GRSI – Beijing Project of Improving Vulnerable Road User Safety at Intersections

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4th IRTAD CONFERENCE
Road safety data: collection and analysis for target setting and monitoring performances and progress

Seoul, 16-17 September 2009
Background

• A 4-year project during 2006—2009

• The Chinese Partners include:
  ➢ Beijing Transportation Research Center
  ➢ Beijing University of Technology
  ➢ Beijing Traffic Management Bureau
Background

• Two phases:

  ➢ phase 1: Situational Survey
data collection/analysis, define theproblem and design solutions

  ➢ phase 2: Solution Implementation and theoutcome evaluation
Objectives

• To improve vulnerable road user safety at the urban intersections in Beijing

• To provide the good practice guide for other cities both in China and overseas.
Methods

• Data collection and analysis
  a) collect and analyze the existing crash data during Jan. 2001-March 2006
  b) collect and analyze the on site traffic and behaviour data of the selected intersections.

• Using low cost engineering countermeasures (channelization, barrier, pedestrian island, road signs, etc) to improve VRU’s safety at the selected intersections.

• Using before/after data comparison to evaluate the effectiveness of the countermeasures used for the project.
## Information of the Selected Intersections

<table>
<thead>
<tr>
<th>Name</th>
<th>Numbers of Casualty Crash</th>
<th>Type of Intersection</th>
<th>Existing Safety Facility</th>
<th>Main Crash Type at Each Intersection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dawang Bridge Arterial-minor arterial</td>
<td>9</td>
<td>Under bridge</td>
<td>Having Interchange station of bus and subway</td>
<td>Pedestrian</td>
</tr>
<tr>
<td>Xidan Intersection Arterial- arterial</td>
<td>12</td>
<td>At-grade interchange</td>
<td>North-south has underpass</td>
<td>Bicycle and pedestrian</td>
</tr>
<tr>
<td>Dongsishitiao Arterial--branch</td>
<td>11</td>
<td>Roundabout</td>
<td>Only the east has underpass</td>
<td>Bicycle</td>
</tr>
<tr>
<td>Dongdan Arterial- arterial</td>
<td>3</td>
<td>At-grade interchange</td>
<td>North-south has underpass East-west has overbridge</td>
<td>Bicycle and pedestrian</td>
</tr>
<tr>
<td>Jiangzhai Intersection Arterial- arterial</td>
<td>6</td>
<td>4-leg</td>
<td>Having Overpass in four directions</td>
<td>Bicycle</td>
</tr>
<tr>
<td>South gate of chaoyang park Arterial- minor arterial</td>
<td>2</td>
<td>3-leg</td>
<td>Underpass</td>
<td>Pedestrian</td>
</tr>
</tbody>
</table>
Location of the Selected Intersections
Problems, countermeasures and outcomes at Intersections of Xian and Dongsi Shi Tiao
Xidan
Problem:

- Due to lack of channelization, many left turn bicycles crossing the street at one stage, which cause many conflicts between left turn bicycles and motor vehicles at the intersection;

Countermeasure:

- Set up waiting line for left turn bicycles for two-step crossing
Before

After
Xidan

Proportion of two-step left turn bicycle

<table>
<thead>
<tr>
<th>Direction</th>
<th>Before</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>South</td>
<td>21%</td>
<td>79%</td>
</tr>
<tr>
<td>North</td>
<td>13%</td>
<td>77%</td>
</tr>
<tr>
<td>East</td>
<td>22%</td>
<td>77%</td>
</tr>
<tr>
<td>West</td>
<td>29%</td>
<td>72%</td>
</tr>
</tbody>
</table>
The Conflicts with Left Turning Bicycles

Before:

10 non serious conflicts per hour (45%) 12 serious conflicts per hour (55%)
After

11 non-serious conflicts per hour (69%)  5 serious conflicts per hour (31%)

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The mean speed and 85-percentile speed of right turn vehicles

<table>
<thead>
<tr>
<th></th>
<th>Before</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Speed</td>
<td>16.5 km/h</td>
<td>15.4 km/h</td>
</tr>
<tr>
<td>V85 Speed</td>
<td>22 km/h</td>
<td>20.7 km/h</td>
</tr>
</tbody>
</table>
Problem 2

- Some pedestrians do not use the underpass as requested when crossing the intersection.

Countermeasure

- Install leading sign and barrier to guide pedestrians using existing underpass.
After – Barrier
After – Road Signs
### Xidan

<table>
<thead>
<tr>
<th></th>
<th>Before</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>The number of pedestrians across</td>
<td>27</td>
<td>12</td>
</tr>
<tr>
<td>the street on the ground per hour</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Dongsi Shi Tiao
Dongsi Shi Tiao

• Problems:

1. The barriers separating bicycles from vehicles were set inappropriately; therefore, many bicyclists use the vehicle lane.

2. The intersection is too big for the pedestrians to cross at one stage.
• **Countermeasures:**

1. Modify the length and radius of the barriers;
2. Made the bicycle lane one meter wider at the section 1;
3. Install a 9-meter barrier between section 1 and 6;
4. Install pedestrian island for pedestrian’s two-step crossing at the west entrance.
Before

After
The average proportion of bicycle comply with the rule in the peak hour and non peak hour

- 20% before, 37% after
- 42% before, 47% after
- 65% before, 75% after
Dongsi Shi Tiao

• Pedestrian Island Usage: 89%

• Average walking speed of pedestrians when crossing the intersection
  – Before: 1.3m/sec.
  – After: 0.9m/sec.

• 79 percent of the pedestrians feel much safer when cross the street
Conclusion

• The traffic conflicts have been reduced at all selected intersections after taken the countermeasures;

• All road users especially the VRUs feel safer when crossing the intersections;

• To improve the road safety is not necessary expensive.
Discussion

• The countermeasures used in the project are neither expensive nor unique. What makes the project unique are:
  
  a) Multi-sector cooperation;
  b) Evidence based decision making

• However, it is only the beginning of the long process, there still are a lots of room for continuous improvement.
Discussion

- As a output of the project, a good practice manual *Design & Operational Guide on Vulnerable Road User Safety at Intersections* is being developed based on international/national good practice and experience gained from the project. The manual will be published in both Chinese and English. We hope it can be used as a reference book by leaders and professionals in the field of road safety.
Thank You!

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