Choosing appropriate Mass Rapid Transit alternatives to improve urban accessibility

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Government Policy Statement (GPS) on Land Transport

- Mass Transit & Public transport priority for cities and interregional commuting
- Auckland LRT City centre ↔ Mt Roskill ↔ Airport.
- Regional rail (Auckland ↔ Hamilton ↔ Tauranga)
- Freight rail improvements (Mode neutrality)
- Reduced investment in highway projects
- Sustainable transport (e.g. electric vehicles, walking and cycling projects)
- Transport safety improvements
2013 Census Data

- 13.4% travelled by company vehicle
- 6.6% walked or jogged
- 7.0% cycled
- 8.0% Whenuapai West cycled
- 12.6% travelled by company vehicle
- 9.9% bus, train, taxi, ferry + other
- 21.0% walked or jogged
- 16.8% public bus

...lies, damn lies and statistics
Integrated Masterplan to 2050 - Vision, goals and objectives

**Vision**
- Integrated, Sustainable, Accessible, Inclusive Masterplan

**Goals**
1. Support economic development through improvement of infrastructure and public transport
2. Enhance urban environment and tackle increasing congestion
3. Enhance social inclusion, provide safe, easy and convenient accessibility to sustainable transportation

**Objectives**
- Mass Transit Networks
- Urban Bus network development
- Rail Network expansion
- Land Use intensification and accessibility
- Walking & cycling network
- Value Capture

**Outcomes**
1. MRT for improved Airport/CBD accessibility
2. Bus priority treatments for higher frequency bus routes
3. Urban commuter cycle projects
4. Active transport mode share improvement projects
5. Commuter rail line extensions
Integrated Masterplan methodology

The masterplan is undertaken in conjunction with the land-use planning, or more specifically to be integrated to the land use and development planning for the city.

The process involves:

- The development of a number of land-use and transport alternatives
- Evaluation
- Discussions with all stakeholders in order to achieve the best solution.
Integrated Masterplan

Historically, disjointed transport and urban planning practices in developing cities mean that relatively little effort is put into designing communities integrated with transport systems.

- **Land use change**
  - Increased traffic generation
  - Increasing traffic conflicts

- **Level of Service**
  - Improvement in service

- **Land Value**
  - Increasing land value

**LAND USE AND TRANSPORTATION CYCLE**

- Increased traffic generation
- Increased traffic conflicts
- Network improvements
- Deterioration in the Level of Service
- Land Use change
- Increased Land Value
Integrated Masterplan & urban mobility

- Mass Rapid transit
- Frequent bus
- Normal bus
- ¼ Acre dream

Timeline:
- Today
- Tomorrow
- Not too distant
- Future

Notations:
- Normal bus
- Frequent bus
- Mass Rapid transit
- ¼ Acre dream
**Alternatives Analysis – Start Point**

**Holistic Approach:** An interconnected whole that is part of a larger system.

1. **Integrated Masterplan:** Conceptualise a public transport system that is easy and convenient to use, fast, safe, clean & affordable.

2. **Alternatives Analysis:** Project identification step; bridging the gap between policy-oriented strategic planning and the preparation of specific investments in new rapid transit capacity.

3. **Feasibility Study & Preliminary Design:** A preferred solution test and design scenario.

**Level of Design Definition**

- Minimal
- 20% Design
- Highest

**Number of Alternatives**

- Lowest
- Integrated Masterplan
- Alternatives Analysis

**Final Design**
Why Alternatives Analysis should be the basis for Mode Decisions

• No magic “silver bullet”
  o Each situation a unique combination of factors
  o Usually more than one “feasible” alternative

• Detailed, reliable information on costs, benefits, impacts needed to make good decisions on far-reaching investments
What is Mass Rapid Transit (MRT)

- Highest performance and quality transport mode
  - Majority of service on a dedicated transitway
  - Permanent and substantial stations / terminals
  - Permanent integrated system by design
  - Unique identity and quality image
Mass Rapid Transit

- Mode options

Monorail, Kuala Lumpur

Guideway Transit, Singapore

SkyTrain METRO, Bangkok

Light Rail Transit, Strasbourg

Bus Rapid Transit, Bogota
Mass Rapid Transit

- Mode comparison

Peak Hour Forecast 2026
PEAK LOADING CITY TO AIRPORT LRT

- METRO TRANSIT (Capital Costs per km) $USD 50 – 120 Million
- LIGHT RAIL TRANSIT (Capital Costs per km) $USD 10 – 65 Million
- BUS RAPID TRANSIT (Capital Costs per km) $USD 5 – 15 Million
- MONORAIL (Capital Costs per km) $USD 35 – 105 Million

Capacity (passengers / hour / direction)

High Capacity BUS RAPID TRANSIT
90,000 to 30,000
35,000 to 12,000
12,000 to 2,000
15,000 to 2,000

PEAK LOADING CITY TO AIRPORT LRT
Peak Hour Forecast 2046
12,500
Selection of a Specific Mass Rapid Transit Mode

Factors Impacting selection:

• Strategic goals, objectives
  ○ Transport
  ○ Land use
  ○ Social, environment, economic
• Current / future multi-modal transport network size, condition, performance
• Current and future land use patterns
• Available rights-of-way
• Costs, benefits, impacts
• Financial resources, current & future needs
Alternatives Analysis Process

**STEP 1:** Inputs from Masterplanning
- Established Goals & Objectives; Transportation / Land Use

**STEP 2:** Strategic planning problem definition
- Evaluate Current Problems, Future Challenges

**STEP 3:** Screened list quantitative analysis
- Identify Investment Alternatives & Evaluate Alternatives

**STEP 4:** Mode Decision - Go!!
- Decision on Mode, Alignment, Design Concept

**Project Preparation:**
- Feasibility Study & Preliminary Design
Alternatives Analysis - best practice

1. Develop and implement a formal communications process
2. Establish goals, objectives, evaluation process and criteria
3. Understand the process and causes of problems
4. Consider the right alternatives (multi-modal)
5. Develop decision support information
6. “Make the case” for the selected alternative
Vietnam Examples
Vietnam Project locations

Hà Nội
Hồ Chí Minh

Vietnam stats 2018
The current population of Viet Nam is 96,147,061.
Viet Nam ranks number 15 in the list of countries (and dependencies) by population.
35.2% of the population is urban (33,991,799 people in 2018).
The median age in Viet Nam is 30.9 years.

NZ stats 2018
The current population of NZ is 4,733,756.
NZ ranks number 126 in the list of countries (and dependencies) by population.
86.0% of the population is urban (4,085,994 people in 2018).
The median age in NZ is 37.4 years.

http://www.worldometers.info
Da Nang 2030 – 2050 transport masterplan

Dramatic urbanisation...

Population of Da Nang 2000 - 2018

- 2000: 706,000
- 2005: 806,000
- 2010: 942,000
- 2018: 1,300,000
Rail Development

1. Current railway network

2. Railway according to the Decision of P.M 1436/QĐ-TTg

3. Future Express rail network
Tram & Metro – Future Vision

**LRT / Tram**

- **Tramway Line**: Da Nang station (new) – Hai Van – Chan May Lang Co travel zone.

**Metro**

- **Option 1**: Da Nang station (new) – Hung Vuong – the University village.
- **Option 2**: Da Nang station (new) – Quang Trung – the University village.
Bus Rapid Transit Network


Route 2: Da Nang station (new) – Nguyen Sinh Sac – North West urban street – Hue intersection – Truong Chinh – National road No.1A – South bus station


Route 4: Hoa Khuong industrial zone – South ring road – South bus station – University Village (new)


Route 6: Tuyen Son bridge – Thu Khoa Huan – Ho Xanh tourist service zone.
Bus Rapid Transit (BRT) examples

MEXICO CITY

Tonkin+Taylor
Bus Rapid Transit (BRT) examples

BOGOTA, COLUMBIA
Bus Rapid Transit (BRT) examples
Bus Rapid Transit (BRT) examples

PEREIRA, COLUMBIA
Bus Rapid Transit (BRT) examples

PERIERA, COLOMBIA
Da Nang - Final Networks and designs

- The core BRT route is 24.9 km long
- 37 BRT stations and 2 termini points (Bau Tram Lake – North; & Viet Han College - South)
- Dedicated lanes: 13.0km, Mixed traffic lanes: 10.7 km - fully dedicated by 2020
- 2 additional BRT service routes (Hoi An and Ba Na)
- BRT operates daily from 05.00 to 21.00; peak service hours 07:00 to 09:00 and 16:00 to 18:00.
Da Nang BRT designs
Da Nang...then and now...Vietnam style!
Hanoi BRT

- Significant project delays and delivery issues – planning started 2004
- 14.7km, 23 station BRT corridor
- World bank funded cost US$110 million
- No ITS or ticketing on the BRT
- Serious issues related to accessibility boarding at 3 stations
Bus Rapid Transit (BRT) examples – Stations

HÀ NỘI, VIETNAM
Hanoi BRT

- Since its debut in Dec 2016, the BRT system has received mixed reviews from local residents.
- Daily ridership on the BRT has risen from 8,000 at the start to 13,000.
- BRT system continues to run at half its 90-person capacity, averaging around 42.4 riders per trip – reported in May 2017.
Hanoi METRO

The metro system will eventually consist of 8 lines with the total length of 318 km. Currently, there are 2 lines under construction:

- Line 2A Cat Linh - Ha Dong
- Line 3: Nhon - Hanoi Station section.

Initially, the system will carry 200,000 passengers per day. Funding from Japan (Line 1), China (Line 2) and France (Line 3).
Conclusions

• Multiple factors need to be considered in mass rapid transit investment decision making
• Each corridor or area presents a unique combination of these factors
• There is no single, dominant Mass Rapid Transit mode
• A detailed, objective Alternatives Analysis following strategic planning is critical
• Effective AA’s include a strong, extensive communications process
• Communications, transparency make the process work
Next Steps

- Develop the cities ITS systems and create a SMART city
- Update ticketing and technology
- Create “e-road user charges” that cause shift to public transport
- New light rail and autonomous bus vehicles
- Create new networks for mass rapid transit
- Develop first & last leg options for MaaS (Mobility as a Service)
Next steps

Fleet Management System (FMS)

1. Real Time Passenger Information System (RTPI)

2. Integrated Automatic Fare Collection and Ticket System (AFC)

3. Camera Surveillance (CCTV)

4. Traffic Priority System (TPS)

5. IT Infrastructure

6. Other Systems:
   - Help Point & IP PABX
   - Auto Door & Precision Docking System

Public Transport Intelligent Transport Systems / Integrated for all modes / Existing & future systems
Next steps

- Automatic Fare Collection (AFC) and Integrated Ticketing
  - Frequent Users (Monthly and ‘Pay as you Go’) – Registered and issued on-line
  - Infrequent Users (Single Journey) – dispensed from Ticket machine or direct to device
Next steps

- **E-RUC**: Electronic Road User Charging
- Norway implemented electronic urban tolling on main road corridors into Bergen (1986), Oslo (1990) and Trondheim (1991)
- London recommended congestion charging in 1964 and road pricing considered by the Greater London Council in 1973
- London implemented congestion charge in 2003
Next steps

- MaaS – “Mobility as a Service”

The taxi and private hire industry has also innovated, alongside its public transport counterparts.
Many thanks for listening...