Together for Safer Roads

Shanghai Pilot Project
2016-2017 Project Report

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Together for Safer Roads
携手创建更安全道路国际联盟
Foreword

Numbers of motorized vehicles and registered drivers grow rapidly with the rapid motorization of the city. As of 2015, highway mileage in Shanghai has reached 18 thousand km, among them freeway accounts for 825 km. Motorized vehicle ownership has increased to 3.34 million and the number for registered drivers is 6.54 million. In 2015, the fatality rate per 100,000 population of Shanghai is 3.60 which reveals a severe traffic situation compared to other cities around the world.

Under rapid urban expansion, suburban arterials started to function as urban roads and traffic safety issues are getting worse where 14% fatal crashes occurred along suburban arterials in Shanghai. In recent 5 years, the identified city-level crash hotspots were all suburban arterials. Skewed intersection, oversized intersection, insufficient access management and poor sight distance are the common ones. So far there is a lack of practical road safety improvement standard, and improvement mechanism is also insufficient.

Commercial vehicle safety problem is an important issue in Shanghai. In 2015, about 1/3 fatal crashes of Shanghai were involved with commercial vehicles. So far there is a lack of safety education methods for commercial drivers.

Therefore, Together for Safer Roads selected Crash Hotspots Safety Improvements and Behavior Based Safety Education for Commercial Drivers as project themes.
1. Traffic Safety Conditions in Shanghai

2. Crash Hotspots Safety Improvements

3. Behavior-based Safety Education for Commercial Vehicle Drivers

4. Academic Exchanges and Public Safety Promotions

5. Tongji University Transportation Safety Discipline
Currently the motorized vehicle ownership has reached 285 millions in China. By 2015, the number of vehicle have been increased with 11.7 millions yearly.

Total highway mileage: by 2015, the total highway mileage has reached 4.58 million km.

By 2015, the registered vehicle drivers has reached 330 millions, and this number have been increased about 20 millions yearly.

The freeway mileage has increased from 16,300 km (year 2001) to 131,000 km in 2016.

The rapid developments of motorized travelling and roadway construction in China have brought severe safety issues. Although traffic crashes have been decreased in recent years, compared to other countries we still hold a relatively high fatality rate.
As the most rapid development city of China, the construction areas have been tripled in the last 20 years, which increased from 1000 km² in 1991 to 3020 km² in 2013. By 2015, road mileage in Shanghai has reached 18,000 km and the freeway mileage has reached 825 km.

By 2015, the vehicle ownership rate is 138 vehicles per 1000 people in Shanghai.

By 2015, the registered drivers in Shanghai were about 6.54 millions, with an increase rate of 0.3 millions.

As the rapid developments of cities, contradictions emerged between road network and land use. Along with the increasing of vehicle ownerships and registered drivers, traffic volumes have been increased rapidly. Given the above-mentioned conditions, the traffic safety problems have become more severe.
The fatality rate per 100,000 population of Shanghai is the highest compared to similar cities in other countries.

**Serious Safety Issues**

- **Road Safety**
  - About 14% fatality crashes occurred along suburban arterials in Shanghai, while suburban arterials only account for 2.5% of the total Shanghai road network area.
  - In recent 5 years, the identified city-level crash hotspots are all suburban arterials.

- **Vehicle Feature**
  - In 2016, about 37% fatality crashes are involved with commercial vehicles.
  - 90% commercial vehicle traffic crashes are caused by illegal activities of drivers from 2012 to 2014.

As the TSR Shanghai academic support institution, **Tongji University** has been working on the safety improvement project from the aspects of **Safer Roads** and **Safer Roadway Users**.
City-level crash hotspot identification was conducted using WebGIS based Shanghai Road Traffic Crash Analysis and Forewarning System (developed by project team and used by traffic police since 2010). Based on crash data, the spatial distribution, time distribution, severity level and type of crashes were analyzed. Based on the status evaluation, the road traffic safety issues were analyzed and countermeasures were suggested. Through coordinating roadway design departments, improvement design could be obtained. Within the process, non-motorized vehicle and pedestrian problems will be paid more attentions. Based on the design outcome, the countermeasures implementation will be put forward with coordinating roadway management organizations. Using Shanghai Road Traffic Crash Analysis and Forewarning System, quantitative evaluation will be conducted from the aspects of traffic safety and operation efficiency.
Crash Hotspots Identification

Shanghai Road Traffic Crash Analysis and Forewarning System can be used to manage, exhibit, and analyze crash and traffic violation data. The system was developed based on WebGIS, spatial database, and traffic safety analysis technology. In the process of crash hotspots safety improvement, the system could provide data support, which could further standardize and regulate the works of hotspots identification, crash analysis, field survey, and countermeasure implementation.

An efficient and accurate identification system to identify crash hotspots.

User friendly data analysis functions to analyze the risk based on crash causations.
Suburban arterial, located in Baoshan district of Shanghai. It is a four lane divided first class highway with the speed limit of 60km/h. The hotspot starts from Fansheng Road to Yunchuan Road with the length of 3.9km.

Suburban arterial, located in south Chongmin district in Shanghai. It runs from east to west. It is a four lane divided first class highway with the speed limit of 80km/h. The length of the hotspot is 66.8km.

Suburban arterial, located in Qingpu district of Shanghai. It runs from north to south. It is a six lane divided first class highway with the speed limit of 50km/h. The hotspot starts from Dianshanhu Avenue to Beiyin Road with the length of 4.3km.

Suburban arterial, located in Pudong district in Shanghai. It runs from east to west. It is a two lane undivided highway with the speed limit of 40km/h. The length of the hotspot is 3km.

Suburban arterial intersection, Longwu Road runs from north to south, Fanghe Road runs from east to west. There are three levels within the intersection. Two ramps enter and exit a freeway are very close with intersection approach. The distance from the end of the ramp to the intersection is only 120m.

Freeway, located in south part of Shanghai. It runs east to west. It is a eight lane divided freeway with the speed limit of 120km/h. The hotspot is the south side of the freeway. (from Linhai interchange to Shengjiahu-Hulu interchange). The length of the hotspot is 10.5km.
Crash Characteristic Analysis

Analyze cash data spatial distribution, identify crash prone locations, and identify safety improvement focus areas;
Analyze crash data temporal distribution, identify crash occurrence features at different time periods;
Analyze crash severity level, vehicle type, type of crashes, crash causations, and traffic violations;
Analyze crash cause by in-depth analysis to identify the influencing factors;
Develop safety improvement strategy and potential countermeasure selection, formulate improvement plan.

Crash spatial distribution analysis
Crash severity level, vehicle type, crash causations analysis
Crash temporal distribution analysis
Coordinating with traffic police departments, roadway administration bureau, filed survey works have been conducted utilizing equipment such as vehicle video recorder, camera, and drones.

Inspection Contents: Traffic conditions, sites of crashes, important locations, night survey.

Combined with field survey and crash feature analyses, the potential risk of roadway was identified and countermeasures were suggested.
In oblique crossing intersection, roadway users are less aware of potential conflict risks.

The crossing time for both vehicles and pedestrians are long, and the traffic operation efficiency is low; The zebra crossing is far from the intersection area, which lead to detours for vehicle and pedestrian; Non-motorized vehicles frequently stop after the stop line, thus increase the crash risk between right-turning motors; The design is bad for roadway users to recognize road signs, markings and signals; It makes the trajectory dispersion of pedestrian and vehicle, which expand the conflict area.

For acute angle regions, vehicles turning is difficult with bad visibility conditions.

For blunt angle regions, crossing path is too long which lead to more vehicle and non-motorized vehicle conflicts.

The intersection could be improved by adjusting the alignment, intersection layout, turning radius and ect.

Reduce radius of the intersection; move the stop line; adjust the location and length of the zebra crossing reasonably; provide reasonable separation facilities for motor and non-motor in the corner; reduce crash risk at the corners; set up necessary traffic islands and diversion lines to regulate the traffic flow.
2. Crash Hotspots Safety Improvements

### Poor Visibility Condition at Sight Triangle Area in the Intersections

**Before**

*Cleaning Sight Distance Obstacles*

**Blocked drivers’ sight**

The corner of the intersection is high-frequent crash location, and it has bad impact on the sight of the vehicle drivers from both directions.

### Absence of Roadway Median Barriers

**Before**

There are residential areas on both sides of the highway, and the travelling traffic volume is large, and the road has no median barriers. Residents cross the road frequently, which have lead to severe crashes.

Countermeasures

Clear the afforest and barrier sheltering from the sight can improve the visibility condition and reduce the crash risk.

### Countermeasures

Set up medians barriers could reduce pedestrians’ passing through the road, and decrease the probability of head on collisions, thus reducing the risk of crashes.
The excessive access points around the intersection area may cause the interruption of traffic flow, which reduce the traffic efficiency and increase crash risk; To deal with this issue, combinations of merge, shift, traffic flow control and other measures should be made to reduce the impacts of the accesses on the intersection safety.

The main line lacks the necessary signs, and the landscape covers the line of the sight. It is difficult to identify access points (crash scene).

Branches: lack of deceleration strip and yield signs; and the sight distance was blocked.
Imperfect Non-Motorized Traffic Facilities

The sidewalk is too narrow

Mixed traffic between motor and non-motorized vehicles

The Landscape Blocked Traffic Signs

The landscape have blocked the signal lights

The landscape have blocked the traffic signs
Through crash analysis and field investigation, Chenhai highway has the following risk:
1. The intersection layout is unreasonable and the scale is too large
2. The visibility is poor around the twice crossing
3. The visibility is poor around the access points
4. Speed control of part section can be improved
5. Add lighting for section with too many non-motor and pedestrians

Other measurements:
- Reduce the height of the landscape in the upstream of the access to ensure visibility between the mainline and the branch roads;
- Optimize the traffic control of the part section.
- Add lighting for necessary sections
Countermeasures for Sansan Highway

- Installing a sign of 40km/h speed limit on the poor-visibility section;
- Setting a sign of no overtaking;
- Setting the single yellow line in the median and speed reduction markings;
- Add the oscillating deceleration in the section with bridge;
- Change the bus stop at the end of the curve into harbor-shaped bus stop

- Advance the stop lines;
- Set the pedestrian refuge;
- Adjust the width of zebra crossing;
- Adjust the knuckle radius
Countermeasures for Longwu Road - Fanghe Road intersection

The potential risk:
The distance between the ramps and the intersection is short; Vehicles travelling on the off-ramps with high speed, which increased the difficulty to choose speed for drivers in a short time period;
The distance between the accesses and the intersection is too short, and there is no barrier facilities dividing the motor and non-motorized;
There is no barrier facilities dividing the motor and non-motor around the intersection;
The pier blocked from the sight of drivers on the intersection.

Countermeasures:
Add a speedlimit sign of 40km/h and a warning sign of crash hotspots on the junction of off-ramp;
Add lane indication sign and set deceleration induction line;
Seal off the access in the north side of the road (the access of Breakdown service) around the intersection;
Extend the guardrail separating the motors and non-motors northward to the stop line;
Setting up a reflecting sign on the pier at the intersection to remind the drivers.
2 Crash Hotspots Safety Improvements

Conduct Traffic Safety Propaganda and Education for the Intersections with High Violation Rates

After analyzing the “high-frequent crash intersection” and "residential quarter around it (Shiyou new village, Luling new village)” and identify:

- Non-motor’s violations such as running red lights, occupying motor’s lanes and stop on the line, occur frequently, which often causes severe crashes.
- Drivers of non-motor lack of safety awareness and attention to slow down and observe, occupying, and violating the traffic signs and markings are critical causes of the crashes.

In November 23th, 2016, aimed at non-motor’s safe travel, the research group conducted a public service campaign entitled "civilized travel, safety to you and me" with the local traffic police, security police, community housing committee in "Caoan road -S20 intersection", “Shiyou New Village” and "Luling New Village " of Pudong New District.

The activities mainly aimed at non-motor’s drivers and pedestrians, to carry out non-motor’s safety travel publicity, and conducted a questionnaire survey. On the day of the activity, more than 600 copies of the publicity materials were issued, and about 100 questionnaires were collected.
From 2016 to 2017, the project group has provided improvement schemes for Chenhai Road, Sansan Road, Longwu Road - Fanghe Road intersection, Yueluo highway, Caoying Road, S32 Shenjiahu freeway. After evaluating the result of improved road section, the improvement effect is pretty good with the total number of crashes and the number of fatality crashes been reduced substantially, and the traffic efficiency has been improved also.

In the meanwhile, there are several other projects under the implementation stages.

The median barriers were added to reduce the conflicts by pedestrians’ crossing the road. Together with the other improvements, the number of crashes on the Yueluo highway have dropped by 25% and the fatality crashes have dropped by 80%.

Countermeasures such as sealing off the roadside access points, adding decelerations markings, and setting up reflecting signs on the piers have been implemented. After the implementation, the crashes on the Longwu Road - Fanghe Road intersection have dropped by 33% and the number of fatality crashes have dropped by 100%.
Through optimizing traffic organization of the intersection, such as adding waiting area and adjusting the signal phases and the lane markings, the crash risk has been effectively reduced and the traffic operation efficiency has been improved. With the implementations of countermeasures, the number of crashes of Caoying Highway have dropped by \(15\%\) and the fatality crashes have dropped by \(100\%\).
Behavior-based Safety Education for Commercial Vehicle drivers

1 Data Collection
- Develop and install equipment
- Record traffic conditions and driving behavior

Acceleration data, trajectory, in-vehicle and environment video were collected with the installed naturalistic driving data acquisition equipment.

2 Behavior Analysis
- Analyze individual driving behavior
- Integrate with crash and violation records to identify common risky driving issues

Compiling “Coding book for commercial vehicle drivers’ risk-driving behaviors”: extracting data for crash, near-crash, violation behavior, and evasive behavior according to the coding book. Analyzing individual driver’s risk-driving behavior and the common issues for all drivers from each company.

3 Safety Education
- Group education on common issues
- Individual education on personal driving behavior

Giving lectures to drivers with slides on common issues; Preparing individual report for selected drivers and implementing one-on-one education.

4 Education Evaluation
- Calculating the risk-driving events before and after education
- Evaluating and improving education methods

Comparing the risk-driving events before and after the education for each type of risk driving behavior. Then evaluate the education effectiveness based on the statistics results.
Project Implementation

**Step 1: Preparation**
- Select companies
- Investigation on companies’ safety management and industry’s key problems

**Step 2: Equipment installation and data analysis**
- Data acquisition equipment development and installation
- Analysis of characteristics of driving behavior
- Identification of common risk-driving behaviors

**Step 3: Safety education**
- Prepare education slides
- Design posters for common risk-driving behaviors
- Produce individual monthly risk-driving behavior
- Implementation of combined Behavior-based Safety education method continuously

**Step 4: Effectiveness evaluation**
- Evaluate and improve the effectiveness of education methods
- Organize Behavior based Safety Education for Commercial Drivers Forum

**Step 5: Compiling education manual**
- Compile «Safety Education Manual for Commercial Drivers based on Behavior based Safety»
Cooperation with Shanghai Urban Transport Management Office

Selected one company from each four kinds of transport industries for implementation. Choose 10 drivers from each company as participants, collect their driving behavior data, and educate them monthly.

- Intercity passenger transport industry
- City bus industry
- Hazardous materials transport industry
- Container transport industry
Key Problems for Intercity Passenger Transport Industry

**Severity**
High in severe crashes with over 10 fatalities
58.3% of all the severe crashes with over 10 fatalities involved intercity passenger transport in China, 2015

**Location**
Crashes mainly happened on urban roads while casualty crashes happen on freeways
54% of all the crashes in Shanghai took place on urban roads from 2006 to 2011. 40% percent of passenger fatalities took place on freeway

**Violation**
Speeding is the most frequency violation
Exceed speed limit over 50% is the most violation behavior for intercity bus drivers with a percentage of 44.2% in Shanghai, 2011

*Data source: Annual Statistics Report for Highway Crashes 2006-2011*
Statistics of safety critical events for 16 drivers, 11 vehicles

**Percentages of Risk Driving Behavior**

<table>
<thead>
<tr>
<th>Behavior</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cell phone usage</td>
<td>30%</td>
</tr>
<tr>
<td>Smoking</td>
<td>25%</td>
</tr>
<tr>
<td>Talking with passengers</td>
<td>15%</td>
</tr>
<tr>
<td>Eating or drinking</td>
<td>10%</td>
</tr>
<tr>
<td>Driving fatigue</td>
<td>10%</td>
</tr>
<tr>
<td>Speeding</td>
<td>5%</td>
</tr>
<tr>
<td>Bowing to pick up things</td>
<td>5%</td>
</tr>
<tr>
<td>Tidying up personal appearance</td>
<td>5%</td>
</tr>
<tr>
<td>Following too close</td>
<td>5%</td>
</tr>
<tr>
<td>Picking up things around</td>
<td>5%</td>
</tr>
</tbody>
</table>

**Cell Phone Usage While Driving**

**Danger of cell phone usage while driving**
Crash risk is raised up to 4 times when using a phone while driving comparing to non-phone use circumstances. Cell phone usage while driving brings 4 kinds of distraction: visual, manipulating, auditory and cognitive.

**Special case - phone usage in the dark**
As shown in the figure, a driver was using a phone while driving at a speed at 90km/h. Looking at cell phone for 2s will cause a 50m of blindly driving in day time. But it will be even longer at night as his eyes had to adapt to the brightness changes.

**Speeding on ramp**

**Danger of speeding**
Speeding will 1) increase the large impact force and results in severe crashes, 2) enlarge the braking distance by 4 times with 1 times increasing in speed, 3) make the driver more anxious and tired then results in driving fatigue, 4) increase the chances of roll over crashes.

**A speeding case**
Results showed that speeding mainly took place on freeway ramp with a speed of 60km/h over the speed limit of 40km/h.
Implementation and Investigation

- Safety management investigation
- Equipment installation and individual survey
- Combined Behavior-based Safety education

Investigation at Baiyulan Ltd.

Investigation at Baiyulan Ltd. Investigation at Shanghai Jiaoyun Group Co. Ltd.

Equipment installation

Signing informed consent and filling out individual questionnaires

Showing posters to drivers

Explaining common risk-driving behaviors
City Bus Industry

Casualty

Higher number of casualties ▼
During the first 6 months of 2017, 23 fatalities and 35 injuries involving city buses were reported, ranking 2nd among 6 types of transportation industry.

Frequency

High frequency in crash occurrence ▼
41 crashes were reported for the first half year of 2017.

Data Source: Crashes and crash causations for professional transport industry (first half year of 2017)
Data for 10 drivers with 10 vehicles were collected. Non-standard stopping is the main risk driving behavior occupied a quarter among all. Furthermore, three behaviors that rushing through the green lights, grabbing the way and non-standard operation also frequently occurred.

Every driver had safety risk driving behavior resulted from Non-standard stopping and rushing through the green lights.
3 Behavior-based Safety Education for Commercial Vehicle Drivers

Implementation and Investigation

- Introducing the project to the company
- Discussing the implementation feasibility
- Filling the drivers' questionnaires
- Consulting drivers’ opinion on the questionnaire
- Monthly group education
- Educating participating drivers

Combined Behavior-based Safety Education
The fatality rate per 10,000 vehicles was far higher than that of all the crashes from 2006 to 2011.

Of all the freight crashes in Shanghai, from 2006 to 2011, 56% are angle crashes.

Violations of yielding regulations and traffic signals were the top two types of violations among all with 31% and 19% respectively from 2006 to 2011, in Shanghai.

**Data source:** Annual Statistics Report for Highway Crashes 2006-2011
According to the statistics of risk driving behavior for 10 drivers, all of them used cell phone while driving. The cell phone usage event for one driver even occupied 68% of all his safety critical events, which was the highest among all drivers.

Statistics of risk driving behavior for 10 drivers, cell phone usage was the most serious behavior with a one third proportion.
3. Behavior-based Safety Education for Commercial Vehicle Drivers

Implementation and Investigation

- Equipment installation and test
- Communicating and interviewing with the drivers
- Face-to-face safety education lectures on common risk-driving behaviors
- Putting up and explaining the posters
- Individual safety education
- A group photo with the managers and drivers

Container Transport Industry
Key Problems for Urban Public Transit Industry

Crash type

Crash characteristics for hazardous materials transport industry
75% of all the crashes related to hazardous materials transport vehicles were crashing with moving vehicles from 2006 to 2011, in Shanghai

Crash modality

Crash modality statistics for hazardous materials transport industry
53% of all the crashes related to hazardous materials transport vehicles were angle crashes from 2006 to 2011, in Shanghai

Crash causation

Crash causation statistics for hazardous materials transport industry
80% of all the crashes related to hazardous materials transport vehicles resulted from violations, from 2006 to 2011, Shanghai, in Shanghai

Statistics of risk driving behavior for 10 drivers. Cell phone usage, driving fatigue and Aggressive takeover account for a large proportion.

Analysis of typical risk driving behavior

**Cell phone usage**: A driver was holding a phone to browse the information when driving.

**Driving fatigue**: A slight sleep phenomenon occurred, and the blind driving time was up to 10 seconds.

**Smoking**: A driver was smoking when driving, which will cause driving distraction and may ignite of hazardous chemicals.

**Aggressive overtaking**: The driver drove over the double yellow line, overtaking in the condition of meeting opposite vehicle.
Implementation and Investigation

Safety management investigation

Conducting Individual safe driving awareness survey

A group photo of drivers and the research team

Face-to-face safety education lectures on common risk-driving behaviors

Driving problem forum

Individual safety education
Cell phone usage while driving. Cell phone usage was the most common problem for all three companies except city bus company that did not allow drivers to bring cell phones at work.

Driving fatigue. Driving fatigue happened to all three companies with similar frequencies, also except city bus company whose drivers needed to stop frequently.

Rushing through the flashing green light. This behavior happened mostly in hazardous materials transport company, then the city bus company, and not significant for the other two companies.

Other risk-driving behaviors. This varied in different companies. Each company needed specific education content, i.e. speeding for intercity passenger transport company, aggressive stopping and fighting for road with others for city bus company, aggressive overtaking for hazardous materials transport company.

Safety education key points

1. Pass intersection safely
   Do not rush through the green light tail. Check the space bring by the difference of radius between inner wheels in advance when turning right.

2. Cell phone usage
   Using phones for 3s equals to blindly driving for 50m. Texting enlarges the risk probability.

3. Aggressive overtaking
   Make sure of the safe overtaking distance. The reasons why overtaking from the right is banned.

4. Driving fatigue
   Driving fatigue and the physiological cycle. Micro sleep.
Avoid Phone Usage while Driving

Phone usage while driving leads to distraction and higher risk rate to crash. However, this behavior is prevailing and brings strong influences on driving safety.

- **Phone usage while driving** enlarge the risk rate of crash by 3 times.
- **Every time you look down at the phone** equals to 4.3s of blind driving.
- **Each time you use your phone, 56%** of all the time you will be looking down to your phone.

Drivers hold cell phone for calls or watch videos will get 2 points deducted.

- **Drivers look at cell phone 3 times an hour in average**
- **87% drivers use cell phone while driving**

**Advises on driving safety related to cell phone usage**

- Do not answer the phone while driving. Leaving a voice message for the callers is a good way.
- Do not use the phone when stopping at intersections.
- If you are in great need to use phone, please park the vehicle first.

Texting will make the crash risk rate 23 times larger than non-phone use involved.

“Shanghai Road Traffic Regulations”: distracted behaviors, e.g. hand-held phone conversation, browsing, are not allowed when driving.

Phone use while driving brings about 4 kinds of distraction: visual, manipulating, auditory and cognitive. Therefore, any kinds of phone use are not recommend while driving.
Posters for Common Risk-Driving Behaviors (2/4)

Danger and Prevention of Driving Fatigue

40% of the major crashes are related to driving fatigue.

- Driving continuously for no more than 4 hours
- Rest no less than 20 min
- Otherwise, receive a 6 points deduction

**Micro-sleep**
- Commonly known as “doze” or “nap”;
- Sleep slightly for a short period around 2-3s;
- Fall asleep
- Close eyes at a speed of 60km/h equals to driving blindly for 34m

Driving fatigue and physiological cycle

- Fatigue often occurs at afternoon or midnight according to human physiological cycle. Specific advices are put forward here.

- The sun is rising. I need to smear some Essential Balm to keep away from fatigue.
- When feeling sleepy in the afternoon, take a nap!

Tips on related laws and regulations are directly and visually shown to drivers.

Striking numbers visually warn drivers of the danger.

At the stage of micro sleep, drivers are slightly conscious of the surroundings and can hardly react to any emergency.

Specific advices on avoiding driving fatigue.

Producers: Tongji University

Together for Safer Roads
Avoiding Aggressive Overtaking

Legal provisions: Overtaking is prohibited in following cases

- The front car is turning left, turning around or overtaking; There is meeting possibility with opposed vehicle; The front car is police car, fire engine or ambulance etc.; In urban road with great traffic flow.

Overtaking on the right is prohibited

Steering wheel is on the left-hand riding by the right in China

When overtaking on the right, the drivers' horizon is narrower, which can cause crash easily.

Ensuring safe distance before overtaking

When you drive at a speed among 50km/h, you should keep 10~12 seconds-driving distance with opposed vehicle.

You can drive through about 150 meters in 10-12 seconds, also opposed vehicle can drive through about 150 meters. Therefore, keep a distance over 300 meters with opposed vehicle when overtaking.

Producers: TONGJI UNIVERSITY

Tips on related laws and regulations are directly and visually shown to drivers.

To explain the reason why overtaking on the right is prohibited.

Enhance the drivers' concern of safe overtaking.

Provide a method to judge safe gap for overtaking.
Pass the Intersection Safely

Intersection in the joint of urban road, also it is the black spot. Drivers should be careful especially at the intersection.

Running the amber light is more dangerous than running the red light sometime!

- You may well be crash the pedestrians who are on the zebra crossing when running the amber light.
- If you rush through the amber light, the vehicle is faster than that running the red light sometime.

Tips:
Before through the intersection, slow down and observe the road condition. Put the feet on the pedal and be prepare for stopping, then pass carefully.

Pay attention to the blind area when turning

- Lean to the right/left when turning right/left;
- Observe the vehicle ahead actively and quickly.

Tips on related laws and regulations are directly and visually shown to drivers.

To provide tips of making the stop-go decision.

Provide correct way to pass intersection safely.
Face to Face Individual Education Based on Individual Risk Driving Behavior Report

Individual Risk Driving Behavior Report

<table>
<thead>
<tr>
<th>Education date</th>
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<td>Main organization</td>
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<td>Education form</td>
<td>Face to Face</td>
</tr>
<tr>
<td>Education executive</td>
<td>He Linlin</td>
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</table>

**Data acquisition time:** From August 4, 2017 to August 11, 2017.

**Total number of the driver’s risk driving behavior events:** 27

**Average number of the driver’s risk driving behavior events:** 3.5

**Ranking of the driver’s risk driving behavior events:** 3.

**Distribution of the driver’s risk driving behavior:**

- Fatigue with eyes to control
- Drugs
- Excess speed
- Distraction at the controls
- Fatigue with head to control
- Driving
- Smoking
- Using cell phone
- Conversation with cell phone

**Feedback and suggestion according to the case:**

**Case 1**

- **Date:** August 11, 2017
- **Time:** 10:09:33
- **Weather:** Sunny, Light
- **Road type:** Urban road
- **Event type:** Crash, Risk event, Cell phone use

**Description of the event:** The driver made a cell phone call for voice chat during driving.

**Picture of the event:**

**Suggestion for safety driving:**

- **Law:** Drivers must keep the eyes on the road and hands on the wheel while driving.
- **Underlying Mechanism:** While using your cell phone, your ability to acquire, handle and respond to the road information will decrease and you will get yourself, passengers, other vehicles and pedestrians on the road in danger. Especially when you drive at a high speed, every single decision could be fatal.

**Suggestion:**

1. Keep a good sleep at night and have a rest during 13:00 to 14:30
2. Keep your phone away from you
3. Keep your hole on the road and hands on the wheel while driving
4. Have a rest on your journey
5. Follow the traffic rules

**Evaluation of the case:**

- Analysis of the event reason: Very clear
- Help of the suggestion for safety driving: Very useful
- Positive motivation of the educator: Very agreeable
- Time of the learning: Very interesting

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3 Behavior-based Safety Education

for Commercial Vehicle Drivers
Date: 16 Sep, 2017

Participants:
Shanghai Municipal Transportation Management Bureau
Shanghai Traffic Police
Shanghai Traffic Engineering Society
Safety managers of 4 selected companies
Traffic Safety Research Group of Tongji University
Experts from Tongji and Fudan University

Main Topics
Project implementation progress and suggestion collection
Current management situation, main problem and international experiences on safety education of commercial drivers
Typical risky driving behavior （Driving fatigue, Cellphone usage）

Key contents
Four key enterprises manager introduced the current management situation and relevant experience respectively, also in view of the problems faced by the enterprises, participants conducted in-depth discussions and exchanges.

For improving the driver safety and prevent road crash, experts from school of medicine, school of software of Tongji University and school of psychology of Fudan University put forward some suggestions from physiology, technology and psychology etc.

The participants from traffic management department introduced the current road safety status in Shanghai, and they hoped to strength the cooperation with Traffic Safety Research Group of Tongji University.
The frequencies of risky driving behavior are reduced by $32\%$ after safety education; Rushing through the flashing green lights and Driving fatigue are the most effective.
Behavior-based Safety education method

Combined education method which combined face-to-face education lectures and individual education for participants

Safety education materials for commercial vehicle drivers

Materials of education lecture (posters, education slides), individual education materials (Individual Behavior Reports)

Safety Education Guideline For Commercial Vehicle Drivers

Key safety problems, education method, education materials

《 Shanghai Safety Education Guideline For Commercial Vehicle Drivers 》

was compiled and submitted to Shanghai Traffic Committee as reference.

Guideline Contents

- Literature review of crashes and violations characteristics;
- Analysis of typical crashes causation;
- Typical violations (red light runners, speeding etc.) Including relevant laws, harm, preventive measures;
- Typical risk-driving behavior (aggressive driving, distracted driving etc.) Including principles and harm explanation, preventive measures;
- Combined safety education method Including observed driving behavior, education materials, effect evaluation.
- Table of safety tips
“Together for Safer Roads” was officially launched in Shanghai on December 2nd, 2015 the fourth “National Traffic Safety Day”. Ming Yao and Xiang Liu jointly attended the launching ceremony as “Shanghai Road Traffic Safety Celebrity Endorsers”. Joint International Research Laboratory of Transportation Safety of Tongji University acts as the academic supporting organization.

On April 6th, 2016 “Together for Safer Roads” held 2016 Plan Kick-off Meeting in Shanghai. Vice President of ABInbev Asia Pacific Frank Wang, senior officials from Shanghai Municipal Transportation Commission and Traffic Police Corps of Bureau of Public Security of Shanghai, Professor Xuesong Wang from Tongji University and Huijun Zhu, Secretary General of Shanghai Institute of Traffic Engineering attended the meeting.

The 4th International Symposium on Transportation Safety was successfully held on July 10th, 2016 in Tongji University. Focusing on “learning experiences from developed countries to improve traffic management proficiency of developing countries”, the Symposium explored the traffic safety improving directions in order to boost developing countries’ ability to improve traffic safety.

During September 25th and 26th, 2017, the 5th International Symposium on Transportation Safety was held at Tongji University. The symposium invited international well-known experts to share their latest research on connected-autonomous vehicle, safety management, driver behavior and psychology, public health and traffic safety, and roadway safety design. The symposium promoted the collaborations on transportation safety between experts of different disciplines, including engineering, human behavior and psychology, and public health.
Mission and Objective

Joint International Research Laboratory of Transportation Safety was established on October 29th 2015. Gathering world-class transportation safety research experts, the laboratory is committed to improve transportation safety in China by working on the core safety issues of People-Vehicle-Road-Management transportation system and conducting systematic research.

Research Directions

- Traffic Behavior Investigation and Improvement
- Cooperative Vehicle Infrastructure System and Advanced Driver Assistant System
- Infrastructure Design Safety Evaluation and Improvement
- Transportation Safety Management
- More Efficient Management
- More Responsible People
- Safer Vehicles
- Better Roads

Facilities

- world-leading 8 degree-of-freedom driving simulator
- naturalistic driving vehicle and equipment

International Academic Collaboration

[Image of world map with partner institutions marked]
In 2016, “111 Project on Transportation Safety Discipline” was approved by Ministry of Education and State Administration of Foreign Experts Affairs under “111 Project”. This project is jointly supported by the 111 Project of Transportation Safety Program (No. B17032).