The Future of LAMAT in Asia

(アジアにおけるLAMATの未来)

LAMAT: Locally Adapted, Modified and Advanced Transport

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Outline

1. What is LAMAT?
   LAMATとは?

2. Motivation & Objectives
   研究の背景と目的

3. Market Share of LAMAT Users
   LAMATの市場シェア

4. The Future of LAMAT
   LAMATの未来

5. Discussion & Conclusion
   議論、結論
They are known as *Paratransit*, but we call them as **LAMAT**.

These modes are locally manufactured with minimal standard in response to local needs and each has its own unique design.
• “Paratransit” means “alongside transit,” 1st used 1965 in North America.

• Its **concept differs** among developed and developing countries:

<table>
<thead>
<tr>
<th>Developed countries</th>
<th>Developing countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>-In USA: <strong>Paratransit</strong> covers</td>
<td>-There are several definitions and terms given for <strong>paratransit</strong></td>
</tr>
<tr>
<td>1) Specific transport service for disabilities (ADA 1990)</td>
<td>-<strong>Paratransit</strong> is called as “Informal transport,” “Low-cost transport,” “Intermediate technology,” “Third world transport,” and “Indigenous transport”</td>
</tr>
<tr>
<td>2) Demand-responsive service</td>
<td></td>
</tr>
<tr>
<td>-In Europe: <strong>Paratransit</strong> refers to particular transport services including dial-a-ride, jitneys, and shuttles</td>
<td></td>
</tr>
</tbody>
</table>

*By GAO 2012*  
*By Phil Chen*  
*Remork by QuickDraw*  
*By eengSU*
Concept of LAMAT

Why LAMAT, not paratransit?

LAMAT is proposed to replace paratransit because:

- Different paratransit concepts in developed vs developing countries.
- Various terms & definitions for paratransit (e.g. informal transport).
- To cover all paratransit services in Asian developing countries.

Definition

“LAMAT is defined as indigenous public Transport mode that is Locally Adapted, Modified and Advanced for a certain transport service in a particular city or region.”

Source: Phun & Yai (2016a)
LAMAT in its Description

L: Locally
A: Adapted—a vehicle imported without physical alteration.

M: Modified—a vehicle that is physically modified based on local needs.

A: Advanced—a vehicle that is upgraded with available technologies.

T: Transport

Source: Phun & Yai (2016a)
## Land-based Transport System

### 道路上の交通手段分類

<table>
<thead>
<tr>
<th>Type</th>
<th>Mode</th>
<th>Vehicle</th>
<th>Capacity</th>
<th>Infra.</th>
<th>Route</th>
<th>Shedule</th>
<th>Collective Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public</td>
<td>Mass Transit</td>
<td>MRT (in pphpd)</td>
<td>10000–40000</td>
<td>Rail</td>
<td>Fixed</td>
<td>Fixed</td>
<td>Shared</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LRT (in pphpd)</td>
<td>6000–12000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>BRT (in pphpd)</td>
<td>5000–10000</td>
<td>Own lane</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Public</td>
<td>Special LAMAT</td>
<td>Large Bus</td>
<td>25–60</td>
<td>Road</td>
<td>Fixed</td>
<td>Fixed</td>
<td>Shared</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Taxi</td>
<td>3–4</td>
<td>Road</td>
<td>Flexible</td>
<td>On-demand</td>
<td>Individual</td>
</tr>
<tr>
<td>Public</td>
<td>LAMAT</td>
<td>Minibus</td>
<td>12–24</td>
<td>Road</td>
<td>Fixed</td>
<td>Semi-fixed</td>
<td>Shared</td>
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<tr>
<td></td>
<td></td>
<td>Microbus</td>
<td>4–14</td>
<td>Road</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Auto-Rickshaw</td>
<td>2–4</td>
<td>Road</td>
<td>Flexible</td>
<td>On-demand</td>
<td>Individual</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Motorcycle Taxi</td>
<td>1–2</td>
<td>Road</td>
<td>Flexible</td>
<td>On-demand</td>
<td>Individual</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cycle Rickshaw</td>
<td>1–2</td>
<td>Road</td>
<td>Flexible</td>
<td>On-demand</td>
<td>Individual</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Animal-Cart</td>
<td>2–6</td>
<td>Road</td>
<td>Flexible</td>
<td>On-demand</td>
<td>Individual</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pulled-Rickshaw</td>
<td>1–2</td>
<td>Road</td>
<td>Flexible</td>
<td>On-demand</td>
<td>Individual</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bicycle Taxi</td>
<td>1–2</td>
<td>Road</td>
<td>Flexible</td>
<td>On-demand</td>
<td>Individual</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Car</td>
<td>2–6</td>
<td>Road</td>
<td>Flexible</td>
<td>Personal</td>
<td>Personal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Motorcycle</td>
<td>1–2</td>
<td>Road</td>
<td>Flexible</td>
<td>Personal</td>
<td>Personal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bicycle</td>
<td>1–2</td>
<td>Road</td>
<td>Flexible</td>
<td>Personal</td>
<td>Personal</td>
</tr>
<tr>
<td>Private</td>
<td>Private</td>
<td>On-Foot</td>
<td>1</td>
<td>Sidewalk</td>
<td>Flexible</td>
<td>Personal</td>
<td>Personal</td>
</tr>
</tbody>
</table>

1. Transport capacity in pphpd: passengers per hour per direction; Source: UITP (2015). Public Transport Trends
3. Auto-Rickshaws at some cities (e.g., Kolkata in India) are operated on fixed-route and shared type basis.
What is LAMAT?

- **LAMAT** (Locally, Adapted, Modified and Advanced Transport) is the new term proposed and used instead of “paratransit” in Asia.

- **LAMATs are indigenous PT modes, ranging from non-motorized 2-wheelers to motorized 4-wheelers, with seating capacity \( \leq 25 \).**

Source: Phun & Yai (2016a)
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4. The Future of LAMAT

5. Discussion & Conclusion
Benefits of LAMAT

• Inadequate mass transit ➔ Citizens mainly depend on LAMAT.

• LAMAT plays a significant role in urban mobility:
  ✓ Service coverage between private vehicles and mass transit
  ✓ Transport service to low-incomes, students, elderly, and disabled
  ✓ Job opportunities to the poor or low-skilled people
  ✓ Personalized and flexible transport services, etc.

• LAMAT requires low energy & operational costs, no public subsidy, etc.

➤ Flexibility, availability, & affordability are keys to LAMAT survival.
Drawbacks of LAMAT

- With lack of control & regulation, LAMAT often causes:
  - **Congestion** (e.g., letting in/out passengers)
  - **Accidents** (e.g., reckless driving, violations)
  - **Air/noise pollution** (e.g., old vehicle, overloading)

- LAMAT is also considered as **unreliable** with minimal comfort, inhuman working condition, and criminal-style structure.

> Because of *these drawbacks*, some LAMAT modes were restricted and some gradually disappeared.
Motivation & Objectives

Motivation

- Drawbacks of LAMAT (jam, safety, etc.)
- Urbanization
- Economic growth
- Effects of mass transit services

Concerns

The future of LAMAT system is questionable!

Question

➢ Should LAMAT be removed from modernized urban transport system?

Objectives

1. To analyze market share of LAMAT users in Asia
2. To discuss the possible future of LAMAT in Asia
Outline

1. What is LAMAT?
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   LAMATの市場シェア
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**Objective:** To analyze LAMAT market share vs population & GDPPC.

- **About 2.7 million trips** from 11 Asian cities were analyzed:

<table>
<thead>
<tr>
<th>No.</th>
<th>Country</th>
<th>City</th>
<th>Year&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Population&lt;sup&gt;b&lt;/sup&gt; (1000)</th>
<th>GDPPC&lt;sup&gt;c&lt;/sup&gt; (USD)</th>
<th>Analyzed trips</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bangladesh</td>
<td>Dhaka</td>
<td>2009</td>
<td>14216</td>
<td>685</td>
<td>153848</td>
</tr>
<tr>
<td>2</td>
<td>Cambodia</td>
<td>Phnom Penh</td>
<td>2000</td>
<td>1149</td>
<td>300</td>
<td>40369</td>
</tr>
<tr>
<td>3</td>
<td>China</td>
<td>Chengdu</td>
<td>2000</td>
<td>4222</td>
<td>932</td>
<td>67961</td>
</tr>
<tr>
<td>4</td>
<td>Indonesia</td>
<td>Jakarta</td>
<td>2000</td>
<td>8390</td>
<td>790</td>
<td>1083280</td>
</tr>
<tr>
<td>5</td>
<td>Malaysia</td>
<td>Kuala Lumpur</td>
<td>1999</td>
<td>3902</td>
<td>3735</td>
<td>218460</td>
</tr>
<tr>
<td>6</td>
<td>Mongolia</td>
<td>Ulaanbaatar</td>
<td>2008</td>
<td>1051</td>
<td>2136</td>
<td>37784</td>
</tr>
<tr>
<td>7</td>
<td>Pakistan</td>
<td>Lahore</td>
<td>2010</td>
<td>7487</td>
<td>1008</td>
<td>126602</td>
</tr>
<tr>
<td>8</td>
<td>Philippines</td>
<td>Manila</td>
<td>1996</td>
<td>9538</td>
<td>1290</td>
<td>471035</td>
</tr>
<tr>
<td>9</td>
<td>Vietnam</td>
<td>HCMC</td>
<td>2003</td>
<td>4866</td>
<td>475</td>
<td>262375</td>
</tr>
<tr>
<td>10</td>
<td>Vietnam</td>
<td>Hanoi</td>
<td>2005</td>
<td>2160</td>
<td>623</td>
<td>188700</td>
</tr>
<tr>
<td>11</td>
<td>Vietnam</td>
<td>Danang</td>
<td>2008</td>
<td>751</td>
<td>1043</td>
<td>50509</td>
</tr>
</tbody>
</table>

<sup>a</sup>The year of data collected, one limitation of this study

<sup>b</sup>Numbers obtained from Department of Economic and Social Affairs, United Nations

<sup>c</sup>The GDP per Capita (GDPPC) for countries from United Nations, are used instead as GDPPC for each city appeared to be unreliable sources.

- Various transport modes were first classified into 1) Walking, 2) Own vehicles, 3) LAMAT, 4) Mass transit, and 5) Others.
Cities of Vietnam & Cambodia had the highest share of own MCs. This might be due to the inadequate public transport services.

Less public transport services → higher share of private vehicles.
Non-motorized LAMATs almost disappeared.

Share of railways is small (0.03-1.48%), while LAMAT share is large. (E.g., Jakarta & Manila have railways, yet majority use LAMATs)

✓ LAMAT services are still popular in several Asian cities.
LAMAT Share Vs Population Growth

• LAMAT share: 0.5%-78.9%, with average of 28.8%.
  ➢ The share of LAMAT increases with the city population.
  ✓ This might be due to inadequate mass transit system; hence, more citizens depended on LAMAT to travel.
• Whether LAMAT is preferred in higher income city?

Fig. Relationship between LAMAT share and GDPPC

- LAMAT share decreases when GDPPC increases (insignificant).
- As users’ income increases, LAMAT is less likely to be preferred.
When Fixed-Route LAMAT Preferred?

- **When GDPPC > 1,000 USD,** **Fixed Route LAMAT** gains majority share.
- **Fixed Route LAMAT** should be considered when GDPPC becomes higher than a certain threshold (i.e., 1,000 USD).

![Diagram showing the relationship between GDPPC and flexible & fixed route LAMAT](JICA Person trip data)

- **Fixed Route LAMAT:**
  - Minibuses
  - Microbuses

- **Flexible Route LAMAT:**
  - Auto-rickshaws
  - MC taxis
  - Cycle rickshaws

Fig. Relationship between GDPPC and flexible & fixed route LAMAT

\[ y = 0.4334 \ln(x) - 2.4966 \quad R^2 = 0.6838 \]

\[ y = -0.433 \ln(x) + 3.4966 \quad R^2 = 0.6838 \]
This section analyzed market share of LAMAT and its relationship with city population & GDPPC:

- Non-motorized LAMATs have almost disappeared.
- LAMAT services are popular in several Asian cities.
- LAMAT share increased with population but not with GDPPC.
- Fixed route LAMAT should be operated when GDPPC>1,000USD.
Outline

1. What is LAMAT?
2. Motivation & Objectives
3. Market Share of LAMAT Users

4. The Future of LAMAT
   ① The government
   ② Passengers
   ③ Operators/drivers
   ④ Vehicle & Technology

5. Discussion & Conclusion
Factors Influencing on the Future of LAMAT

Objective: To discuss the possible future of LAMAT from 4 perspectives.

① The government
- Policies & regulations
- Control & management
- Environmental policy
- Traffic safety policy
- Infrastructure supports
- etc.

② Passengers
- Perceived service quality
- Traffic risk perception
- Access/egress mode
- User satisfaction
- Negative experiences
- etc.

③ Operators/drivers
- Service quality
- Drivers’ quality of life
- Driver association & internal regulations
- Accessibility/Feeder services
- etc.

④ Vehicle & Technology
- Standard vehicle & design
- Fuel alternatives & EVs
- Fare systems
- Ride-hailing apps
- ICT
- etc.

C) Dr. PHUN Veng Kheang, Japan Transport Research Institute, 2017
Non-motorized LAMAT

- Samlor-Thips were banned in Bangkok in 1964.
- Becak is banned throughout Jakarta.
- Riksha-Walas are banned from major streets in Dhaka.
- Cycle & pulled rickshaws were banned in Pakistan in 1991.

Motorized LAMAT

- Yangon bans motorcycles & lets motorcycle taxis only in permitted areas.
- Tricycles are only seen on small/local roads in Cebu.
- Tuk-Tuks are banned from expressways in Thailand.
- Kathmandu banned Diesel Tempos (3-wheerlers).
- Jeepney modernization program in the Philippines.

Governments have restricted some LAMAT operations in urban areas due to their negative effects (e.g., congestion, safety, emission).

Source: Various Sources
• In 1999, Kathmandu banned diesel Tempos and second hand vehicles to combat air pollution.

• Vehicle emissions was 38% of PM10.

Fig. PM10 levels in Kathmandu Valley 2002-2006 (Source: MoSTE)

➢ Successfully introduce Safa Tempo (EV) by:
  - Rising level of air pollution in city
  - Nepal faced fuel scarcity in 1989

Source: MeYa Fact Sheet #5. (2014)
Kathmandu to Phaseout Safa Tempos
カトマンズにおけるSafa Temposの段階的禁止

1989
• Fuel crisis, as India imposed trade embargo

1993
• 7 diesel Tempos were converted to Safa Tempos & tested successfully for 6 months

1996
• 600 Safa Tempos were introduced to replace diesel Tempos

1997
• Publish EV tax policy

2017
• There are about 1,200 Safa Tempos
• 2017.3: Gov’t banned vehicles older than 20 years, including Safa Tempos:
  • Air pollution → Reduce vehicular emission
  • Traffic congestion → Increase capacity of public vehicles (e.g., bus)
  • Traffic safety → Vehicle safety

Source: The KathamanduPost, 20170603 and http://www.onwardnepal.com
2017.7: Gov’t launched the “Jeepney modernization” program:

- To ease traffic congestion
- To reduce traffic emission
- To comply UN safety standards

Drivers may buy a new electric, hybrid, or Euro-4 Jeepney (P1.2-P1.6 million).

Gov’t supports the program by:

- Buy an old unit at P30,000
- Subsidy a new unit at 5%
- Release 200,000 units in 3 years
- Mandate drivers to form a union
- Standardize salary for all drivers

Source: ph.news.yahoo.com 20171003

Fig. Modern Jeepney Prototype
Jeepney Modernization or Phaseout?

Jeepneyの近代化か段階的禁止か？

- About 270,000 Jeepneys registered in the Philippines.
- Traffic Crisis Act 2016 calls for phasing-out 15-year-old Jeepneys, affecting 162,500 drivers (>60%) and 45,000 operators.
- For a new Jeepney, drivers pay Land Bank P800 a day for 7 years. But drivers earn only around P600 a day!

ộ At several cities, a series of protests against the “Jeepney Phaseout”.

Jeepney Phaseout means:
- Jobless to drivers
- Bankruptcy for small operators
- Higher fare for commuters

Source: GMA News Online 20170207, Xinhua 20170329, ph.news.yahoo.com 20171003
**Factors Influencing on the Future of LAMAT**

LAMATの将来に影響を与える要素

**Objective:** To discuss the possible future of LAMAT from 4 perspectives.

1. **The government**
   - Policies & regulations
   - Control & management
   - Environmental policy
   - Traffic safety policy
   - Infrastructure supports
   - etc.

2. **Passengers**
   - Perceived service quality
   - Traffic risk perception
   - Access/egress mode
   - User satisfaction
   - Negative experiences
   - etc.

3. **Operators/drivers**
   - Service quality
   - Drivers’ quality of life
   - Driver association & internal regulations
   - Accessibility/Feeder services
   - etc.

4. **Vehicle & Technology**
   - Standard vehicle & design
   - Fuel alternatives & EVs
   - Fare systems
   - Ride-hailing apps
   - ICT
   - etc.
Most LAMAT operations are unregulated and profit-based motive.

- **Poor regulations**
  - lack of control
  - lack of enforcement

- **Driver factors**
  - dangerous driving
  - inadequate training
  - traffic violations
  - long working hours

- **Poor vehicles**
  - old & poorly maintained
  - overloaded
  - non-standardized

- **Other factors**
  - weather condition
  - road infrastructure

- **Traffic accidents**

- **Poor driving performance**

- **Poor safety of LAMAT**

- **Traffic risk perception**

- **Perception** that riding LAMAT is *unsafe* could affect users’ *satisfaction* & behavioral intentions.
Objective: To explore the effects of traffic risk perception on satisfaction and behavioral intentions of LAMAT users.

Three main hypotheses:

H1: Traffic risk perception has positive effect on new PT.

Users who perceive higher risk of traffic accidents are more likely to switch to a new (safer) public transport (PT) mode.

H2: Traffic risk perception has negative effect on satisfaction.

Users less satisfy with LAMAT when they perceive higher risk of traffic accidents involving that LAMAT.

H3: Traffic risk perception has negative effect on user loyalty.

Perceiving LAMAT as unsafe would reduce users’ intention to continuing using that LAMAT.

Note: Behavioral intentions = user loyalty + intention towards a new safer public transport mode.
SEM examines theoretical models by testing hypotheses, to better understand causal relationships among interested variables.

Fig. The conceptual SEM for LAMAT users

The hypotheses (*H1, H2, H3*) are tested under this SEM.
Survey Locations: (Major destinations like markets)

- **Date:** May 13-20, 2016
- **Method:** Questionnaire-based face-to-face interview
- **756 Respondents:** 484 Motodop + 272 Remork users
- **Data:** Subjective responses (5-point scale), etc.
- **Surveyors:** 11 well-trained students
Estimate Results of SEM

- Latent variables are well measured by indicators ($p < 0.01$).

Fig. Results of SEM for LAMAT users ($N = 756$)

Testing hypotheses for Motodop/Remork users

<table>
<thead>
<tr>
<th>Hypotheses</th>
<th>Expected</th>
<th>Findings</th>
<th>Judgements</th>
</tr>
</thead>
<tbody>
<tr>
<td>$H1$</td>
<td>Positive</td>
<td>$+0.211**$</td>
<td>Accepted</td>
</tr>
<tr>
<td>$H2$</td>
<td>Negative</td>
<td>$-0.304**$</td>
<td>Accepted</td>
</tr>
<tr>
<td>$H3$</td>
<td>Negative</td>
<td>$+0.148**$</td>
<td>Rejected!</td>
</tr>
</tbody>
</table>

$\chi^2/df = 4.892$, RMSEA = 0.072
GFI = 0.897, AGFI = 0.870
*p < 0.05, **p < 0.01
Why H3 is rejected?
なぜH3は仮説と逆の結果となったのか？

Finding (H3): Users seem to tolerate the risk of traffic accidents and would continue to use LAMAT services because:

1. Majority (56.6%) were younger users (age ≤ 30) and were risk-takers, comparing to older users (age >30) \(t\)-test (696.97) = -5.4, \(p < 0.001\).

2. Users who perceived higher risk had fewer modal choice (77.1%).
   - Poor supply of other PT modes, LAMAT services tend to be riskier.

Table. Share of “No choice” as a reason to choose LAMAT, among other factors.

<table>
<thead>
<tr>
<th>Traffic risk perception (Total scores of 4 indicators)</th>
<th>User loyalty (Total scores of 4 indicators)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low (n = 103)</td>
<td>Low (n = 30)</td>
</tr>
<tr>
<td>Reject H3</td>
<td>Reject H3</td>
</tr>
<tr>
<td>No choice 1.9%</td>
<td>No choice 17.3%</td>
</tr>
<tr>
<td>Accept H3</td>
<td>Accept H3</td>
</tr>
<tr>
<td>No choice 3.7%</td>
<td>No choice 77.1%</td>
</tr>
<tr>
<td>High (n = 434)</td>
<td>High (n = 507)</td>
</tr>
</tbody>
</table>

Note: Low is defined when the total scores of 4 indicators are 4-11, and High is defined when the total scores are 12-20. “No choice” covers no other transport modes, no own vehicles, and no one to drive for.
Factors Influencing on the Future of LAMAT

LAMATの将来に影響を与える要素

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- Fare systems
- Ride-hailing apps
- ICT
- etc.
• **Ridership of mass transit** in most Asian developing countries has failed to meet the forecasted level due to:
  
  ➢ Limited network of the mass transit,
  ➢ Competition with other public transport modes, and
  ➢ Lack of accessibility to a station of mass transit.

• Developing cities considers the model of **Trunk-Feeder (TF) system**.
  
  ➢ *Possibly to include LAMAT as feeder to TF system, with two issues:*
    
    □ Negotiations with LAMAT operators
    □ Costs related to LAMAT formalization
Motorcycle Taxis in Bangkok

• Emergence of MC Taxi services because of:
  – The Soi network (long, narrow, dead-end, no sidewalk)
  – The solution for traffic gridlock in city
  – Shift from water-based to land-based city, etc.

• Growing importance of MC taxis:

➢ MC Taxis fill the accessibility void created by a rapid urban expansion that is not matched by supply of main trunk systems.

Source: Ratanawaraha and Chalermpong (2017)
Bangkok’s MC Taxis: “The Feeder Army Ants”
バンコクにおけるバイクタクシー

• MC Taxis feed main trunk systems:
  – Mass transits (Rails, BRT)
  – Public buses
  – Minibuses & Microbuses
    (Silors, Passenger Vans, Songtaeaws)

• Walking & bicycling are not comparative, MC Taxis will remain the essential feeder transport.

➤ Lack of integration makes MC Taxis even more indispensable as feeder from the Sois.

Source: Ratanawaraha and Chalermpong (2017)
Feeder Intention of LAMAT Drivers in Phnom Penh

Objective: To investigate the attitudes of LAMAT drivers towards the bus and their intention to operate as its feeder service.

Public bus service
- Feb. – Sept. 2014: 1 line (7.5km)
- Sept. 2014 – present: 3 lines (51.5km)
- Fare: 1500 KHR (~ 0.4USD)

About 30% of bus users previously traveled by LAMATs. The government has no specific solution to affected drivers.

LAMATのドライバーは路線バスに並行する経路の旅客を失った
LAMAT Drivers’ Survey in Phnom Penh

- **Date:** December 19-23, 2014
- **186 Respondents:** 80 Motodop & 106 Remork drivers
- **Data:** Subjective responses, working conditions, etc.
- **Surveyors:** 4 well-trained students

**Fig. Map of Phnom Penh**

Source: Phun and Yai (2016b)
• SEM is applied to test hypotheses. Overall model fit is good.

- Motodop drivers had intention to feed the bus, regardless they support the bus or not.

- Remork drivers did not support the bus and had no intention to operate as feeder of the bus.

- Motodop should be arranged as feeder to bus, while leaving Remork service as it is (similar to Bangkok case).
Objective: To discuss the possible future of LAMAT from 4 perspectives.

1. The government
   - Policies & regulations
   - Control & management
   - Environmental policy
   - Traffic safety policy
   - Infrastructure supports
   - etc.

2. Passengers
   - Perceived service quality
   - Traffic risk perception
   - Access/egress mode
   - User satisfaction
   - Negative experiences
   - etc.

3. Operators/drivers
   - Service quality
   - Drivers’ quality of life
   - Driver association & internal regulations
   - Accessibility/Feeder services
   - etc.

4. Vehicle & Technology
   - Standard vehicle & design
   - Fuel alternatives & EVs
   - Fare systems
   - Ride-hailing apps
   - ICT
   - etc.
New std design to cope with emission and safety issues.
Better LAMAT fare (collecting) systems have been implemented.

- Multiple rides
- Multiple modes
- Auto-Rickshaws accept debit/credit card

LAMAT fare becomes standardized through a better fare system.
• World’s dominant ride-hailing apps: Uber covers 107 countries.

Fig. Global map of dominant ride-hailing apps (Source: Similarweb)

• Recently in Asia, more ride-hailing apps for Taxis, Auto-Rickshaws, and Motorcycle Taxis.

➢ *Ride-hailing apps have a big influence on LAMAT market.* (Future work)
This section discussed the future of LAMAT from:

① **The government** (Nepal and Philippines cases)
   - Convert diesel to Safa Tempos and then phaseout Tempos ≥ 20 years.
   - Phaseout Jeepneys ≥ 15 years and then modernize Jeepneys.

② **Passengers** (Cambodia case)
   - Uses continues to use unsafe LAMAT because of few modal choices.
   - Users tend to shift to safer PT mode when that mode is available.

③ **Operators/Drivers** (Thailand and Cambodia cases)
   - MC taxi drivers provide accessibility to mass transit in Bangkok.
   - MC taxi drivers had intention to feed public bus in Phnom Penh.

④ **Vehicle & Technology** (Asia cases)
   - More standard designs of LAMAT vehicles and E-LAMATs.
   - Better LAMAT fare system and more popular LAMAT ride-hailing apps.
Outline

1. What is LAMAT?
2. Motivation & Objectives
3. Market Share of LAMAT Users
4. The Future of LAMAT
5. Discussion & Conclusion
Discussion: When LAMAT Should Be Removed?

議論: LAMATをいつ禁止すべきか?

Each LAMAT mode has different characteristics:

- **Benefits**: Service coverage, transport needs, job opportunities, etc.
- **Drawbacks**: Causes of traffic congestion, accident, emission, etc.

Should LAMAT be removed from modernized urban transport system?

<table>
<thead>
<tr>
<th>Conditions</th>
<th>Remove?</th>
<th>Gov’t’s counter-measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benefits &lt; Drawbacks</td>
<td>Yes</td>
<td>- Phase out</td>
</tr>
<tr>
<td>Benefits ≥ Drawbacks</td>
<td>No</td>
<td>- Modernize or</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Sustain with:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1- Improvement</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2- Environmental friendly</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3- Gov’t &amp; Formalization</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4- Harmonization</td>
</tr>
</tbody>
</table>

Future LAMAT relies on the *tradeoffs* between *benefits* & *drawbacks*, as well as the government’s *counter-measures*. 
Removing LAMAT might help reduce the traffic issues. But this also causes several potential issues:

- **Joblessness** (e.g., Phaseout affects 162,500 Jeepney drivers, Philippines; MC taxi drivers to feed bus to secure jobs, Cambodia),
- **Service void** (e.g., MC taxis fill accessibility void in Sois, Thailand),
- **Accessibility** (e.g., MC taxis feed trunk system from Sois, Thailand),
- **Transport poor** (e.g., Few choices, users chose LAMAT, Cambodia), etc.

Despite gov’t’s supports (e.g., subsidy), modernizing LAMAT might cause joblessness & bankruptcy to many operators & drivers, who could not afford to upgrade/buy new vehicles (e.g., Philippines, Nepal).

Removing the current LAMAT may cause several potential issues (e.g., jobs, service void).
In the long term:

Philippines

- Currently about 270,000 people drive Jeepneys.
- When the economy grows, more people will get other jobs rather than drivers, until then Jeepneys may be removed.

Bangkok, Thailand

- MC Taxis are well suited with Soi network in Bangkok.
- When gov’t makes a huge investment on Soi network improvements, until then MC Taxis may be removed.

Phnom Penh, Cambodia

- Motodop & Remork are popular, 3 lines of public bus (51.5km).
- When there will be sufficient public bus services (and railways), until then Motodop & Remork may be removed.
This study analyzed the market share of LAMAT and discussed the possible future of LAMAT in Asia.

- LAMAT remains popular in several Asian cities. As individual income increases, LAMAT is less likely to be preferred.
- Gov’ts restricted some LAMATs, causing serious traffic issues.
- LAMAT users intended towards a safer PT mode. LAMAT Drivers intended to feed mass transit to maintain jobs.
- LAMAT has been modernized (Vehicle std) & adapted new technologies (EVs, Fare system, Apps) to offer a better service.

**LAMAT should not be simply removed for now.** LAMAT should be sustained for a period of time to supply jobs & inevitable transport needs, until the issues (e.g., Jobs, transport needs) are sufficiently addressed.
Future Works

• The future of LAMAT is uncertain.

• More researches to discuss the future LAMAT in Asia:
  1) Attractiveness of LAMAT pick-up locations near mass transit stations: Case of MC taxi wins in Bangkok,
  2) Effects of ride-hailing apps on LAMAT market,
  3) Etc.
Selected References


Thanks for Your Attention!
ご清聴ありがとうございました。

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Appendix
Motodop and Remork (2/3wheelers) are the most popular and active public transport modes in Phnom Penh.
Measurement Models- Users’ Traffic Risk Perception

- Each indicator is from the 5-point (1: Very Unlikely, 3: Neither, 5: Very Likely)

<table>
<thead>
<tr>
<th>Questionnaire items (Abbreviation)</th>
<th>Mean</th>
<th>SD</th>
<th>All users</th>
<th>Motodop</th>
<th>Remork</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Traffic risk perception</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I feel that there is a high risk of traffic accidents when riding Motodop/Remork (Risk1)</td>
<td>Mean</td>
<td>3.53</td>
<td>3.75</td>
<td>3.14</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SD</td>
<td>1.22</td>
<td>1.12</td>
<td>1.30</td>
<td></td>
</tr>
<tr>
<td>I often warn Motodop/Remork drivers to drive more carefully (Risk2)</td>
<td>Mean</td>
<td>3.62</td>
<td>3.82</td>
<td>3.27</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SD</td>
<td>1.18</td>
<td>1.11</td>
<td>1.23</td>
<td></td>
</tr>
<tr>
<td>Motodop/Remork operations often cause traffic accidents (Risk3)</td>
<td>Mean</td>
<td>3.15</td>
<td>3.26</td>
<td>2.96</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SD</td>
<td>0.85</td>
<td>0.79</td>
<td>0.92</td>
<td></td>
</tr>
<tr>
<td>Overall, Motodops/Remorks are safe from traffic accidents (Risk4)</td>
<td>Mean</td>
<td>3.11</td>
<td>2.89</td>
<td>3.50</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SD</td>
<td>0.91</td>
<td>0.92</td>
<td>0.73</td>
<td></td>
</tr>
<tr>
<td><strong>New public transport</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Citizens require a new public transport mode, which is flexible, safe, and comfortable (NewPT1)</td>
<td>Mean</td>
<td>4.04</td>
<td>4.05</td>
<td>4.04</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SD</td>
<td>0.86</td>
<td>0.84</td>
<td>0.91</td>
<td></td>
</tr>
<tr>
<td>It is good to have a passenger van offering a new public transport service in the city (NewPT2)</td>
<td>Mean</td>
<td>4.39</td>
<td>4.39</td>
<td>4.38</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SD</td>
<td>0.78</td>
<td>0.76</td>
<td>0.81</td>
<td></td>
</tr>
<tr>
<td>I intend to travel via the passenger van (NewPT3)</td>
<td>Mean</td>
<td>4.34</td>
<td>4.38</td>
<td>4.28</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SD</td>
<td>0.79</td>
<td>0.75</td>
<td>0.86</td>
<td></td>
</tr>
<tr>
<td>I will recommend others to use the passenger van (NewPT4)</td>
<td>Mean</td>
<td>4.18</td>
<td>4.18</td>
<td>4.17</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SD</td>
<td>0.82</td>
<td>0.81</td>
<td>0.83</td>
<td></td>
</tr>
</tbody>
</table>
Measurement Models- Drivers’ Feeder Intention

- Each indicator is from the 5-point (1: Very Unlikely, 3: Neither, 5: Very Likely)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Mean</th>
<th>SD</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Feeder of Bus</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I want proper stations near bus stops</td>
<td>4.05</td>
<td>1.14</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Transport passengers from/to bus stops</td>
<td>3.67</td>
<td>1.20</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Bus on major roads, my service at others</td>
<td>3.84</td>
<td>1.26</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td><strong>Support for Bus Service</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I support the continuum of bus</td>
<td>2.96</td>
<td>1.55</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>It is good to have public bus in the city</td>
<td>3.02</td>
<td>1.45</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Bus helps reducing the traffic accidents</td>
<td>3.90</td>
<td>1.02</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td><strong>Negative Impacts of Bus Service</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Public bus lowers my monthly income</td>
<td>3.54</td>
<td>1.36</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Public bus lowers my daily passengers</td>
<td>3.58</td>
<td>1.36</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Public bus affects my living conditions</td>
<td>3.25</td>
<td>1.44</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td><strong>Regulation &amp; Service</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All drivers to have paratransit uniform</td>
<td>4.46</td>
<td>1.08</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>To register &amp; define all drivers each zone</td>
<td>3.97</td>
<td>0.99</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>To use fare system like taxi-meter</td>
<td>3.53</td>
<td>1.60</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td><strong>Vehicle Size</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D_Remork (1 if a driver of Remork, 0: Otherwise)</td>
<td>0.57</td>
<td>0.50</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

(Phun and Yai, 2016b)
LAMAT to Feed Future Railway in Phnom Penh

- In 2014, JICA study team recommended **Automatic Guided Train (AGT)**.

![Route Alternatives for East-West and Southwest Transport Corridors](image)

**Figure 11.2-2 Route Alternatives for East-West and Southwest Transport Corridors**

By 2020: 68,000 pax/day for **Alternative 1**.

**Urban Transport Plan**
- 2014: Begin City bus
- 2016 (Short-term): Parking & Traffic management
- 2020 (Medium-term): Begin Rail transit
- 2025
- 2035 (Long-term)

**rail transit system is planned at the highest transport demand along four transport corridors with bus system and para-transit as feeders** of the rail transit. Development of the mode interchange area, which

- **JICA has considered role of LAMAT as a feeder to future railways.**