Moving Towards A Safer and Healthier Transportation System
-- Taiwan’s Experience

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National Chiao Tung University
Hsinchu, Taiwan
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Is it safer to live in a major city?

<table>
<thead>
<tr>
<th></th>
<th>Six Major Cities In Taiwan</th>
<th>Other Counties In Taiwan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
<td>69.2%</td>
<td>30.8%</td>
</tr>
<tr>
<td>Number of Traffic Injuries</td>
<td>70.0%</td>
<td>30.0%</td>
</tr>
<tr>
<td>Number of Traffic Fatalities</td>
<td>52.0%</td>
<td>48.0%</td>
</tr>
</tbody>
</table>
## Accident Rates for 6 Major Cities in Taiwan

<table>
<thead>
<tr>
<th>City</th>
<th>Traffic Fatalities &amp; Injuries per 100,000 Pop.</th>
<th>Population (Million)</th>
<th>MRT</th>
<th>% of Public Transportation Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taipei City</td>
<td>(3.15, 1011)</td>
<td>2.685</td>
<td>Yes</td>
<td>40.7</td>
</tr>
<tr>
<td>New Taipei City</td>
<td>(3.73, 944)</td>
<td>3.985</td>
<td>Yes</td>
<td>29.9</td>
</tr>
<tr>
<td>Taoyuan City</td>
<td>(6.20, 1761)</td>
<td>2.175</td>
<td>New</td>
<td>13.0</td>
</tr>
<tr>
<td>Taichung City</td>
<td>(6.05, 2558)</td>
<td>2.780</td>
<td>Under Const.</td>
<td>11.1</td>
</tr>
<tr>
<td>Tainan City</td>
<td>(10.3, 1456)</td>
<td>1.886</td>
<td>No</td>
<td>5.9</td>
</tr>
<tr>
<td>Kaohsiung City</td>
<td>(8.07, 2339)</td>
<td>2.778</td>
<td>Yes</td>
<td>7.9</td>
</tr>
</tbody>
</table>
Accident Fatalities per 100 Thousand Population vs. Public Transportation Patronage

The Percentage of Public Transportation Usage
Accident Injuries per 100 Thousand Population vs. Public Transportation Patronage

The Percentage of Public Transportation Usage
Accident Fatalities per 100 Thousand Population vs. Motor Vehicle Ownership

Motor Vehicles Owned per 100 Thousand Population
Accident Fatalities and Injuries for Different Transportation Modes

Accident Fatalities and Injuries for Different Vehicles (Year 2011)
## The Mode Use of Travel in Taiwan

<table>
<thead>
<tr>
<th>Mode</th>
<th>Neighborhood Travel (&lt; 1Km)</th>
<th>Short Distance Travel (1~15Km)</th>
<th>Medium Distance Travel (15~60Km)</th>
<th>Long Distance Travel (&gt;60 Km)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Walk</td>
<td>●</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bicycle</td>
<td>○</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motorcycle</td>
<td>●●●●●●●○</td>
<td>●●●●○</td>
<td>○</td>
<td></td>
</tr>
<tr>
<td>Car</td>
<td>●●○</td>
<td>●●●</td>
<td>●●●●●●</td>
<td>●●●●●</td>
</tr>
<tr>
<td>Bus</td>
<td>○</td>
<td>●●</td>
<td>●●</td>
<td>●●○</td>
</tr>
<tr>
<td>Mass Rapid Transit</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td></td>
</tr>
<tr>
<td>Traditional Railway</td>
<td>●</td>
<td>●●</td>
<td>●●</td>
<td>●●●</td>
</tr>
<tr>
<td>High Speed Rail</td>
<td></td>
<td></td>
<td></td>
<td>○</td>
</tr>
</tbody>
</table>
Moving Towards A Safer Transportation

Moving private vehicle users towards public transportation in Taiwan

- MRT construction projects in major cities
- LRT construction projects in Taiwan
  Kaohsiung and New Taipei
- Traditional railway improvement
  Taiwan Railway Administration (TRA)
- Bus service improvement projects
  ✓ Subsidizing new bus purchase
  ✓ Seamless transportation – time, ticket, information, fare, ... etc.
  ✓ Employing new technologies for bus operation safety
  ✓ Promoting road traffic safety management system ISO 39001
Engineering improvement projects

- **Roadway safety design**
  - **Motorcycle:** priority lane, pavement and marking, motorcycle waiting zones,
  - **Pedestrian:** sidewalk construction
  - **Bicycle:** bicycle lane

- **Traffic engineering and management**
  - **Traffic signal design:** pedestrian signal, motorcycle two-step left turn regulation, pedestrian priority program
  - **Traffic regulations:** Seat-belt, helmet, BAC regulation, speeding, senior driver licensing

Traffic safety enforcement projects

- **Traffic safety campaign:** drunk driving, speeding, unlicensing driving, parking violation, ..etc.
Moving Towards A Safer Transportation

- **Traffic safety education**
  - **School education**
    - Traffic safety education review program
    - School bus administration program
    - Bicycle and motorcycle riding training and education
  - **Continuing education**
    - Roadway traffic safety instructors program
    - Community traffic safety education program
  - **Driver education & Licensing**
    - Driving school administration and evaluation program
    - Driver licensing modification
    - Senior driver licensing program
Moving Towards A Healthier Transportation

◆ Green Transportation Promotion

➢ Electric vehicle projects
  ✓ Electric bus and motorcycle
  ✓ Emission inspection programs

➢ Pedestrian and bicycle projects
  ✓ Sidewalk construction and improvement program
  ✓ Bicycle lane and public bicycle (Ubike)
  ✓ Bicycle parking facility

➢ Public transportation projects
  ✓ Electric and low floor bus program
  ✓ Free bus programs in several cities
  ✓ Energy saving education for commercial drivers
<table>
<thead>
<tr>
<th>Mode</th>
<th>Efforts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Walk</td>
<td>• Encourage, Promote, Environment &amp; Engineering Improvement</td>
</tr>
<tr>
<td></td>
<td>• exclusive pedestrian signal, walkway, sidewalk, pedestrian priority</td>
</tr>
<tr>
<td>Bicycle</td>
<td>• Encourage, Promote, Environment &amp; Engineering Improvement</td>
</tr>
<tr>
<td></td>
<td>• bicycle lane, Ubike, school education</td>
</tr>
<tr>
<td>Motorcycle</td>
<td>• Reduce usage, Push toward public transportation</td>
</tr>
<tr>
<td></td>
<td>• parking charge, Licensing policy + Promote electric motorcycle</td>
</tr>
<tr>
<td>Automobile</td>
<td>• Reduce usage, Push toward public transportation</td>
</tr>
<tr>
<td></td>
<td>• parking charge, licensing policy + promote electric automobile</td>
</tr>
<tr>
<td>Public Transportation</td>
<td>• Encourage, Promote + Development and Construction</td>
</tr>
<tr>
<td></td>
<td>• Railway project: MRT, light rail system, traditional rail</td>
</tr>
<tr>
<td></td>
<td>• Bus: exclusive bus lanes, free bus project, feeder bus project, bus transfer station, BRT + electric bus project</td>
</tr>
</tbody>
</table>
Taiwan’s Performance: Accident Fatalities and Injuries 1998-2016

Road Traffic Accident Fatalities

Road Traffic Accident Injuries

Year
Fatalities per 100 Thousand Population in 2016

Accident Fatality Rates: Age Groups
Accident Injury Rates: Age Groups

Injuries per 100 Thousand Population in 2016

Age Groups

Injuries per 100 Thousand Population
Pedestrian Accident Injury Rates

Fatalities & Injuries per 100 Thousand Population in 2016

Age Groups


Pedestrian Fatalities & Injuries per 100 Thousand Population

0 50 100 150 200 250
Motivations of Car & Motorcycle Usage

- Symbolic Motivation
- Intrinsic Affective Motivation
- Extrinsic Affective Motivation
- Car Use Habit
- Motorcycle Use Habit
- Instrumental Motivation

* represents p < 0.01
Moving Towards Safer and Healthier Transportation
-- New Innovative Strategies

Capacity & Efficiency

Safety & Health

- Big Data
- Education
- Law Enforcement
- Intelligent Transport Systems, ITS
- Sharing Economics
- Internet of Things, IoT
- Engineering Improvement
Further Steps Towards The Safer and Healthier Transportation System

◆ High population density and private vehicle ownership in Taiwan -- 0.59 motorcycle and 0.32 auto per person
◆ The increase of bicycle and pedestrian traffic accidents
◆ Increasing traffic injuries and fatalities for elderly people
◆ Challenges to Move forward A Safer & Healthier Transp.
  ➢ Establish a safe and sustainable culture for transportation
  ➢ Moving motorcyclists to use public transportation smoothly
  ➢ Reduce automobile ownership and usage effectively
  ➢ Improving the safety and environment for walking and cycling
  ➢ Integrating public transportations efficiently
  ➢ Provide safe & healthy transport service for elderly people

◆ Modern information and communication technologies as well as innovative management are the potential power.