Improvement of Walking Environments for the Transportation Vulnerable

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Background

Definition

- Increase the interest of the pedestrian environment
- ❖ Generic term of transportation vulnerable: people who are the disabled, the elderly, pregnant women, children, and inconvenient to go

- The law concern about convenient movement of transportation vulnerable in Korea was Enforced in 2010

- In general: The transportation vulnerable
- ❖ USA: Elderly or disabled
- ❖ Now: The mobility handicapped(Including the elderly, pregnant women, children, person with the burden)

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Background

● Progress of elderly

Proportion of the population over the age of 65

(Unit : %)

Year	1980	1990	1998	2000	2008	2009	2010	2018	2026	2030	2040	2050
Proportion	3.8	5.1	6.6	7.2	10.3	10.7	11	14.3	20.8	24.3	32.5	38.2

Source: The National Statistical Office

- An aging society: 7%
- Aged society: 14%
- A super-aged society: 20%

Proportion of the population over the age of 65

2018 year
14.3%

2026 year
20.8%

2000 year
7.2%
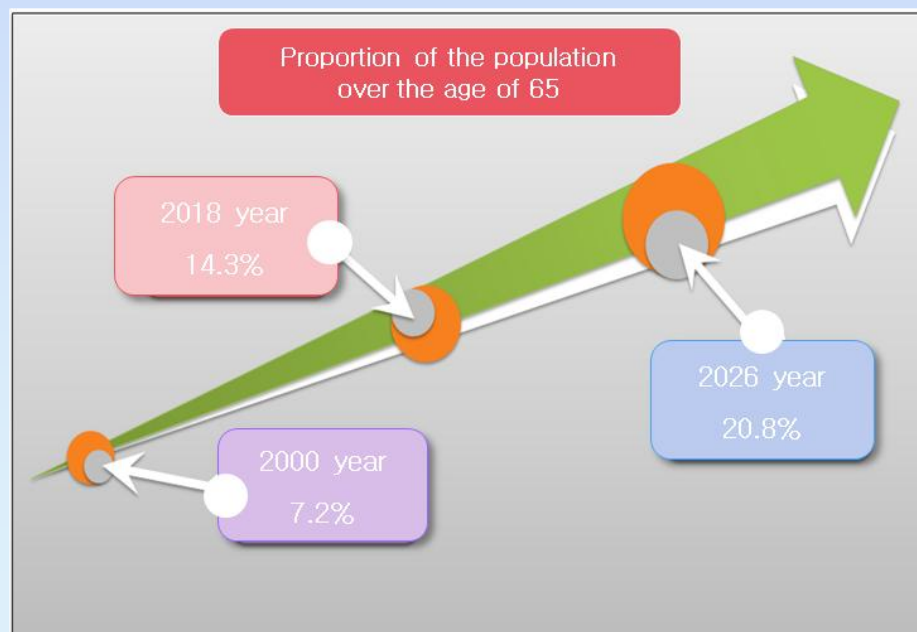
Background

Trend of an aging population in each year

	Year			Year spent	
	7%	14%	20%	7%→14%	14%→20%
Japan	1970	1994	2005	24	11
France	1864	1979	2018	115	39
UK	1929	1975	2028	46	53
USA	1942	2014	2032	72	18
Korea	2000	2018	2026	18	8

Source: National Institute of Population and Social Security research

Background

### Safety for transportation vulnerable

- Build a safe pedestrian environment for the **elderly**
  - ❖ Elderly pedestrian casualty has been increased in all cities
  - ❖ Pedestrian fatality account for 61% of all accidents
  - ❖ Seoul: Elderly pedestrian accidents compared to 2008 was an increase of 163
  - ❖ Elderly pedestrian fatality rates is doubled high more than the general population

- The number of **children** killed on the roads
  - ❖ In OECD countries, Korea ranks highest in the number of traffic fatalities per 100,000 children (3.1 children, Japan: 0.9 child)

- Transportation policy for pedestrian vulnerable is an important issue. But it is hard to be improved due to lack of budget.
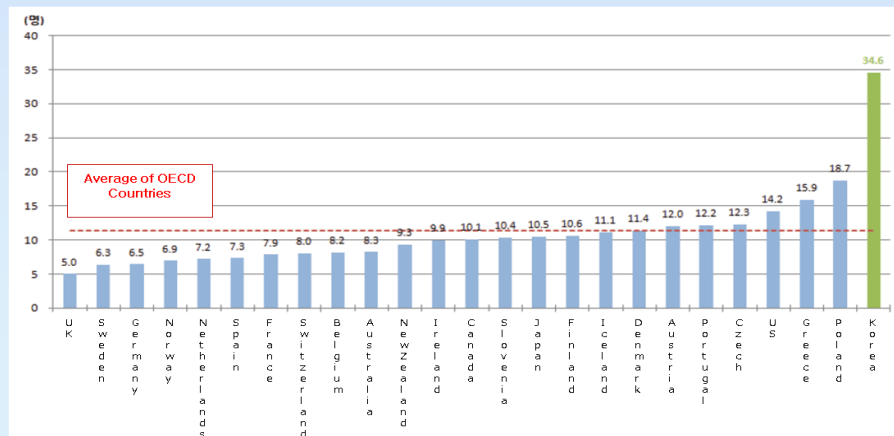
Elderly traffic accident

● **Traffic fatality of elderly aged over 65 in 2008**

❖ Japan: 49.0%

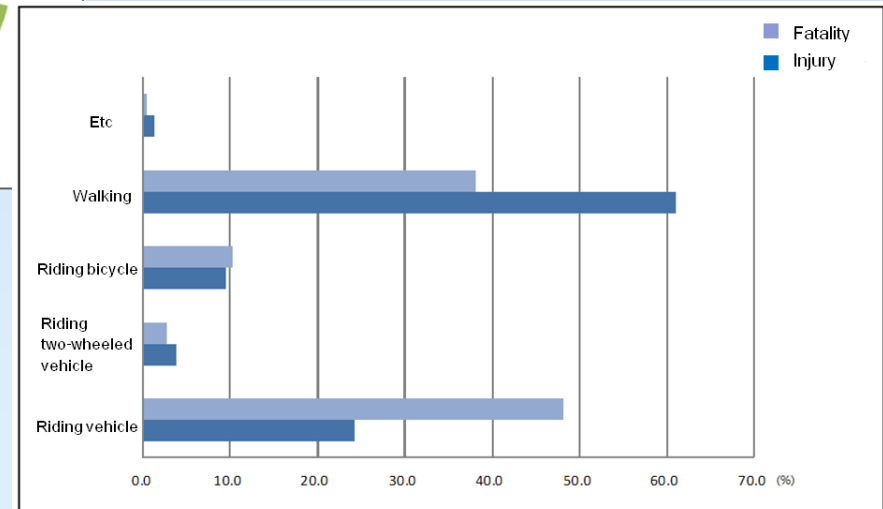❖ Iceland: 33.3%

❖ Korea: 29.6%

Average of OECD Countries
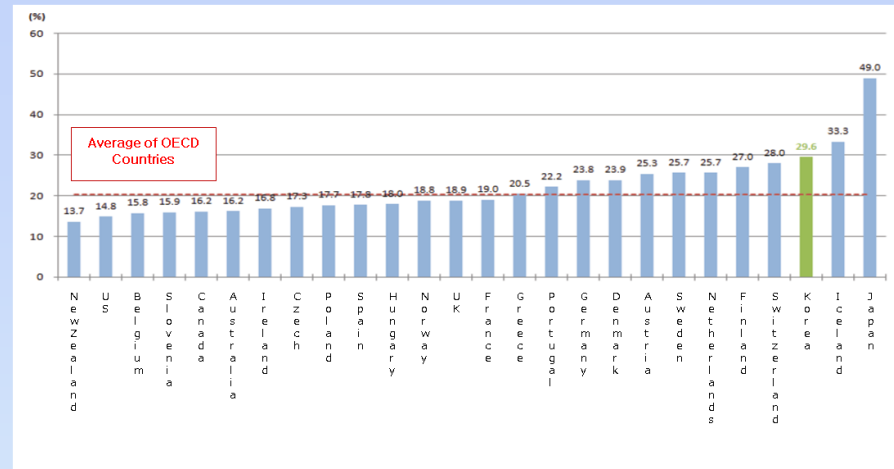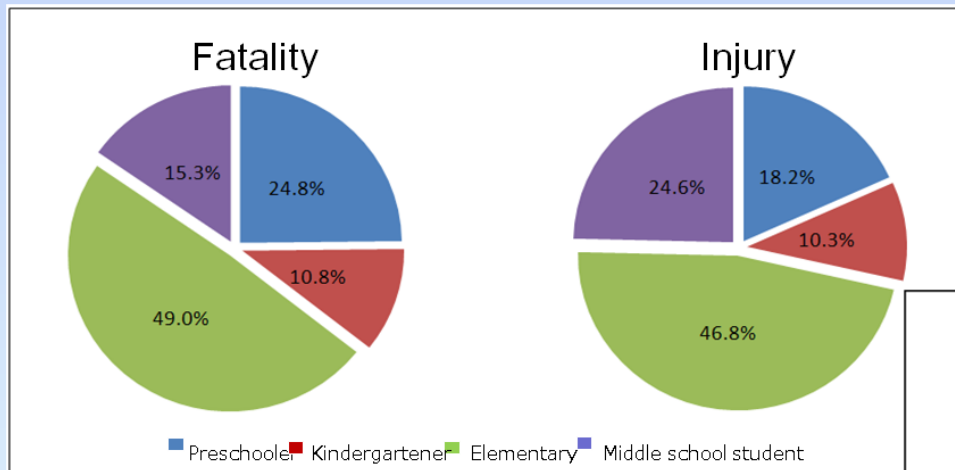
● **Traffic fatality of elderly aged over 65 per 100,000 people in 2008**

❖ Korea: 34.6 people

❖ More than three times high compared to average of OECD countries

Average of OECD Countries

Children traffic accident

Child casualty composition per grade

❖ Elementary fatality rate: 49%

❖ Injury rate: 46.8%

❖The majority of pedestrian death occurs in walking

Fatality

- 24.8%
- 10.8%
- 49.0%
- 15.3%

Injury

- 18.2%
- 10.3%
- 46.8%
- 24.6%

Preschooler ■ Kindergartener ■ Elementary ■ Middle school student

Legend: Fatality, Injury

Categories: Etc, Walking, Riding bicycle, Riding two-wheeled vehicle, Riding vehicle

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Walking Casualty

❑ Traffic accident by borough in Daejeon

- Pedestrian fatality of 7 metropolitan cities: 2,137 people
- Pedestrian injury in 2009: increased to 51,381people
- Pedestrian fatality and injury in Daejeon increased 67 and 1,415 people respectively
- The number of elderly pedestrian casualty increased in all metropolitan cities

Elderly and children pedestrian casualty

	Pedestrian casualty				Child pedestrian casualty				Elderly pedestrian casualty			
	Fatality		Injury		Fatality		Injury		Fatality		Injury	
	'08	'09	'08	'09	'08	'09	'08	'09	'08	'09	'08	'09
Seoul	258	241	10,887	11,519	12	10	1,507	1,498	97	97	1,370	1,533
Busan	111	128	3,659	4,019	4	6	544	537	35	49	559	582
Daegu	94	92	3,042	3,141	5	3	519	523	38	38	457	502
Incheon	78	87	2,876	2,885	2	1	507	449	38	29	344	364
Guangju	69	49	1,724	1,879	1	2	352	359	30	30	229	246
Daejeon	55	67	1,321	1,415	3	2	244	250	26	28	191	196
Yulsan	48	54	1,152	1,145	3	1	232	192	16	22	131	134
Total	2,137	2,137	48,688	51,381	90	96	8,798	8,616	903	952	7,181	7,832

자료: 지역별 교통사고 통계, 도로교통공단

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Child pedestrian characteristics and rick elements

☐ Child pedestrian

● Child pedestrian characteristics

❖ Do not look around when crossing

❖ Follow other's jaywalking

❖ Only look at one side of crossing when they cross

❖ Expecting that the car will be stopped

❖ Break into a run as soon as the light turns green

❖ Stopping in the crossing road

❖ Waiting for the green signal from the road

● Examples of problems at a school zone

❖ No speed hump or bump

❖ No segregation between pedestrian and vehicle

❖ Child safety problem due to illegal parking
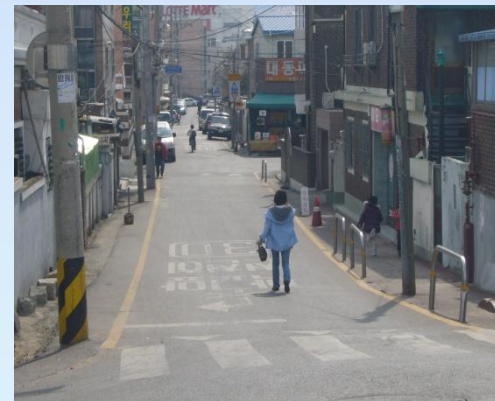
Problem

❑ School zone

No crash barrier and illegal parking

Inappropriate crash barrier

Children walking at the driveway

No color road pavement

Overseas case

☐ The New York City Pedestrian Safety Study & Action Plan, 2010

- New York: By 2030, NY DOT consolidates the speed regulation in order to reduce the traffic fatalities by half goal
- 2009 year in NY city is the safest year ever / Traffic fatality and pedestrian fatality decreased to 35% and 52%, respectively compared to the year in 2001
  - ❖ 36% of accidents caused by driver negligence leads to pedestrian's death or serious injury
  - ❖ 27% of the accidents is the pedestrian deaths or injuries due to the driver's violation
  - ❖ 80% of pedestrian deaths or injuries occurred by a male driver
  - ❖ Two-thirds of serious pedestrian accidents occurred in the main road
  - ❖ From the main road, about 15% of the accidents happen, but 60% of the fatal accidents are occurred

- 2010-2011year plan
  - ❖ Installation of pedestrian signal at 1,500 intersections
  - ❖ Installation of 20mph zone to 60 mile length road in order to improve pedestrian safety

Overseas case

❑ Traffic policy for elderly pedestrians

NY Safe Routes to Seniors

🔴 Background

❖ Transportation Alternative(TA) started 'Safe Routes for Seniors Campaign' for elderly pedestrians

❖ In 2008, TA started the Safe Routes to Seniors project with NYC Department for the Aging (focuses on the elderly pedestrian safety)

🔴 Check lists

❖ not enough time to cross the streets

❖ broken or missing pedestrian ramps

❖ faded and hard-to-see markings

❖ turning vehicles failing to yield
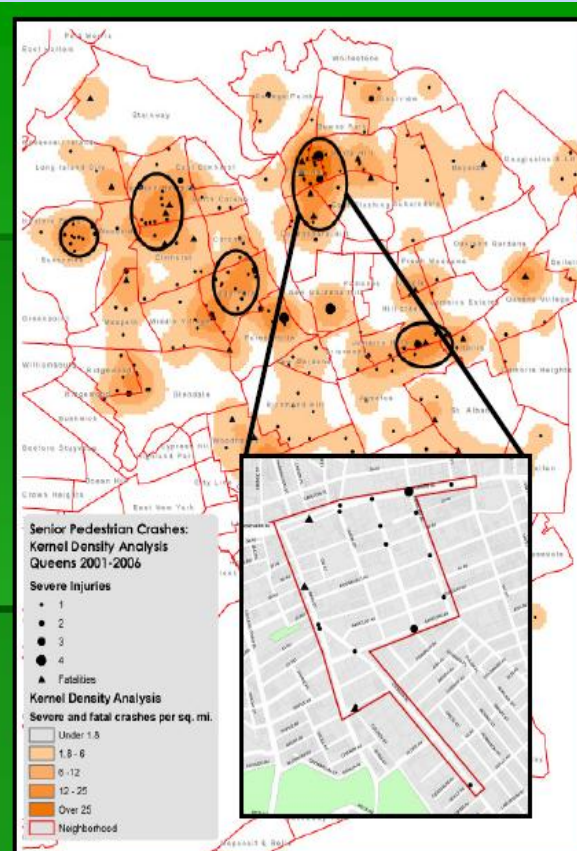
❖ poor drainage or ponding in crosswalks

Overseas case

❑ Traffic policy for elderly pedestrians

The selection of pilot areas using GIS spatial analysis

Senior Areas: Queens

- Flushing*
- Jackson Heights
- Jamaica Hills
- Rego Park
- Sunnyside

Senior Pedestrian Crashes:
Kernel Density Analysis
Queens 2001-2006

Severe Injuries
- · 1
- · 2
- · 3
- · 4
- ▲ Fatalities

Kernel Density Analysis
Severe and fatal crashes per sq. mi.
- Under 1.8
- 1.8 - 6
- 6 - 12
- 12 - 25
- Over 25
- Neighborhood

*Pilot Area

Overseas case

❑ Traffic policy for elderly pedestrians

- **Measures**

  - ❖ Installing new or upgraded pavement markings

  - ❖ High-visibility crosswalks

  - ❖ Advance stop bars to encourage drivers to stop before a crosswalk rather than in it

  - ❖ Narrow streets by reducing the number of vehicle lanes

  - ❖ Various road facilities maintenance activities

    1. replacing missing roadway signs

    2. repairing broken curb ramps

  - ❖ Leading Pedestrian Intervals(LPI), which activate a walk signal before vehicles

    get a green light. So pedestrians can have a head start into a crosswalk

Overseas case

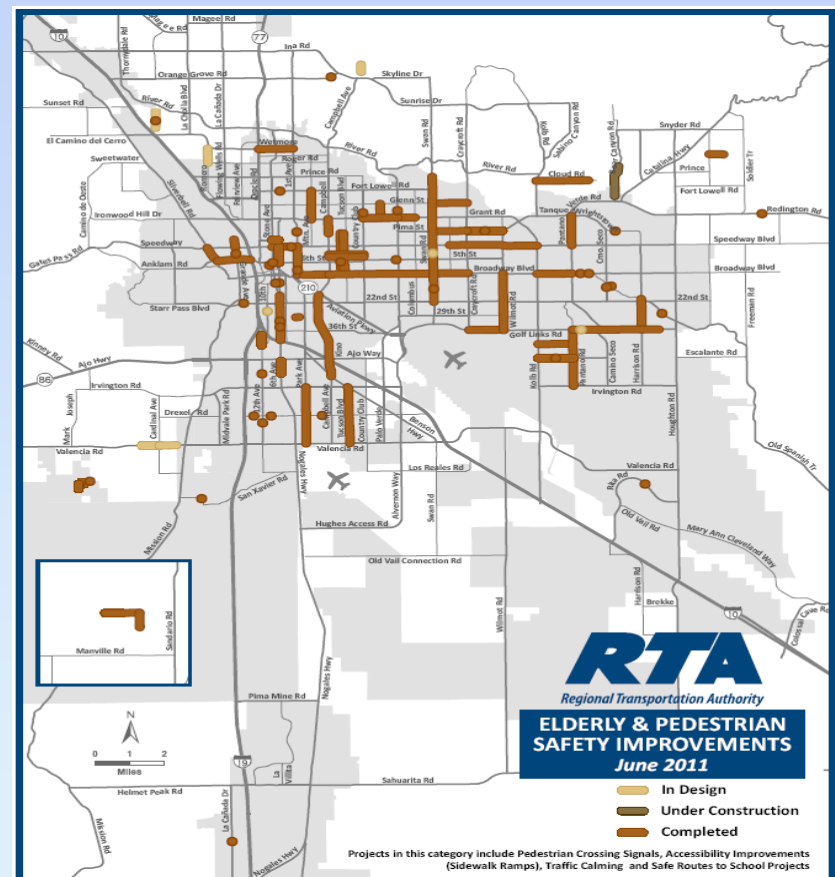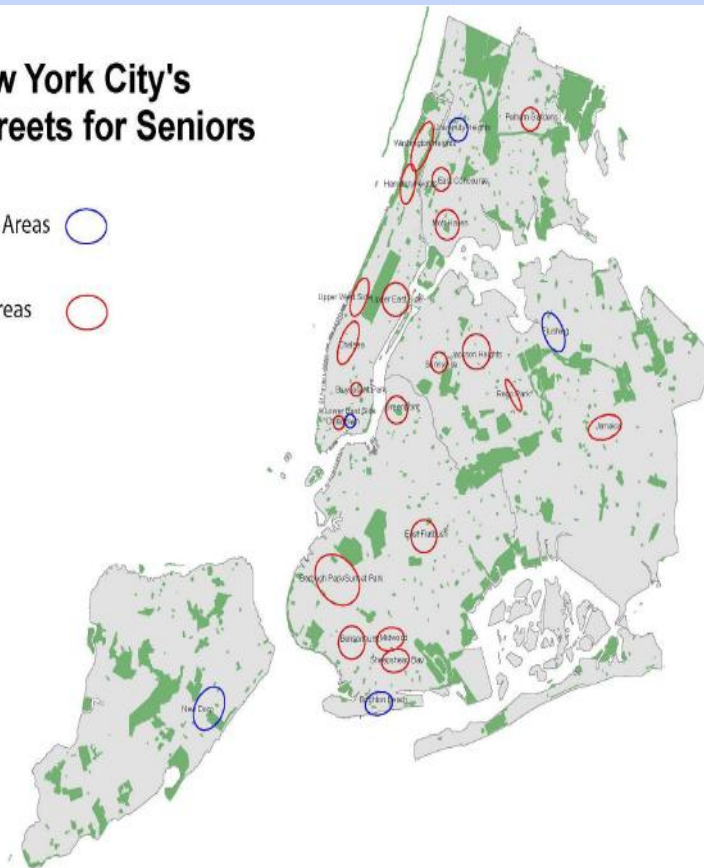### Traffic policy for elderly pedestrians

Safe streets for seniors

The areas for elderly pedestrian safety improvement

Overseas case

☐ Traffic policy for elderly pedestrians

● **Conclusion**

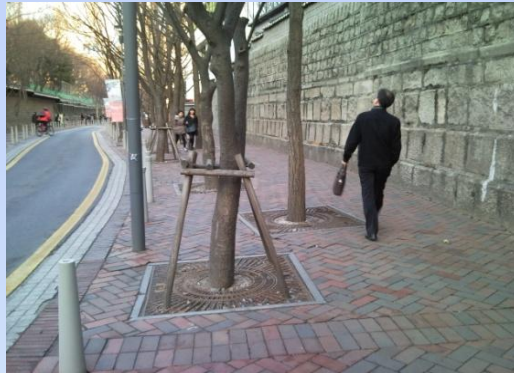❖ Install transport facilities and educate about transport safety to secure the elderly pedestrian safety

Safe driving for pedestrian accident prevention

Improvement method for transportation vulnerable

❏ **Design for pedestrian safety**

● **Secure pedestrian passage**

● **Traffic Calming**

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Improvement method for transportation vulnerable

❑ Design for pedestrian safety

● Smart Crosswalk

❖ LED bulbs installed in the vehicle stop line to increase the visibility

❖ LED bulbs was obtained approval from California Traffic Control Devices
Committee(CTCDC) in 1999 and firstly installed at the intersection in California

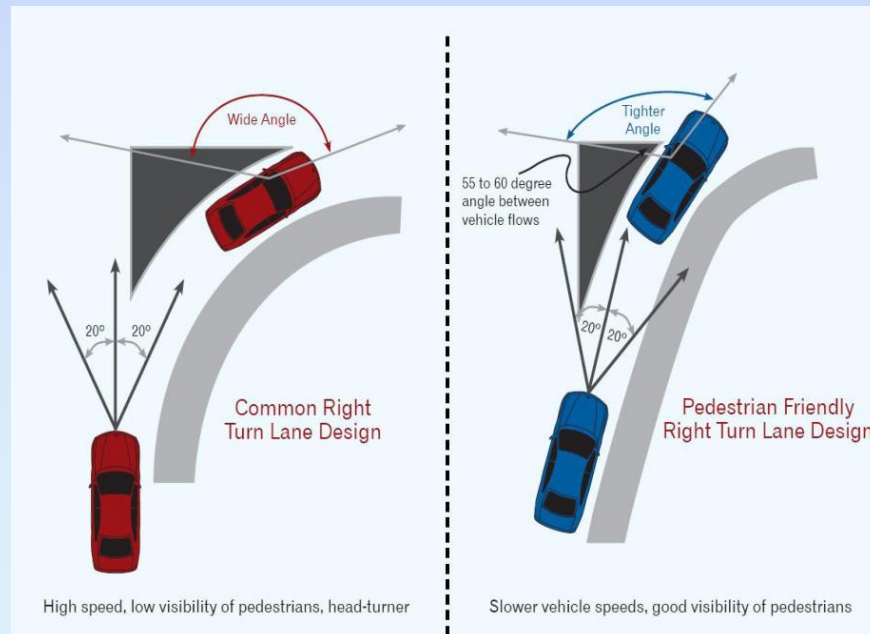❖ This can be helpful to reduce vehicle vs. pedestrian accident

Red light running

Improvement method for transportation vulnerable

❑ Design for pedestrian safety

● Reduce the turn angle

❖ Driver reduces vehicle speed to turn right / pedestrian safety can be ensured

❖ Crossing distance is shorter and a sight distance between vehicle and pedestrian is improved

Reducing right turn angle

Improvement method for transportation vulnerable

❑ Design for pedestrian safety

● Marking at local street

Cross mark and flash light

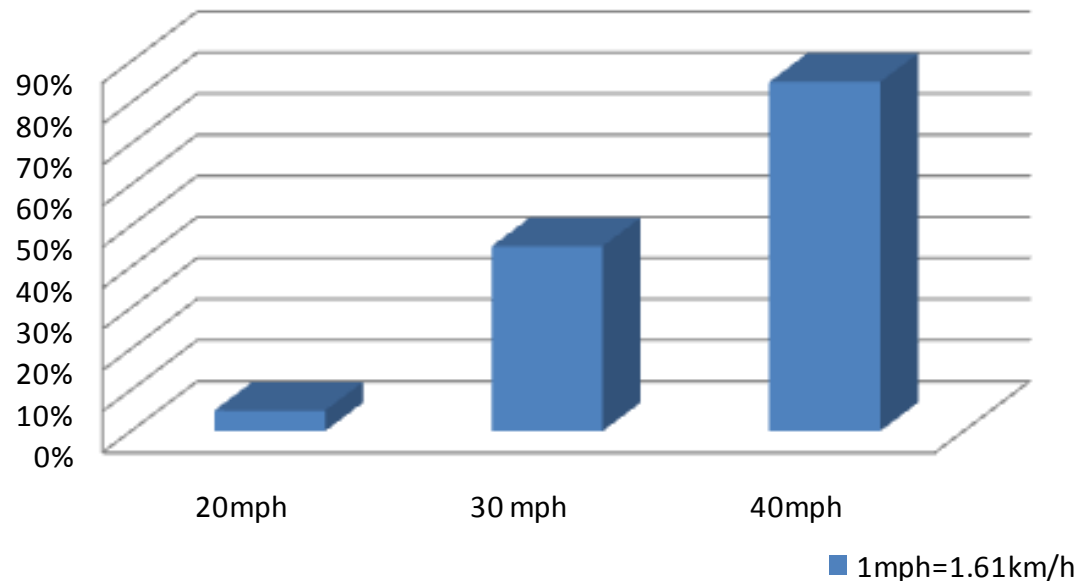● Pedestrian−friendly design

Pedestrian−friendly design

Improvement method for transportation vulnerable

❑ Design for pedestrian safety

🔴 Vehicle speed restriction is important.

❖ Why a driver has to drive with no more than 30km/h speed at the school zone

Fatal accident ratio per speed

A pedestrian's chance of death if hit by a motor vehicle

90%	
80%	
70%	
60%	
50%	
40%	
30%	
20%	
10%	
0%	

20mph   30 mph   40mph

■ 1mph=1.61km/h

Improvement method for transportation vulnerable

Design for pedestrian safety

- Improve school zone

⟨Improve pavement marking⟩

⟨Crash barrier at school zone⟩

⟨Color pavement at school zone⟩

⟨Word legends on the pavement⟩

Improvement method for transportation vulnerable

❑ Design for pedestrian safety

<Neckdown>

<Hump type crosswalk>

Speed reduction facilities

Traffic calming

Improvement method for transportation vulnerable

❑ Design for pedestrian safety

<Pedestrian-friendly sign>

<Conspicuous sign >

<Ensure nighttime visibility>

<Insert the word about fine>

<Install driver feedback sign>

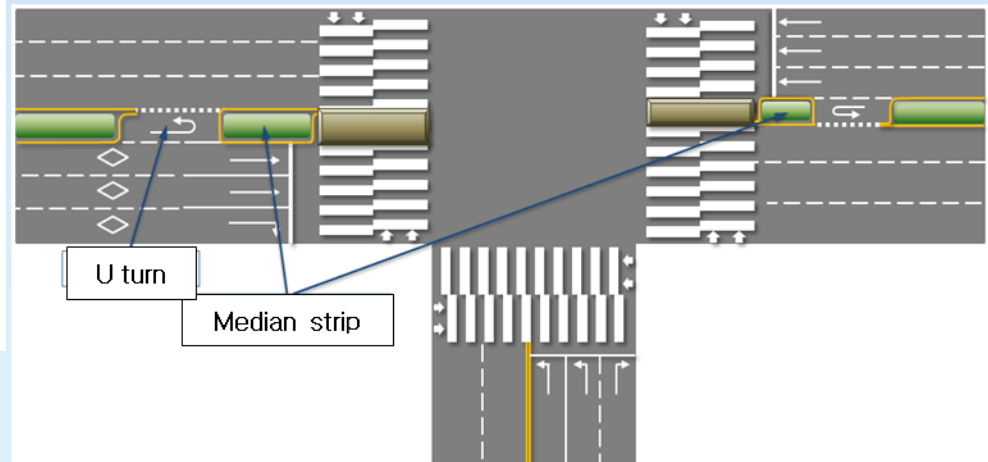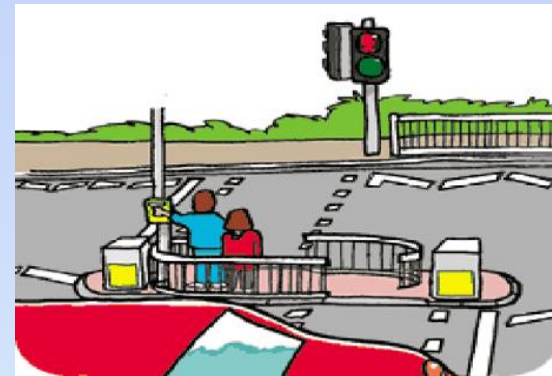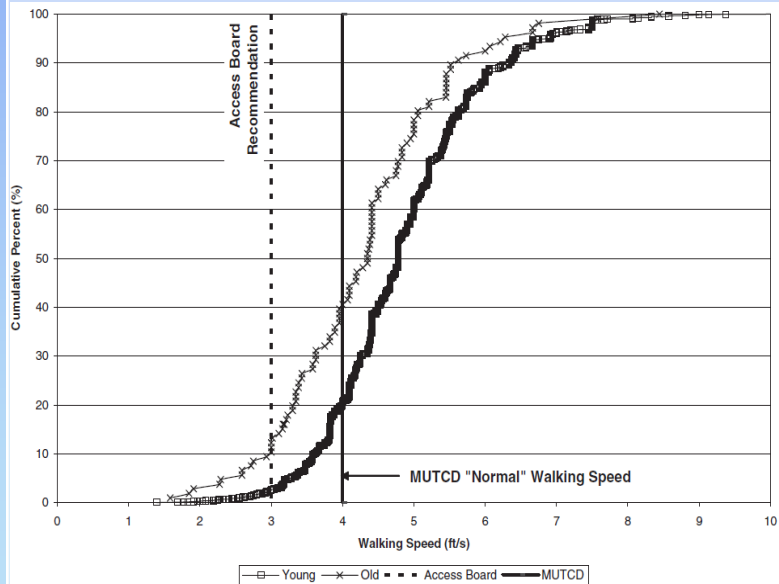## Improvement method for transportation vulnerable

❑ Design for pedestrian safety

- Install lighting facility around crosswalk

  ❖ Install in−pavement flashing markers at accident−prone area, especially at night

  ❖ Install a red blinker ahead of the crosswalk / driver could easily recognize pedestrian crossing

- Remove obstacles at crosswalk

  ❖ Obstacles such as distribution boxes, streetlights, or trees around crosswalk could cause traffic accident because of obstructing of field of vision

- Install refuge island

  ❖ Refuge island with minimum dimension of 1.2−1.8m wide and 2.4−3.6m long

  ❖ Pedestrian accident reduced from 19% to 60% after installing the refuge island in NY city

Improvement method for transportation vulnerable

❑ Design for pedestrian safety

● Adjust crossing time for elderly pedestrian

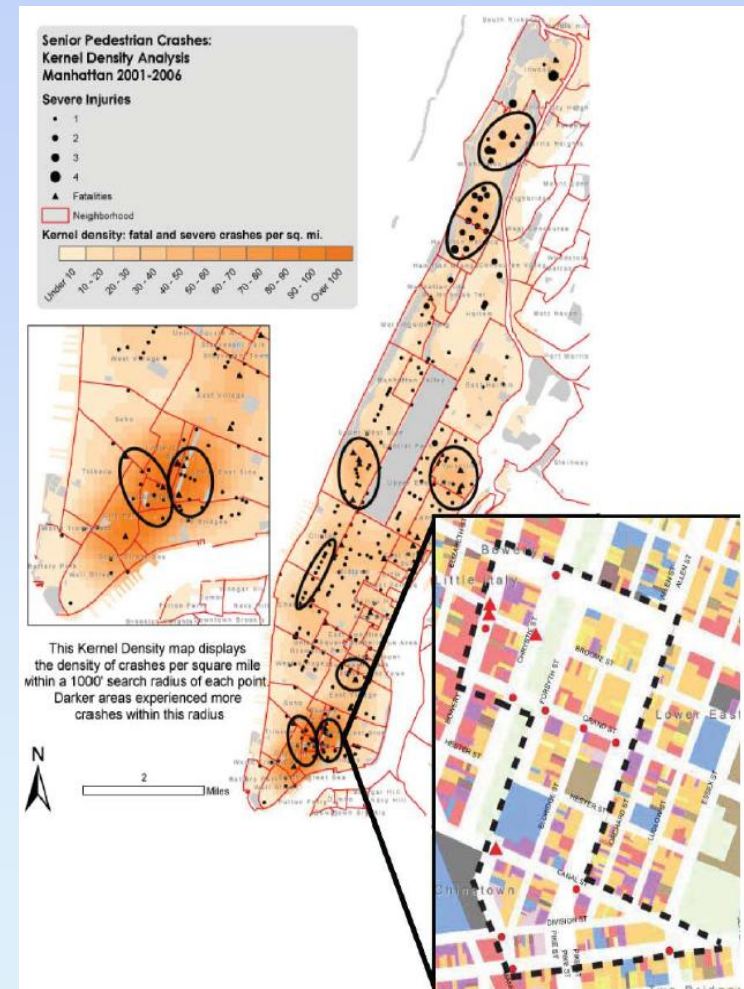❖ Pelican crossing, Staggered Pelican crossing, PUFFIN crossing

● Make refuge island

U turn

Median strip

Improvement method for transportation vulnerable

❑ **Design for pedestrian safety**

Create database

● Create elderly accident database to manage the frequent accident area

Senior Pedestrian Crashes:
Kernel Density Analysis
Manhattan 2001-2006

This Kernel Density map displays the density of crashes per square mile within a 1000' search radius of each point. Darker areas experienced more crashes within this radius

2001~2006 Accident frequency of vehicle vs. pedestrian in Manhattan

Conclusions

- Importance of Pedestrian−oriented transportation policies

- Create a barrier−free environment by improving the pedestrian environments for children and elderly pedestrian

Recommendations

- Sustainable study has to be performed to make barrier−free environment for transportation vulnerable

- Apply Various pedestrian−friendly design through traffic calming techniques

- Have long−term plan for pedestrian safety such as <ins>Safe Routes to Seniors project</ins>

- Make database about frequent accident area to improve pedestrian environment

References

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Thank You !