, as a result of reclamation in Seri Tanjung Pinang, is the most glaring and sad example of such negative physical impact. Negative impacts arising from reclamation are supposed to be addressed through existing laws. However, Malaysia's regulations on reclamation activities are weak both in theory and in practice. Thailand requires submission of an Environmental Impact Assessment (EIA) for reclamation of all sizes, the Philippines requires it for reclamation above 25 hectares, and Malaysia only if it exceeds 50 hectares.

Furthermore, numerous weaknesses have been identified in the process and implementation of an EIA in Malaysia. First, where the consultants for an EIA are appointed and paid for by the project owner, the consultant's independence and objectivity is already compromised. Second, an EIA is undertaken mainly as a bureaucratic and procedural exercise, limiting the scope to assessing possible impacts and mitigating them in order to obtain planning permission, and reducing public participation to a superficial exercise of obtaining token feedback. In the case of the EIA for Seri Tanjung Pinang where detailed reviews of its EIA were submitted by two NGOs to the Department of Environment, the feedback was not even acknowledged, degrading the whole process into an irresponsible and hypocritical exercise in greenwash. Also institutional capabilities to monitor reclamation activities by the state are weak or non-existent.

For the above reasons, reclamation should be used a policy of last resort and not first resort. Despite the fact that land sale is one of the very limited ways the state could generate substantial income, it is ultimately not a goose that can lay unlimited golden eggs. Reclamation should be minimized, not maximized, because of irreversible environmental impact. It should be used sparingly and for social and public purposes, not for private projects and dubious gains.

[18] Penang launches RM42m food industry project in Juru, http://www.themalaymailonline.com/malaysia/article/penang-launches-rm42m-food-industry-project-in-juru#sthash.CBhIBbYD.dpuf

Keep Penang liveable

Penang is among the most liveable cities in Asia, and has in recent years been acknowledged for its blend of modern economy, tropical environment of beaches, hills and sea and unique culture and history. Penang's balanced blend and "liveable" brand are being placed under threat by the oversized infrastructure of the SRS and Zenith BUCG proposals. Here we share with you some of the details that are not immediately obvious from the presentation to date.

No to massive urban elevated highways

In all, a total of at least 70 kilometres of highways costing RM14.7 billion are planned to be built on the island alone. An eight lane highway is planned for Gurney Drive, due to cut through the middle of the Gurney Wharf public park, over half of this new road network on the island will be elevated, with high levels of traffic noise and vibration close to our homes, schools and places of worship. Not even our parks are spared, as plans include as a 6 lane suspension bridge over the Youth Park, with an elevated access road cutting through the Jesselton residential area.

Figure 9: Highway plan (table)

Road		Total Length (km)	At grade (est. km)	Elevated (est.km)	Tunnel (est.km)
1	Paired Road (Zenith BCUG)	10.5	8	2.5	
2	Outer Ring Road (Zenith BCUG)	5.7	1.7	4	
3	Inner Ring Road (Zenith BCUG)	4.1		2.0	2.1
4	Undersea Tunnel (Zenith BCUG)	7.2			7.2
5	Gurney Expressway (E&O) estimated	4.3	4.3		
6	North Coast Link Road (TBC)	4		4	
7	Pan Island Expressway (SRS): PIL1	20		14.8	5.2
8	Pan Island Expressway (SRS): PIL2	8		4.5	3.5
9	Pan Island Expressway (SRS): PIL2A	3		2.5	0.5
10	Pan Island Expressway (SRS): Outer Ring Road connection	3.4		3.4	
Source: pgmasterplan.penang.gov.my, http://www.zenithbucg.com/ Note: Elevated/tunnel sections estimated from drawings		**70.2**	**14**	**37.7**	**18.5**

70.2km

Figure 10: Highway plan (map)

Elevated highways will run above existing roads at heights similar to adjacent buildings along Jalan Bagan Jermal, Jalan Gottlieb, Jalan Lembah Permai, Jalan Tanjung Bungah and Jalan Tanjung Tokong, Persiaran Kuari (Jesselton), Jalan Perak, Jalan Sungai Pinang, Jalan Paya Terubong, Jalan Tengah with the construction of interchange ramps along the route.

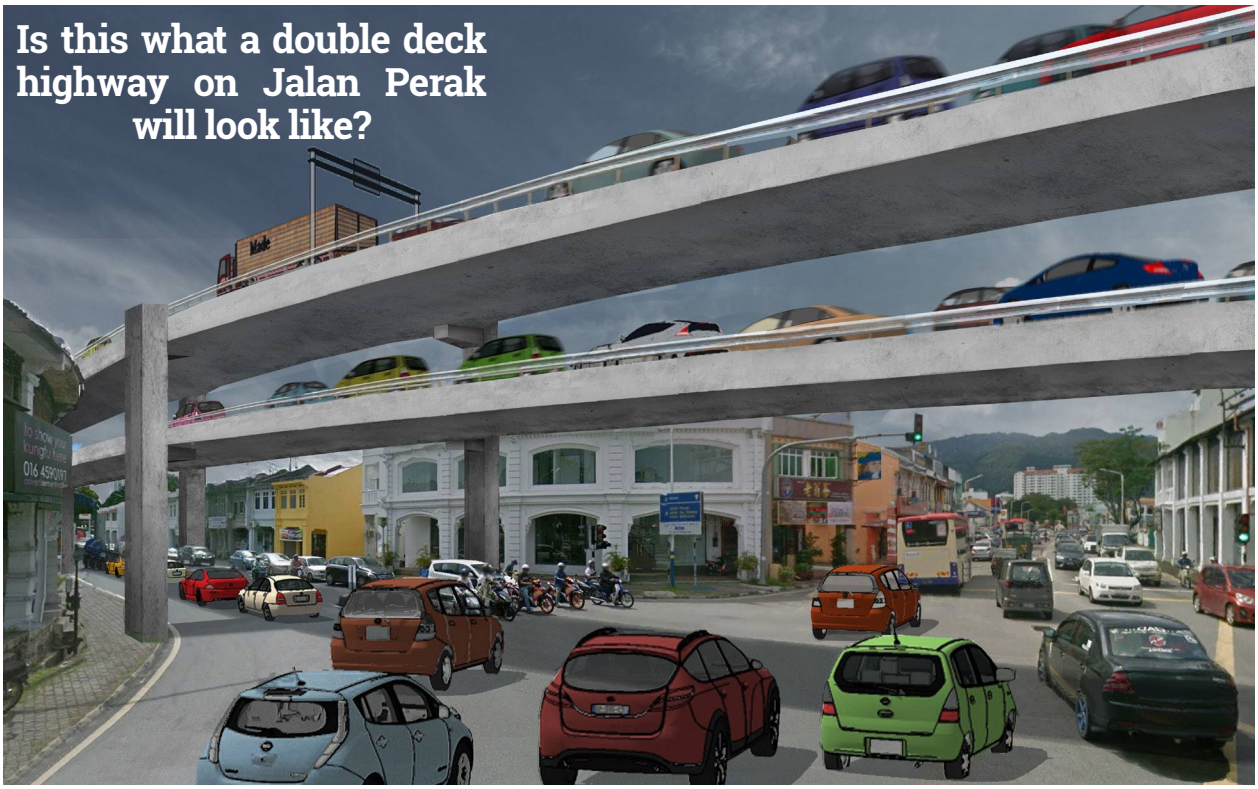
Is this really what we want for Penang?

The experience of Klang Valley tell us that elevated structures destroy communities who live in their shadows. Businesses close down and move away and areas that were once vibrant, begin a slow demise.

Figure 11: Elevated highways in Port Klang, Klang Valley

Why are SRS and Zenith BUCG not providing us with images of what they propose?

Figure 12: A double deck highway along Jalan Perak



How are we supposed to judge these massive projects from a line on a map?

Figure 13: Gurney Wharf 8 lane highway.

An 8 lane highway in the middle of a park?

Figure 14: A 6 lane highway over Youth Park

Approx. 18km of land tunnel are being proposed, including a section of land tunnel underneath Jalan Pangkor and Jalan Perak. It is proposed to use a 'cut and cover' method of tunnel building, which will mean huge disruption to traffic in the north of the island during construction.

Figure 15: Cut and cover method of tunnel construction

The Penang Chief Minister is however backtracking on the undersea tunnel, proposing to change it for a bridge, despite years of planning,

RM153 million [?] spent on studies and a stark refusal to consider an alternative until now. Somehow, a costed bridge proposal was developed within days, we are now being told this will cost RM1.8bn and could even be toll free! Have studies been done on the impacts of yet another bridge on the North Channel and Penang Port? What happens to the land tunnel section of the Penang Inner Ring Road, due to start construction in 2017?

The idea is to **'move people, not cars',** so it would make more sense to subsidise public transport across the channel? Rather than provide toll free bridges, which will only encourage people to use private vehicles, resulting in more traffic jams - it is public transport that should be incentivised, not private cars.

No to LRT & Monorail

LRT and Monorail are light rail passenger transport systems running on elevated tracks. An LRT can run on the ground, but its high floor requires raised station platform infrastructure. A monorail on the other hand cannot run on the ground. Obviously, an LRT cannot run on a monorail track and vice versa. Given the nature of its single track, monorails are linear and very difficult to branch off. These systems cannot work together and cannot be integrated into a seamless network. LRT and monorail are not user friendly and construction, operating and maintenance costs are 3 to 4 times higher than trams. Elevated LRT and monorails are also highly visually intrusive. Imagine the monorail beams running past windows of your shop or house, blocking sunlight and airflow.

SRS has replaced Halcrow's recommended tram systems with LRT and monorails. We argue that monorail is the most inflexible, outdated, and least cost effective of the rail systems and that LRT offers little prospect for expansion and should not be considered at all for Penang. The LRT from George Town to the airport (and on to be reclaimed islands), we argue can be achieved at much lower costs and with greater efficiency with a tram or BRT system.

Why No To Monorails in Penang

Monorails have been around for more than a century (1901 - Wuppertal Schwebebahn) but compared to other rail systems, they are the most inflexible and visually intrusive, least efficient and cost effective, and most riddled with financial problems. Rolling stock is not standardized so owners/operators are totally beholden to the suppliers of the monorail for replacement and spare parts. Prasarana is attempting to terminate a RM494mil contract with SCOMI for poor performance related to the KL monorail.[19]

Many cities with monorails find themselves in financial distress:

- Mumbai – running at steep loss of R1.5 crore (RM 1 mil) per month;
- Las Vegas – filed for bankruptcy in 2010;
- Moscow - costs taxpayers RM63m yearly to run, can't cover O&M costs;
- Seattle Monorail Authority dissolved in 2008, cost taxpayers US$125m;
- Kuala Lumpur – declared insolvent in 2007 and taken over by Prasarana.

The problem is so acute that some cities have either torn down their monorails (Sydney in 2013, and Moscow is considering doing the same); while others have abandoned construction (Jakarta, Putrajaya and Malacca). In Sydney, the decision to build the monorail over other forms of rail (e.g. light rail) was in the eyes of many a political decision. Light rail would have been $20 million cheaper to build, service more passengers per hour and cost 40% less for a ticket, but the monorail system prevailed.[20] Professor Leonid Baranov of Moscow University said, "The commission had concluded that the monorail is not cost effective, that it does not pay itself off. This form of transport simply consumes money. The consumption of energy is much greater than conventional subway trains."

The few that have operated successfully are found mainly in Japan where the private operators were given cheap land to develop commercial property around the stations and over 60% of operating revenue comes from non-rail business. There are a host of historical, political and cultural conditions specific to Japan that account for its success that cannot be easily replicated elsewhere.

19 Prasarana gives Scomi 60 days to deliver, http://www.thestar.com.my/business/business-news/2016/03/09/prasarana-issues-notice-to-remedy-to-scomi/

20 Why Sydney Found Itself Looking Up At A Monorail Sydney Morning Herald 29 April 1988

Figure 16a: Existing Burma Road

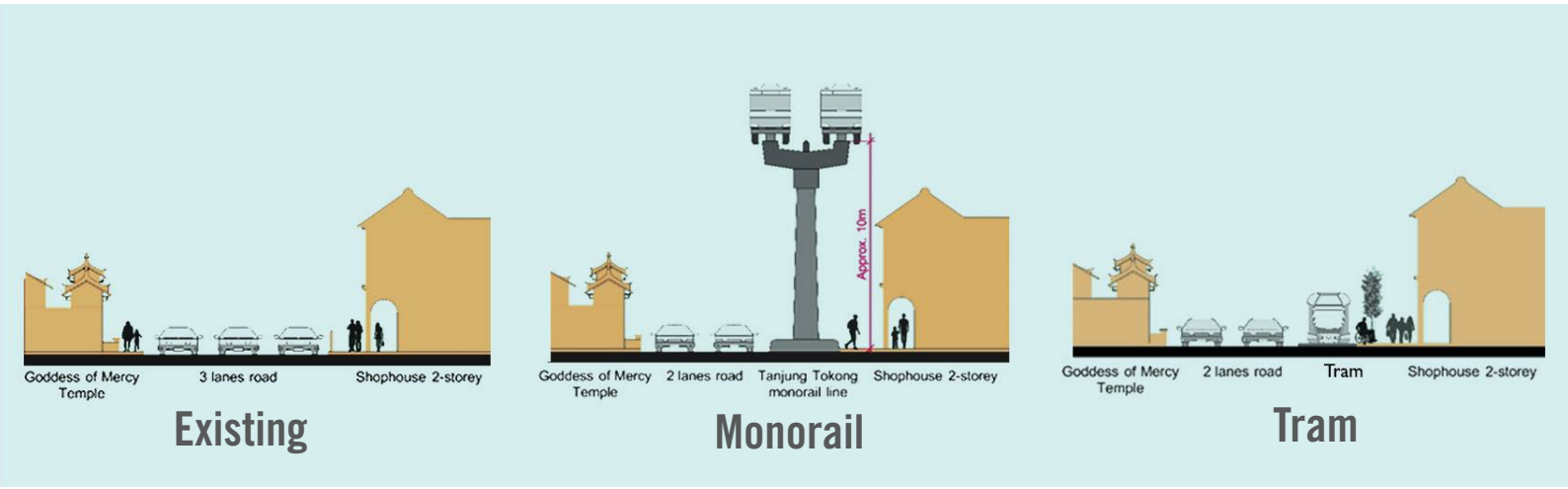
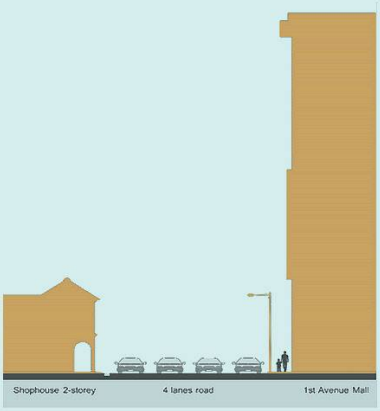


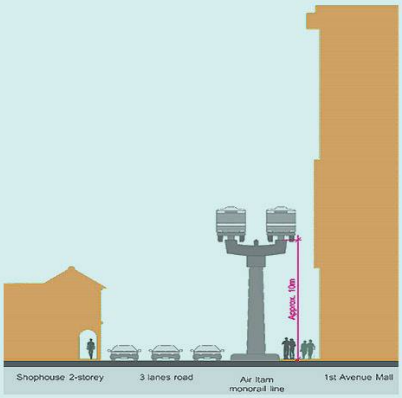
Figure 16b: Burma Road with monorail

Magazine Road

Figure 17a: Existing Magazine Road



Existing



Monorail

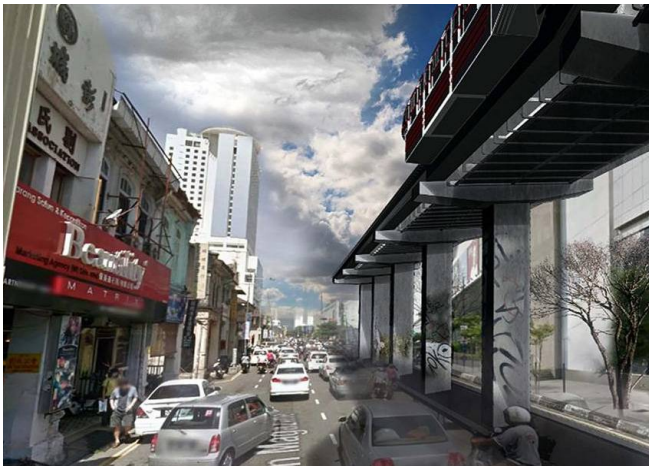


Figure 17b: Magazine Road with monorail

Is this what a monorail would look like at Air Itam market?

Figure 18: Monorail by Air Itam market

Returning to first principles, Penang can adopt a holistic and balanced approach to resolving its transportation issues, adopting a paradigm shift towards "moving people not cars". This can be done with a less expensive public transport system of modern trams, supplemented with Bus Rapid Transit and efficient multiple feeder systems (mini buses eventually electric, electric tuk-tuk (tricycles), bicycles, walking etc.).

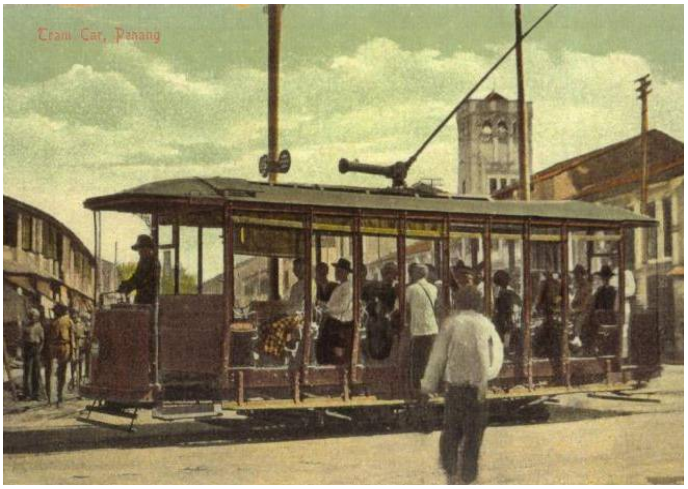
Halcrow, a transport consultancy, very clearly recommended a modern tram-based public transportation system, sections of which will need to be elevated. Starting from scratch, we have an opportunity to develop a single integrated system. SRS proposals for four different systems – LRT, monorail, tram and bus rapid transit – will be more difficult and more costly to coordinate, maintain & upgrade. Seamless connectivity will be difficult to achieve and an incremental approach would be difficult to adopt.

Modern-generation trams & Bus Rapid Transit

When we talk of trams, many Penangites think of the old trams that ran along the roads of Penang (which actually served our transportation needs very well in their day), and hence may think trams are unsuitable for modern day needs. When we talk about Bus Rapid Transit, many people have negative stereotypes of bus travel.

However, the modern generation of trams and buses have improved greatly. Modern trams can match the carrying capacity and speed of LRT and monorail. Also, a modern tram running on a grass-capped track is no louder than a car. Trams are also less intrusive, aesthetically and visually more pleasing.

Figure 19: Penang's original tram[21]



Stage buses still in operation in Seberang Perai [22]

21 http://tdu.to/131041.msg

22 http://dolphinairline.blogspot.my/2008/07/penang-buses-and-butterworth-station.html

Bus Rapid Transit (BRT) which was pioneered in Curitiba, Brazil, first entered service in 1974. To be considered a BRT , buses should operate for a significant part of their journey within a fully dedicated right of way to avoid traffic congestion. In addition, a true BRT[23] system has most of the following elements:

- Alignment in its own right of way (to avoid time spent in traffic);
- Stations with off-board fare collection (to reduce boarding and alighting delay related to paying the driver);
- Station platforms level with the bus floor and multiple bus doors for entry (to reduce boarding and alighting delay caused by steps and queueing);
- Bus priority at intersections (to avoid intersection signal delay).

Figure 20: Modern tram

Exterior

Interior [24]

Figure 21: Modern BRT

Exterior

Interior [25]

[23] https://en.wikipedia.org/wiki/Bus_rapid_transit

[24] http://www.simplonpc.co.uk/T_Barcelona3.html

[25] https://www.vanhool.be/ENG/openbaar%20vervoer/hybride-diesel-elektrisch/Resources/leaflet%20AG300Hyb%202013%20mail.pdf

Better...

Why are modern generation trams and BRT better for Penang?

- **Modern trams and BRT are more accessible for all;**
- **Modern trams and BRT have a smaller footprint and are friendlier for our environment;**
- **Modern trams and BRT are quieter and produce less vibrations;**
- **Modern trams and BRT are flexible and much easier to expand in the future.**

More accessible for all

Modern trams and BRT have low floors so they can easily be boarded at street level, with no need to build costly elevated station infrastructure; which is unfriendly to those who are mobility impaired, e.g., the elderly, the disabled, those with wheelchairs, push chairs, or just those carrying heavy shopping. When you design for those with impaired mobility, everybody benefits. The proposed station infrastructure for the LRT will have 2 levels, the 1st level a ticketing concourse, the 2nd level the platform, so for the mobility impaired this will mean getting 2 lifts just to reach the platform. Compare this with a street level platform which can be easily boarded by all.

Figure 22: Low floor tram (left) & BRT (right) [26]

Smaller footprint and friendlier for our environment

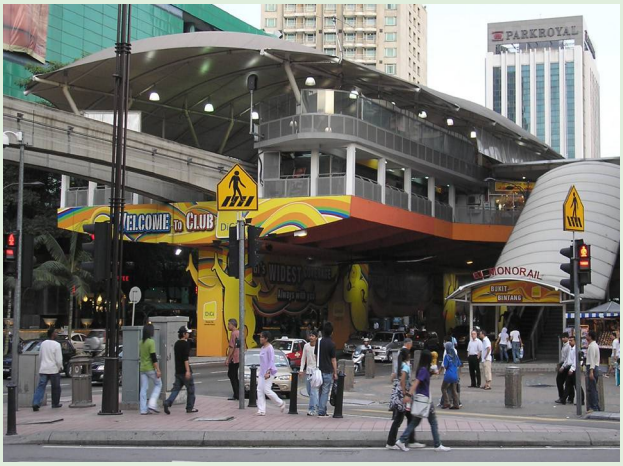
Large LRT and monorail elevated guideways and large station infrastructure will forever alter the nature of our built environment. Its elevated nature not only impedes access, but costs significantly more and takes significantly longer to construct, disrupting daily lives for longer, it would takes up significantly more space in our built environment, requiring additional land acquisition and much greater tree loss.

- It is estimated that almost 3,000 trees will be lost by constructing the LRT and monorail lines in the SRS proposal.
- It is inevitable that local homes and businesses will need to give way to the 70+ elevated stations across the LRT and monorail lines being proposed.
- The proposed elevated structures in George Town, overshadowing our historic townscape may also threaten our heritage listing with UNESCO, a key driver of the tourism industry which generates almost 50% of our GDP.

[26] Tram - https://improve-public-transport.wikispaces.com/city_vienna BRT - http://www.mdot.maryland.gov/Bus_Rapid_Transit_Components.html

Typical Station Infrastructure

LRT



Monorail

Tram

BRT

Figure 23: [27]

[27] Tram - https://1001thingstodoinistanbul.files.wordpress.com/2012/05/img_3229.jpg, BRT - http://usa.streetsblog.org/wp-content/uploads/sites/5/2011/07/strip-exp.jpg LRT (Bandaraya, KL) - https://upload.wikimedia.org/wikipedia/commons/9/97/Bandaraya_station_(Star_Line)_(exterior),_Kuala_Lumpur_(January_2007).jpg Monorail (Bukit Bintang) - https://upload.wikimedia.org/wikipedia/commons/5/5e/Bukit_Bintang_station_(Kuala_Lumpur_Monorail)_(exterior),_Kuala_Lumpur.jpg

Quieter and less vibrations

In KL the LRT exceeds maximum noise levels set by the Department of Environment Malaysia in a number of locations. For example at both Jalan Bukit Ledang, Damansara Heights (80.5dBA) and Jalan Desa Aman 2, Taman Desa Aman, Cheras (80.3dBA) the noise exceeds 75 decibels and these locations require noise mitigation measures including noise barriers. However these mitigation measures have not always been to the satisfaction of residents.


News

SelangorTimes

Residents want longer sound barrier near LRT tracks

Modern trams on the other hand are quieter, particularly when they run on a capped grass track (where the trackbed is covered by a layer of grass). The Alstom Citidas Light Rail vehicle for example is nearly four times quieter than auto traffic, generating noise levels that are lower by about five decibels.

Figure 24: A grass capped track bed reduces noise levels

More flexible and easier to expand

Modern generation trams can run at grade or elevated, they can run in their own Right of Way (ROW) or they can run in mixed traffic. Crucially, they can switch between any of these running modes making them the most flexible type of rail. As LRT is too heavy to expand further around the island, and requires areas of high population density to sustain it, it cannot be expanded over time, which is why SRS proposed monorail; however monorail, running point to point, is the least flexible form of rail, and most difficult to branch or extend in the future. Modern tram vehicles are more manoeuvrable and flexible requiring only a 11m turning radius compared to the LRT's 135m, hence reducing the extent of land acquisition.

Cheaper...

Modern trams and BRT are significantly cheaper to build, operate and maintain than LRT or monorail.

Cheaper to build

SRS rebuttal that trams are more expensive to build based on the Sydney tram is disingenuous as the quoted costs includes land acquisition which is prohibitive given the price of real estate in Sydney. The CBD and SE light rail project spent $71 million (RM210m) acquiring just one building block in 2014. Australia as a more developed country also has much higher labour costs. The average salary for a construction worker in Sydney is $75,000 AUD, which is equal to RM18,375 per month or RM114 per hour! [28]

Figure 25

More appropriate examples would be trams constructed in Kaohsiung, Taiwan, Casablanca, Morocco, Rio de Janeiro, Brazil and Suzhou, China,[29] which are (with the exception of Taiwan) defined by the World Bank as Upper-Middle income countries. Kaohsiung is an interesting example given the similarities between Penang and Taiwan.

The construction costs of modern trams in these cities ranges significantly from RM50 million per km in Rio de Janeiro to RM106 million in Suzhou, with the average cost being RM82 million. Interviews with two of the five largest tram manufacturers in the world led to similar conclusions – average construction costs including civil works, rolling stock and signalling plus communication systems range from Euro 18 -25 million (RM83 - RM115)[30] per kilometre. This excludes land acquisition cost.[31] The tram would need to be elevated in certain sections, meaning piers and elevated guideways.

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28 http://www.dailytelegraph.com.au/newslocal/news/nsw-government-spends-over-half-a-billion-on-buying-up-homes-to-make-way-for-rail-and-road-infrastructure/news-story/42627639004c8266cd48fa7739f06d32

29 Suzhou was the 2014 winner of the Lee Kuan Yew World City Prize. Penang made submissions to the competition in both 2014 and 2016.

30 1 EUR = 4.61622 MYR

31 The Halcrow estimates of tram construction are RM40 million per km for at grade (ground-level) tram and RM80 million per km for elevated tram.

Modern tram examples

Modern tram examples

Kaohsiung, Taiwan
Population: 2.8m
Opened: 2016
Track length: 22.1km
Cost per km : RM92m
Construction time: 36 months

https://en.wikipedia.org/wiki/Circular_Line_(KMRT)

Suzhou, China
Population: 1.3m
Opened: 2014
Track length: 18.2km
Cost per km : RM106m
Construction time: 25 months

http://www.railwaygazette.com/news/news/asia/single-view/view/suzhou-tramway-opens.html

Pricing Benchmarks

The SRS Consortium originally provided a cost estimate for tram of RM40 million per km. Yet, later did a somersault and inflated the tram construction costs to over RM220 million per km. One needs to seriously question the reliability of SRS's statistics. If the cost of tram can escalate by over 450% overnight, how much will the LRT and the monorails really cost?

SRS also quoted a benchmark figure of RM110m for BRT. It's not clear if this is for an elevated BRT network, however it is significantly higher than the Halcrow benchmark of RM25m for a grade separated track and RM7.5m per station. Looking at examples of recent BRT systems around the world suggests a range of between RM40m and RM80m. The Centre of Excellence for Bus Rapid Transit[32] database of projects completed since 2010 suggests an average cost of RM30m per km, based on 61 projects around the world, with a range of between RM15m and RM275m per km.

Figure 26: SRS Consortium benchmarks (RM millions)

	LRT	Monorail	Tram	BRT
SRS original	RM220m	RM170m	RM40m	RM110m
SRS revised	RM220m	RM170m	RM220m	RM110m

Figure 27: Halcrow benchmarks (Tram)

	Cost/km of 2 way track (RM million)		*Cost per station (RM million)*
Street running	RM40m	At grade	RM10m
Segregated (at grade)	RM50m	Elevated	RM20m
Segregated (elevated)	RM80m		

Figure 28: Halcrow benchmarks (BRT)

	Cost/km of 2 way track (RM million)		*Cost per station (RM million)*
Street running	RM7.5m	At grade	RM7.5m
Segregated (at grade)	RM25m	Elevated	RM15m
Segregated (elevated)	RM50m		

32 http://brtdata.org/

From our research, SRS benchmarks for LRT and monorail look like significant underestimates. The long problematic Honolulu Light Rail in Hawaii, at 32 km is currently estimated at RM879m per km, this is something of an outlier, but LRT projects in Manila, Bangkok and Macau have all come in significantly above the SRS estimate of RM220m per km. The same is true for monorail, judging from the proposed Panama City monorail which has a budget of RM396m per km or, the Sao Paulo monorail that opened in 2014 and cost RM274m per km. In the middle of this range we have Dubai monorail (RM299m per km) and the Las Vegas monorail (RM359m per km). Is SRS's estimates of RM170m per km for monorail overly optimistic? They have admitted their tram estimate was **wrong!** Perhaps they will do the same for monorail. SRS point to KL as their example.

However we must remember that the KL Monorail project was initially estimated at RM840mil, but the final cost ballooned to RM1.169bn, an increase of 40%!

Figure 29: Comparative construction costs

Tram	Cost per km (RM millions)	BRT	Cost per km (RM millions)	LRT	Cost per km (RM millions)	Monorail	Cost per km (RM millions)
Casablanca	RM80	Rio De Janeiro	RM74	Honolulu	RM879	Sao Paulo	RM274
Rio De Janeiro	RM50	Yichang	RM67	Manila	RM263	Panama City	RM396
Suzhou	RM106	Caen	RM80	Bangkok	RM247	Dubai	RM299
Kaohsiung	RM92	Istanbul	RM38	Macau	RM266	Las Vegas	RM359
Average	**RM82**		**RM65**		**RM414**		**RM332**

Modern BRT examples

Yichang, China
Population: 4m
Opened: 2015
Track length: 23.9km
Cost per km: RM67m
Construction time: 17 months

http://www.adb.org/sites/default/files/linked-documents/45023-002-prc-ea.pdf
https://www.itdp.org/new-gold-standard-brt-in-yichang-china-leads-the-way-for-mid-sized-chinese-cities/
https://www.itdp.org/construction-starts-on-new-brt-corridor-in-yichang-china/

Rio de Janeiro
TransCarioca
Population: 6.4m
Opened: 2014
Track length: 39km
Cost per km: RM74m
Construction time: 39 months

http://brtdata.org/location/latin_america/brazil/rio_de_janeiro
http://brtdata.org/location/latin_america/brazil/rio_de_janeiro
http://brtdata.org/indicators/corridors/infrastructure_cost_per_kilometer_corridor_us_million_per_km
http://www.insidethegames.biz/articles/1020623/new-bus-rapid-transit-link-opens-in-rio-de-janeiro-for-2016-olympics-and-paralympics

Modern BRT examples

Istanbul, Turkey
Metrobus
Population: 14m
Opened: 2012 (Phase 4)
Track length: 9.7km (Phase 4)
Cost per km: RM38m
Construction time: 16 months (Phase 4)

https://en.wikipedia.org/wiki/Metrobus_(Istanbul)
http://www.nctr.usf.edu/wp-content/uploads/2013/03/16.1_yazici.pdf

Caen, France
Twisto TVR
Population: 110,288
Opened: 2002
Track length: 15.7km
Cost per km: RM80m
Construction time: 36 months

http://www.insee.fr/fr/ppp/bases-de-donnees/recensement/populations-legales/commune.asp?annee=2013&depcom=14118
http://www.nbrti.org/docs/pdf/buseshighlevelofservice_bhns_2009_english.pdf
http://brtdata.org/location/europe/france/caen
http://brtdata.org/indicators/corridors/infrastructure_cost_per_kilometer_corridor_us_million_per_km
https://en.wikipedia.org/wiki/Caen_Guided_Light_Transit

Cheaper to operate and maintain

It is clear from the above that choosing to build an LRT and monorail system over a tram system will impose much heavier financial burden on the people of Penang, with construction costs at least three times higher. However, we must also consider the operational and maintenance costs (O&M). From our interviews with a few tram manufacturers and LRT operators, we are told that the O&M costs for LRT and monorail is also two to three times higher than it is for trams.

YB Chow stated that daily ridership for the George Town to Airport line would be 116,000 daily in 2022 (this is before the islands are reclaimed); this works out to 42.3 million a year! As discussed earlier (see questionable projections, page 7-9) these projections are not slightly realistic. We estimate An annual ridership of a more realistic 25m a year in 2022, which is based on estimates from leading tram companies using the Person Per Hour Per Direction (PPHPD) figures of SRS.

YB Chow has indicated that fare box revenue would not cover the running cost of the LRT, and that additional revenue would come from advertising and station property related activities. In KL, Prasarana's non-fare revenue is less than 15%.[33] Based on the average ticket fare in KL and a more realistic 25 million annual ridership, the LRT line would need to find RM82.5m from alternative revenue sources in year 1, equal to 48% of its running costs, so Penang with no experience would need to outperform Prasarana in non-fare revenue generation by a factor of three! Accumulated deficit in the first 5 years may reach RM400m for an LRT line in Penang. Whereas a tram with the same level of ridership would generate an operating surplus.

The SRS proposal seeks to build an LRT in the first phase, but in the second phase will build 2 monorail lines on the island and 1 on the mainland and also a heritage tram in the George Town World Heritage Site. As each of these rail systems is not connected, each line will require its own depot and the differing systems will require different parts, different maintenance regimes and different skill sets for staff. Building a single modern tram system simplifies the operation and will significantly reduce the overall running costs of the transport system, making it more sustainable in the longer term, reducing the likelihood of the government needing to bail it out.

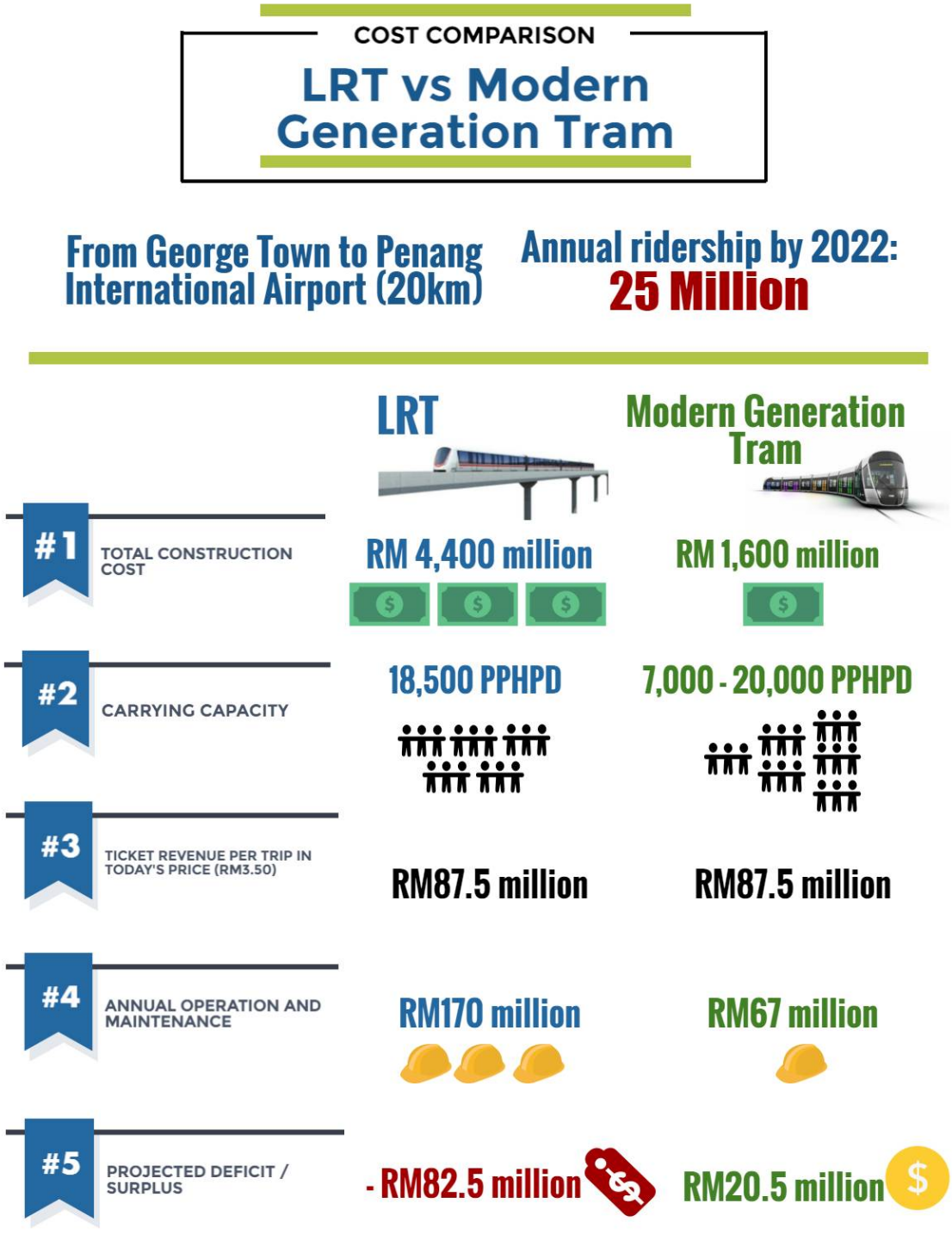
Penang with no experience would need to outperform Prasarana in non-fare revenue generation by a factor of three!

[33] http://themalaysianreserve.com/new/story/prasarana-move-boost-non-fare-revenue

Cost comparison between LRT and modern generation tram

Using the very limited data available, we attempt to construct a comparison between the O&M costs of an LRT or a tram between George Town and the airport. This infographic is meant to be illustrative rather than definitive.

Figure 30.



LRT examples

Hawaii, USA
Population: 1.4m
Opening: 2018
Track length: 32km
Cost per km : RM879m
Construction time: 84 months

http://www.civilbeat.com/2016/05/honolulu-rail-price-estimate-jumps-to-6-9b

https://en.wikipedia.org/wiki/Honolulu_Rail_Transit

http://www.railway-technology.com/projects/bangkok-mass-rapid-transit-green-line-extension/

Bangkok, Thailand
Green Line Extension
Population: 7.8m
Opening: 2017
Track length: 12.6km
Cost per km : RM247m
Construction time: 36 months

http://agbrief.com/news/macau-light-rail-transit-system-be-operational-2019

Manila, Philippines
Metro Rail Transit (MRT) Line 7
Population: 22.7m
Opening: 2019
Track length: 22.8km
Cost per km : RM263m
Est construction time: 40 months

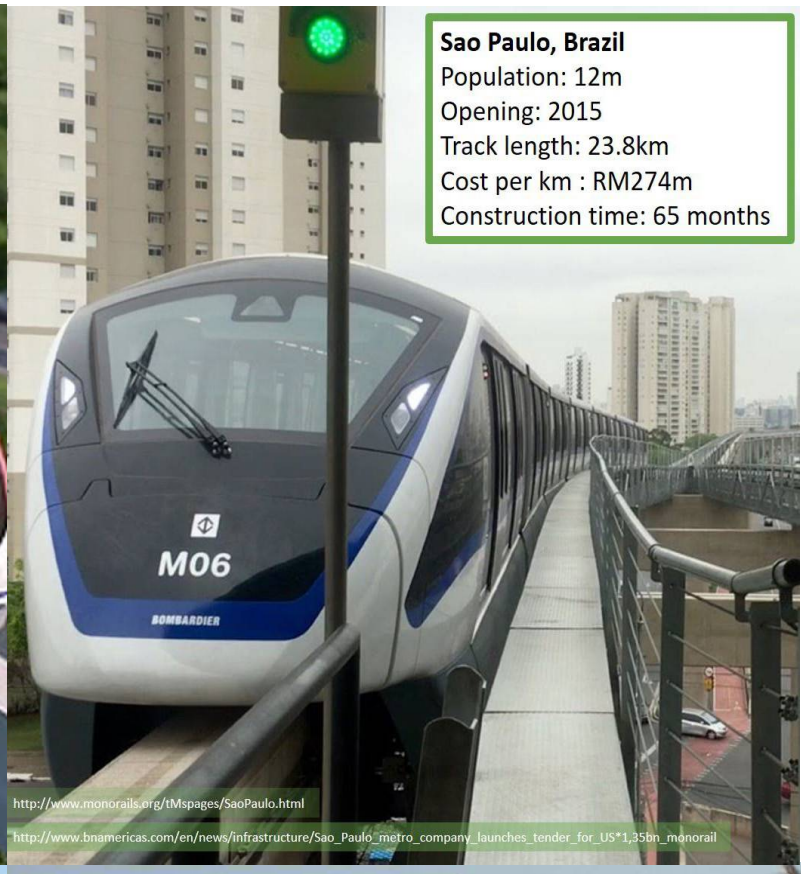
Macau, China
Macau Light Transit System Phase 1
Population: 650,000
Opening: 2019
Track length: 21km
Cost per km : RM266m
Construction time: 84 months

http://www.railway-technology.com/projects/manila-metro-rail-transit-mrt-line-7/

Monorail examples

Panama City, Panama
Line 3
Population: 1.5m
Opening: 2021
Track length: 26.75km
Cost per km : RM396m
Construction time: 48 months

http://www.railway-technology.com/news/newspanama-and-japan-sign-26bn-monorail-deal-4874996



Sao Paulo, Brazil
Population: 12m
Opening: 2015
Track length: 23.8km
Cost per km : RM274m
Construction time: 65 months

http://www.monorails.org/tMspages/SaoPaulo.html

http://www.bnamericas.com/en/news/infrastructure/Sao_Paulo_metro_company_launches_tender_for_US*1,35bn_monorail

Las Vegas, USA
Population: 1.3m
Opened: 2004
Track length: 6.3km
Cost per km : RM359m
Construction time: 38 months

http://www.monorails.org/tMspages/HowMuch.html

http://www.reviewjournal.com/news/las-vegas/judge-rejects-las-vegas-monorail-bankruptcy-plan

Palm Jumeirah, Dubai
Population: 2.5m
Opened: 2006
Track length: 5.45km
Cost per km : RM299m
Construction time: 37 months

https://en.wikipedia.org/wiki/Palm_Jumeirah_Monorail

http://www.monorails.org/tMspages/HowMuch.html

Faster...

Tram and BRT can be built twice as fast as LRT and monorail.

Construction time

The construction time for modern trams and BRT is significantly shorter than for LRT and monorail. Measured in months taken to build one kilometre for different cities; modern generation trams, based on our examples, take an average of 1.5 months per km to construct, with a range of between 1.3 and 1.6 months per km.

Construction time for BRT is slightly quicker at 1.4 months per km, with a range from 0.7 months per km in Yichang, China to 2.3 months per km in Caen, France. As every system is different, it is difficult to compare construction timelines of different projects, however on average the construction of LRT and monorail appear much longer, with the fastest example of LRT and monorails constructed at 1.8 months per km, and 2.8 months on average for LRT and 4.3 months per km for monorail.

Figure 31: Comparative construction timelines

Tram	Months per km	BRT	Months per km	LRT	Months per km	Monorail	Months per km
Casablanca	1.5	Rio De Janeiro	1	Honolulu	2.6	Sao Paulo	2.7
Rio De Janeiro	1.3	Yichang	0.7	Manila	1.8	Panama City	1.8
Suzhou	1.4	Caen	2.3	Bangkok	2.9	Dubai	6.8
Kaohsiung	1.6	Istanbul	1.6	Macau	4	Las Vegas	6
Average	**1.5**		**1.4**		**2.8**		**4.3**

SRS have indicated that the 26km Komtar to airport LRT line in Phase 1 will take 6 years (72 months) to construct, equal to 2.8 months per km, which is the average of the examples we present. To construct a modern tram at grade over the same distance, based on the average of 1.5 km per month from the table above, it would take just 39 months, which is almost twice as quick, and new technologies such as Alstom's Appitrack automated track laying solution, can lay 80 metres of track per day on average (up to 400 metres in favourable conditions).

Significant disruption and added traffic congestion will be caused by transport infrastructure construction, and will result in frustration for commuters, businesses, residents, schools and other institutions along the alignment. Compared to LRT and monorail, the construction of a modern tram system would be far quicker and disruptions would be minimised.

Figure 32

LRT pier piling[35]

Tram track bed construction[36]

Alstom Appitrack[34]

Below ground are a large number of pipes and cables carrying water, sewage, electricity and communications, providing services that are all essential elements of our way of life. Apparatus may be placed anywhere in the street, with sewers and large, high capacity items generally to be found under the carriageway, with more minor apparatus in the footway, road reserves or median. Our roads serve as linear corridors for these utilities and when new infrastructure is introduced it invariably affects utility apparatus by interfering with the access to it. In some cases parts of the apparatus may be physically in the way of the construction process.

A tramway will normally consist of one or more track slabs, each of which will support a pair of rails forming a track. The underside of the slab will be at a depth of approximately 0.5m beneath the road surface. In comparison, a pier for an elevated guideway will require a piling depth of 3.5m. Sewers in Malaysia are typically found at 2.5m.[37]

The International Association of Public Transport[38] have recorded utility diversions typically amount to around 10% of the total project cost, depending on the extent of on-street running.

As SRS have highlighted, the Edinburgh Tram project suffered from problems with utility diversions. Audit Scotland's Interim Report, published in February 2010, estimated that the final extent of diverted utilities for the Edinburgh Tram project would be around 50,000 metres, with the cost of this work contributing to an overall increase in project costs of around £67 million (RM400m) significantly higher figures than first anticipated. This is however just a fraction of the RM6.3bn budget proposed for the LRT.

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34 See http://www.alstom.com/Global/OneAlstomPlus/Railsystems/1200x800/1200x800---Appitrack-1.jpg

35 See http://uploads.tapatalk-cdn.com/20160326/b31822e4fe21e4d232ebc0f8864bd1f2.jpg

36 See https://railturkeynews.files.wordpress.com/2016/01/izmirtramvay.jpg?w=712&h=302&crop=1

37 http://www.span.gov.my/files/MSIG/MSIGVol3/04_Sec._2_Planning_Material_&_Design.pdf

38 UITP Core Brief, 2001 - Diversion of Public Utilities for the construction of light rail and tramway systems

Penang Forum propose an integrated transport network across the whole state based on modern generation trams and Bus Rapid Transit. On the island, the LRT and monorail would be substituted with 3 modern tram lines and a tram connection across the channel to the mainland. On the mainland the proposed monorail and single BRT line would be substituted with 4 BRT lines, complementing the KTM rail network.

Alternative Plan for Penang Island

- A single, integrated modern tram based public transport system where vehicles can travel anywhere on the network, increasing connectivity and accessibility;
- A system of mixed grade and elevated running rail keeps the large scale infrastructure to a minimum, significantly reducing construction cost and also construction time along with the associated negative impacts (social, economic);
- A single modern tram based public transport system with significantly lower operational costs (maintenance, depot and staffing);
- A system which connects all major transit points, including water based transit, more major developments and major trip generators and many more high density housing areas, including affordable housing areas;
- A system that requires less raised infrastructure and employs ground based power systems as required (20%) results in 40% less tree cutting, retaining Penang's natural heritage.
- An at-grade system is quieter, lighter and more flexible for future expansion.

For the Komtar to the Airport line we are proposing a high capacity tram with mixed grade and elevated sections, with the entire route having an exclusive Right of Way (ROW) no mixed traffic street-running sections are proposed. The grade running sections would be exclusively within the road reserve along the same alignment where the SRS proposal indicates elevated rails for LRT. A total of 4 intersections would need to be adjusted to accommodate trams, 3 of which are already signalised, and none of which have any pedestrian access.

Figure 33: Grade running sections

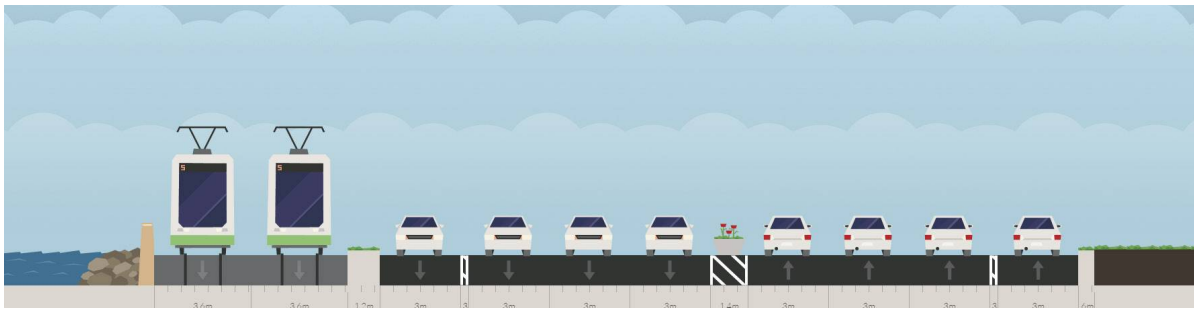
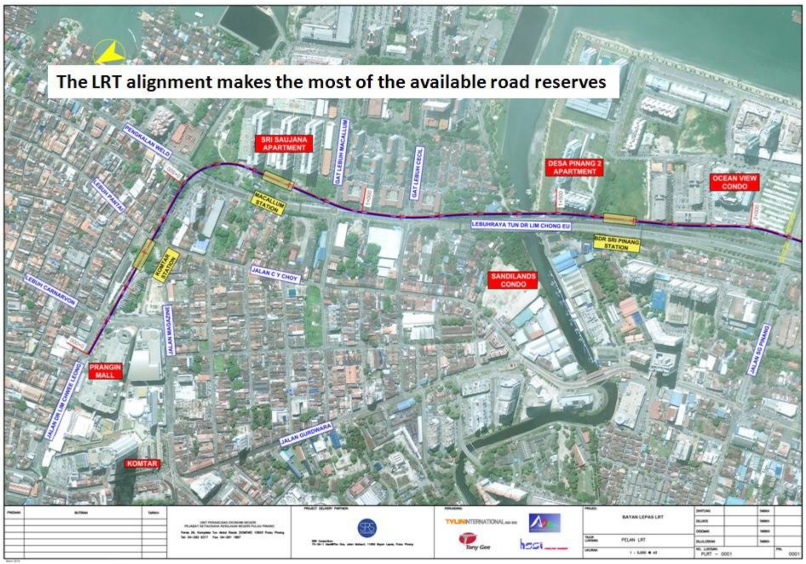


Figure 34: Grade running tram -Dr Lim Chong Eu Expressway

How a modern tram may look alongside the Dr Lim Chong Eu Expressway

SRS LRT Line


The LRT alignment makes the most of the available road reserves
PENGKALAN WELD
SRI SAUJANA APARTMENT
GAT LEBUH MACALLUM
GAT LEBUH CECIL
DESA PINANG 2 APARTMENT
OCEAN VIEW CONDO
LEBUH PANTAI
MACALLUM STATION
LEBUHRAYA TUN DR LIM CHONG EU
BDR SRI PINANG STATION
KOMTAR STATION
JALAN C Y CHOY
SANDILANDS CONDO
LEBUH CARNARVON
JALAN MAGAZINE
JALAN SG PINANG
PRANGIN MALL
JALAN DR LIM CHWEE LEONG
JALAN GURDWARA
KOMTAR
BAYAN LEPAS LRT
PELAN LRT
PLRT - 0001


LEBUH SG PINANG
JELUTONG LANDFILL
THE SPRING CONDO
FORTUNE PARK
The alignment is in the road reserves
SKYCAB STATION
LEBUHRAYA TUN DR LIM CHONG EU
EAST JELUTONG STATION
JALAN SG PINANG
JELUTONG SEWAGE TREATMENT PLANT
JALAN AHMAD NOR
KAMPUNG TENGAH
JALAN JELUTONG
BAYAN LEPAS LRT
PELAN LRT
PLRT - 0002

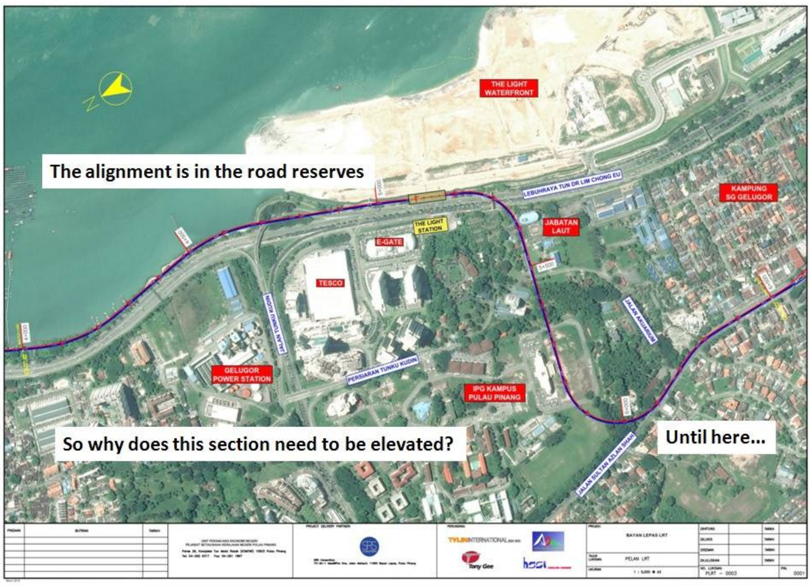

THE LIGHT WATERFRONT
The alignment is in the road reserves
LEBUHRAYA TUN DR LIM CHONG EU
KAMPUNG SG GELUGOR
THE LIGHT STATION
JABATAN LAUT
E-GATE
TESCO
JALAN TUNKU KUDIN
JALAN AKUARIUM
GELUGOR POWER STATION
PERSIARAN TUNKU KUDIN
IPG KAMPUS PULAU PINANG
So why does this section need to be elevated?
Until here...
JALAN SULTAN AZLAN SHAH
BAYAN LEPAS LRT
PELAN LRT
PLRT - 0003

Figure 35: Tram moving from elevated to grade

Figure 36: Grade running tram - SPICE Arena

How a modern tram station may look like at the SPICE Arena

Transport Hub, alternative plan for George Town

SRS have proposed a transit hub on the site of the Penang Heritage Arts District, a 5.5 acre space at Sia Boey (next to Komtar). The Penang Heritage Arts District was launched in September 2015 to redevelop the area into a premier art destination in Malaysia anchored by an iconic art museum, Ilham Penang. It remains unclear how these proposals will now be integrated with a transit hub for the elevated LRT and future monorails.

Adopting a modern tram system allows us to rethink the transport hub infrastructure in George Town. Rather than displacing the Penang Heritage Arts District, a modern tram system can complement the existing plans by better utilising the public space of Komtar Walk.

Sia Boey Reborn vs SRS proposed interchange

Figure 37: Sia Boey: Reborn?

VS

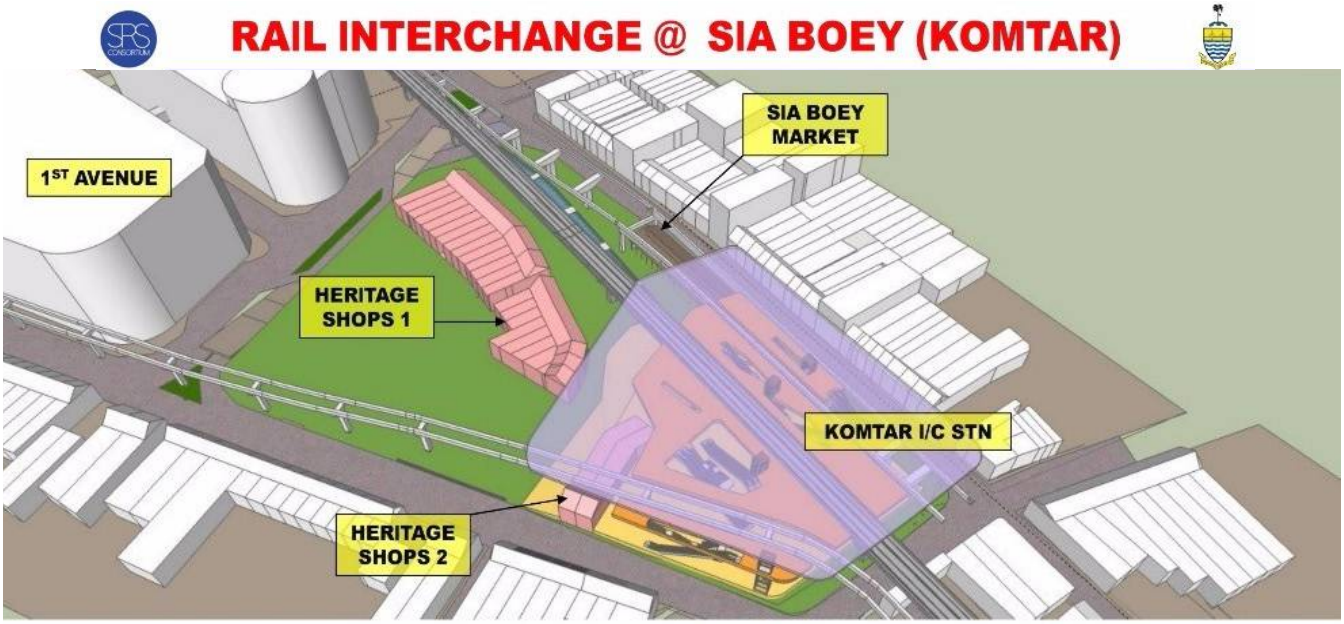


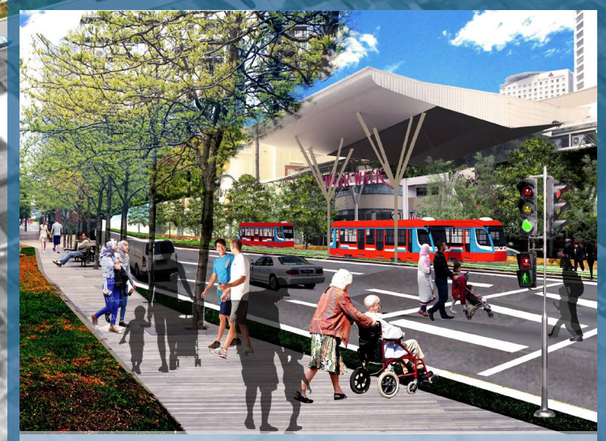
Figure 38: SRS proposed interchange

Alternative Sia Boey/Komtar Walk

It is proposed that the LRT line from the airport arrives over the Tun Dr Lim Chong Eu Expressway elevated and then drops to grade along a 250m ramp, entering the existing Sia Boey marketplace building which can be converted into a modern tram station.

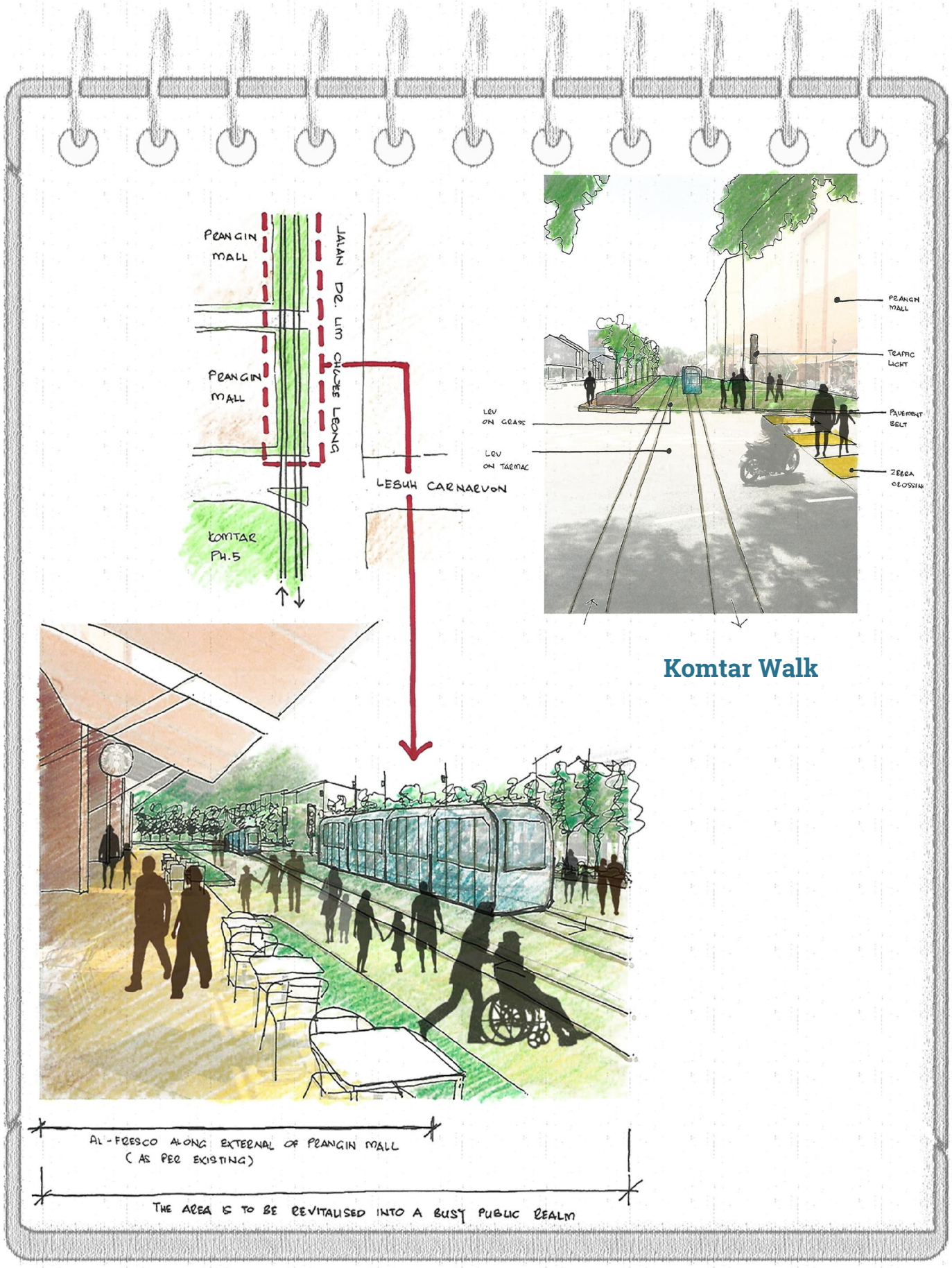
Sia Boey Market tram station

From here the line continues at grade across Lebuh McNair into the under-utilised open public space along the front of Prangin Mall, continuing across Lebuh Lintang into Komtar Walk, where the existing temporary building structures give way to an open air transport hub, where the future Paya Terubong and Tanjung Tokong lines connect with a city centre loop.



Komtar Walk tram hub station

Figure 39


PRANGIN MALL
JALAN DR. LIM CHONG LEONG
PRANGIN MALL
LEBUH CARNARVON
KOMTAR PH.5
PRANGIN MALL
TRAFFIC LIGHT
LRV ON GRASS
LRV ON TARMAC
PAVEMENT BELT
ZEBRA CROSSING
AL-FRESCO ALONG EXTERNAL OF PRANGIN MALL (AS PER EXISTING)
THE AREA IS TO BE REVITALISED INTO A BUSY PUBLIC REALM

Komtar Walk

Jalan Dr Lim Chwee Leong

Elevated vs grade

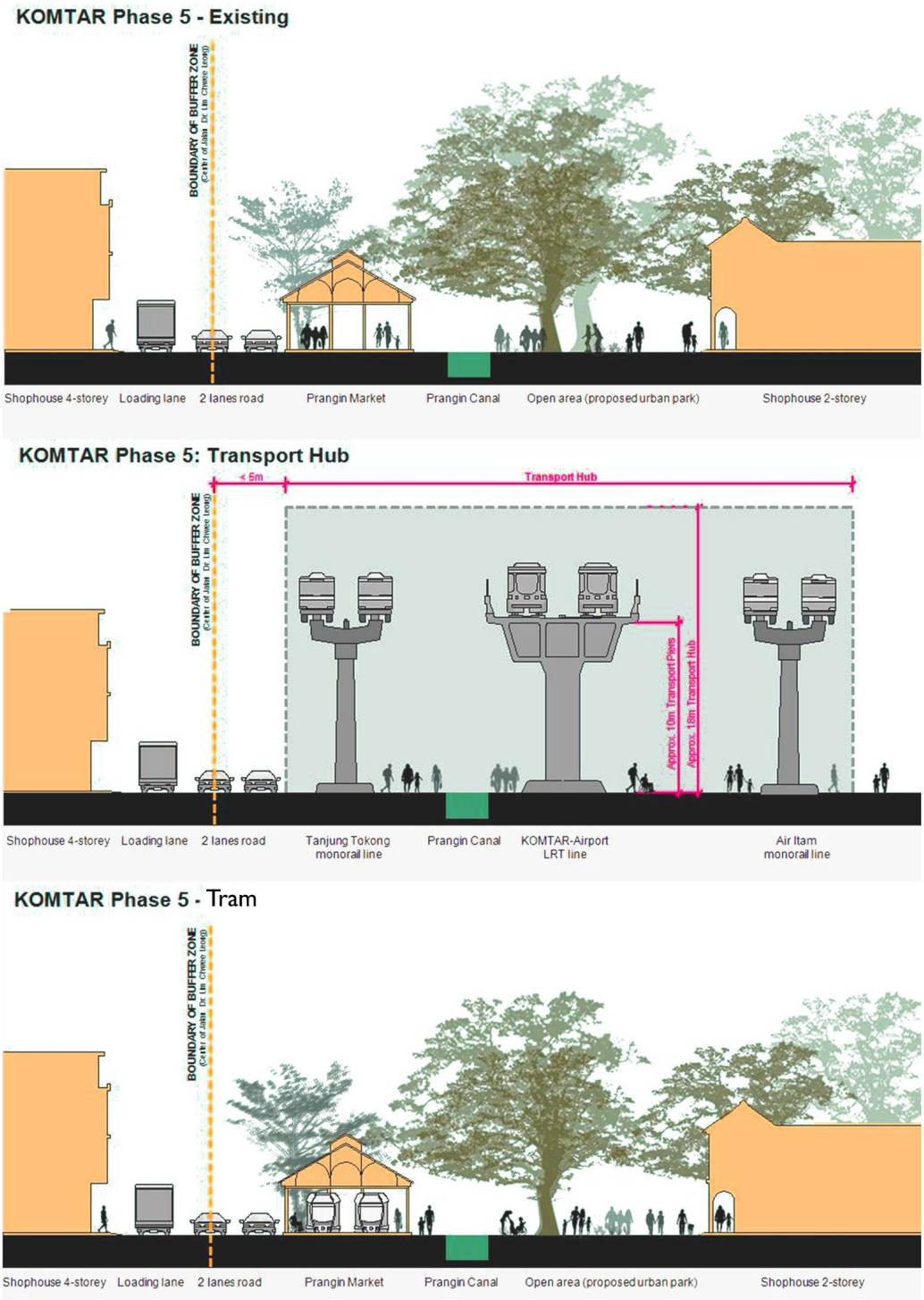
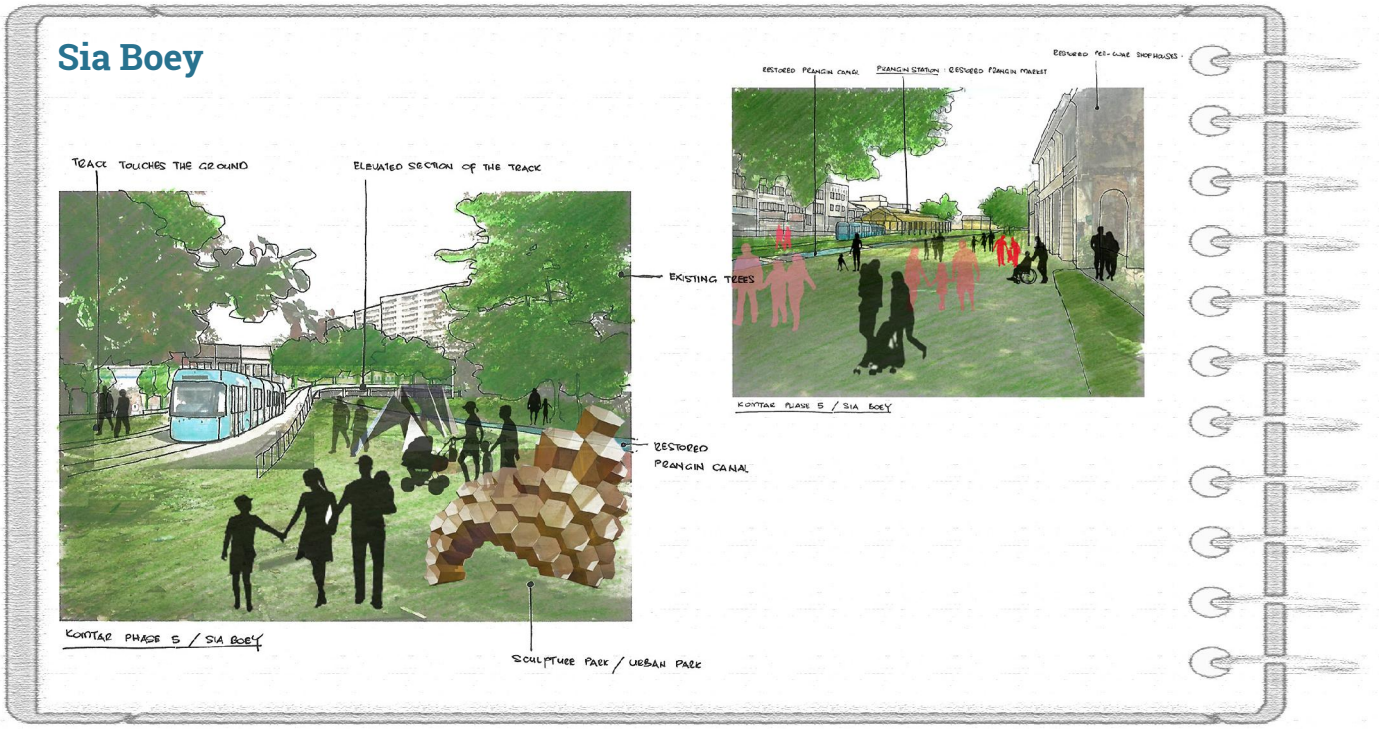


Figure 40: Sia Boey site



City centre tram route

SRS have proposed a heritage tram for George Town to complement the existing Central Area Transit service. This is proposed to run from Carnarvon Street (a 300m walk from the proposed Sia Boey transport hub) to Swettenham Pier Cruise Terminal as a single track. It is not clear if there will be any passing points to allow trams to run both in directions, potentially giving rise to the scenario where you must wait for the tram to pass in one direction, reach the end of its track and return, before you can board to reach your intended destination. This is not a public transport system.

Figure 41: SRS proposal for George Town

Figure 42: Penang Forums proposal for George Town

Penang Forum would propose a city centre loop which is connected to the main hub at Komtar Walk to increase public transport connectivity in the centre of George Town. This one way loop would cover a significantly larger area of the World Heritage Site, and would, using the same single system, allow trams to travel from anywhere on the network into the heart of the city.

Traveling along Carnarvon Street into Jalan Masjid Kapitan Keling the alignment would turn right along Light Street connecting the Street of Harmony, the courts, town hall/city hall and Fort Cornwallis to the network. Continuing past the Swettenham Pier Cruise Terminal, along Weld Quay the alignment would turn into Chulia Street and continue until Penang Road, revisiting the historical trams lines of the city before reaching the Komtar Walk hub.

Figure 43: A modern tram along Light Street/Seafront

This is how a modern tram may look along Light Street

Alternative Plan for Penang Mainland

- A much more comprehensive BRT system linking the major urban areas of the mainland with key connectivity points in the system, strengthening linkages between the island and the mainland;
- The Raja Uda to Bukit Mertajam Monorail which at RM6bn and with no suggested timeline for implementation should be converted into a BRT line directly from Raja Uda to Penang Sentral;
- A new BRT alignment to Batu Kawan should be developed along the west of the North-South Highway, connecting upcoming residential areas with key industrial and leisure centres.
- Bukit Mertajam BRT to connect key urban areas with Penang Sentral, complementing the KTM service.
- Additional BRT connection from Batu Kawan to Penang Airport/FIZ.
- By creating an exclusive, segregated right of way for the BRT wherever possible on the mainland, it becomes very simple in the future to expand the tram network onto the mainland, giving Penang one single public transit system. So eventually you can get board a tram in Butterworth and alight in Tanjung Tokong, or board a tram at the airport and alight in Raja Uda.

Figure 44: A segregated BRT system[39] …over time becomes a tram[40]

39 http://transcub.e-monsite.com/medias/images/metz-stationweb2.jpg

40 https://ivandacho.wordpress.com/2015/09/08/las-cifras-de-penalosa/

Summary

In summary, a modern tram and BRT system would be a better option for Penang, this is what the transport planning consultant recommended. It would also be significantly cheaper and faster to build. A combination of a single integrated network of modern trams with BRT can adequately cater to both the island and the mainland's needs. It can be delivered at half the price and can be delivered twice as fast as the SRS proposal.

Figure 45: Transit type compared

	Cost	Months per km	Grade running	Elevated	Mixed traffic	Mobility impaired friendly	Easy to expand
LRT	$$$	2.8	X	✓	X	X	X
Monorail	$$$	4.3	X	✓	X	X	X
Modern generation trams	$$	1.5	✓	✓	✓	✓	✓
Bus Rapid Transit	$	1.4	✓	✓	✓	✓	✓

$ = RM40-80m per km

$$ = RM80-115m per km

$$$ = RM250m+ per km

Better

- **Because it is more accessible for all;**
- **Has a smaller footprint and is friendlier to the environment;**
- **Is quieter and produces less vibrations;**
- **Is flexible and much easier to expand in the future.**

Cheaper

- **A modern tram and BRT system is no more than half the price to build, saving up to RM16bn of our money;**
- **A modern tram and BRT system is two to three times cheaper to operate and maintain, saving your children from having to bail it out in the future. [needs to be rephrased]**
- **The network will be cheaper to expand on the island and to the mainland; the extent of area coverage is positively correlated to ridership.**

Faster

- **A modern tram and BRT system is twice as fast to construct and can be built on the island and the mainland at the same time;[41]**
- **A system built twice as fast means half the disruption to daily life;**
- **A system which is half the price can be built far quicker, meaning no need to wait until 2030 for SRS to get round to completing their proposal.**

[41] Neither the Raja Uda to Bukit Mertajam Monorail or the Butterworth to Simpang Ampat BRT have any committed timeline in the SRS RFP proposal.