Transport and Human Health in China

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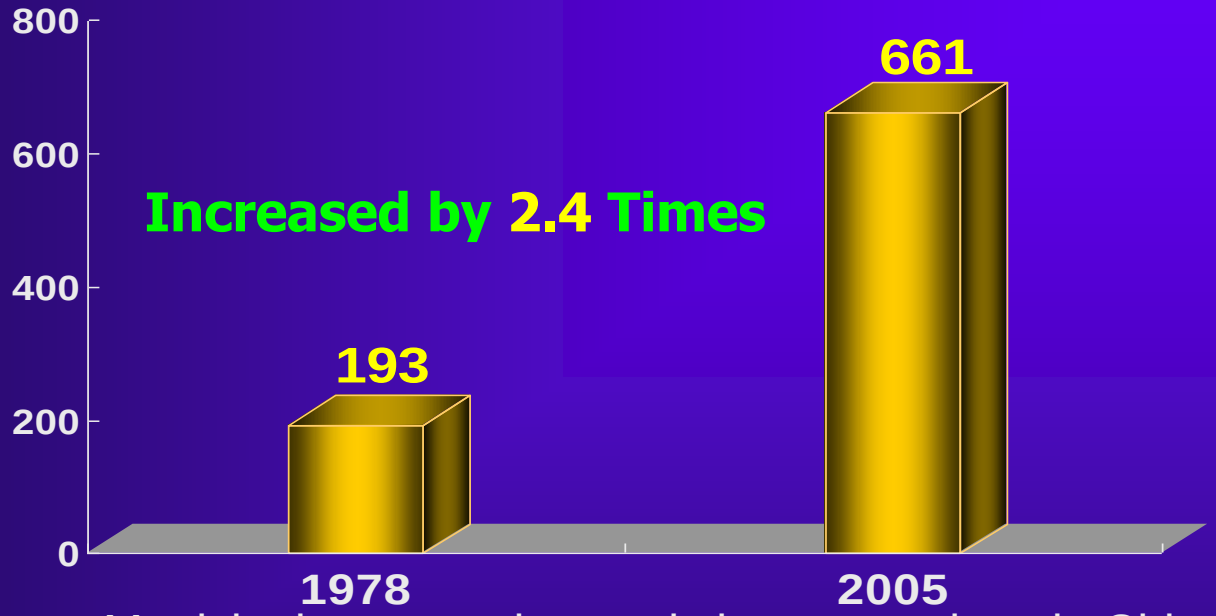
Traffic Challenges
Vehicle Exhaust and Health
Traffic noise and health
Road Traffic Accidents and Injuries
Laws and regulations
Recommended Actions

Ⅰ. Challenges of Transportation Sector

1. Rapid Urbanization in China

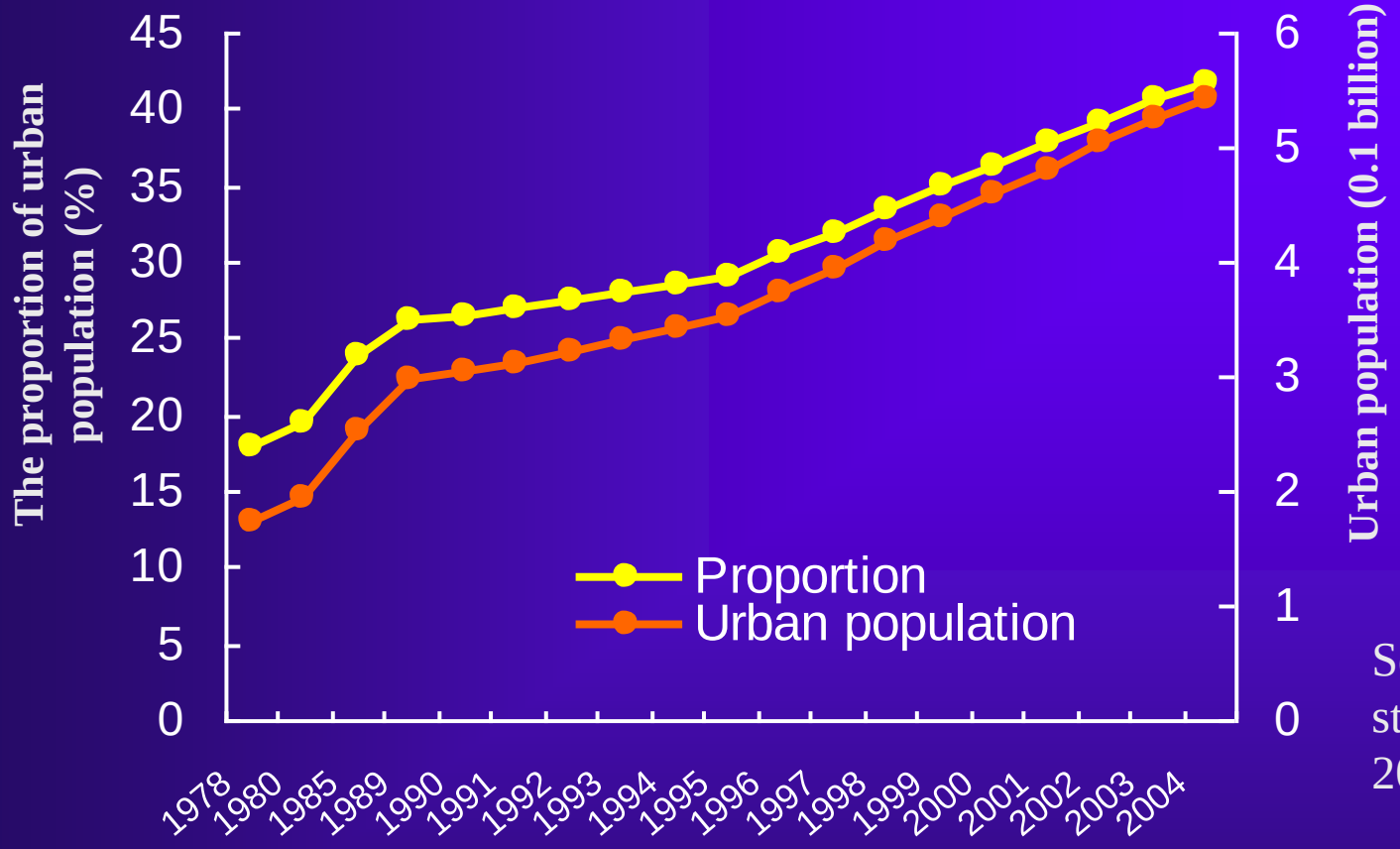
Fig.1 Number of cities in China



(Source：Municipal construction statistic communique in China，2005)

❖ **With the development of economy, urbanization in China is developing rapidly. The total number of cities had risen from 193 in 1978 to 661 in 2005, increased by 2.4 times.**

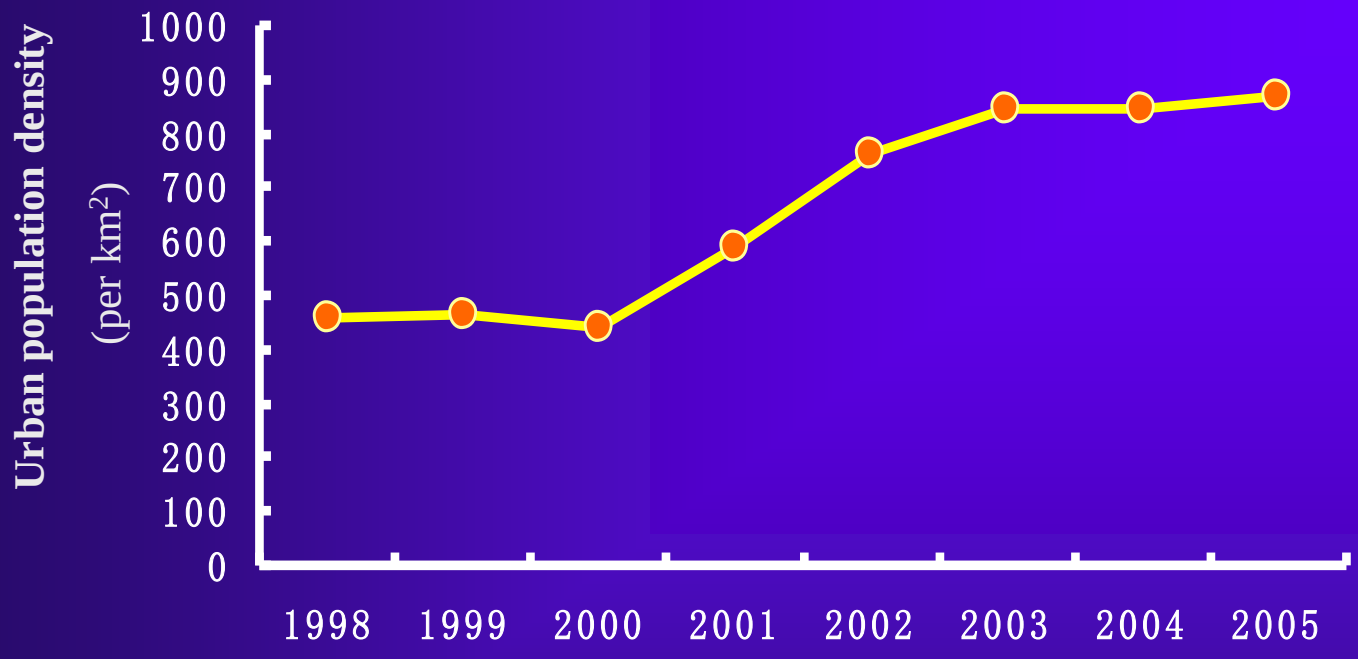
Fig.2 Increasing trend of urban population



Source：China statistic annals, 2005

❖ **Urban population had increased from 172 million in 1978 to 543 million in 2004, which accounted for 41.8% of total population. It's estimated that by 2010, the proportion of urban population will increase to 46%.**

Fig.3 Urban population density in China

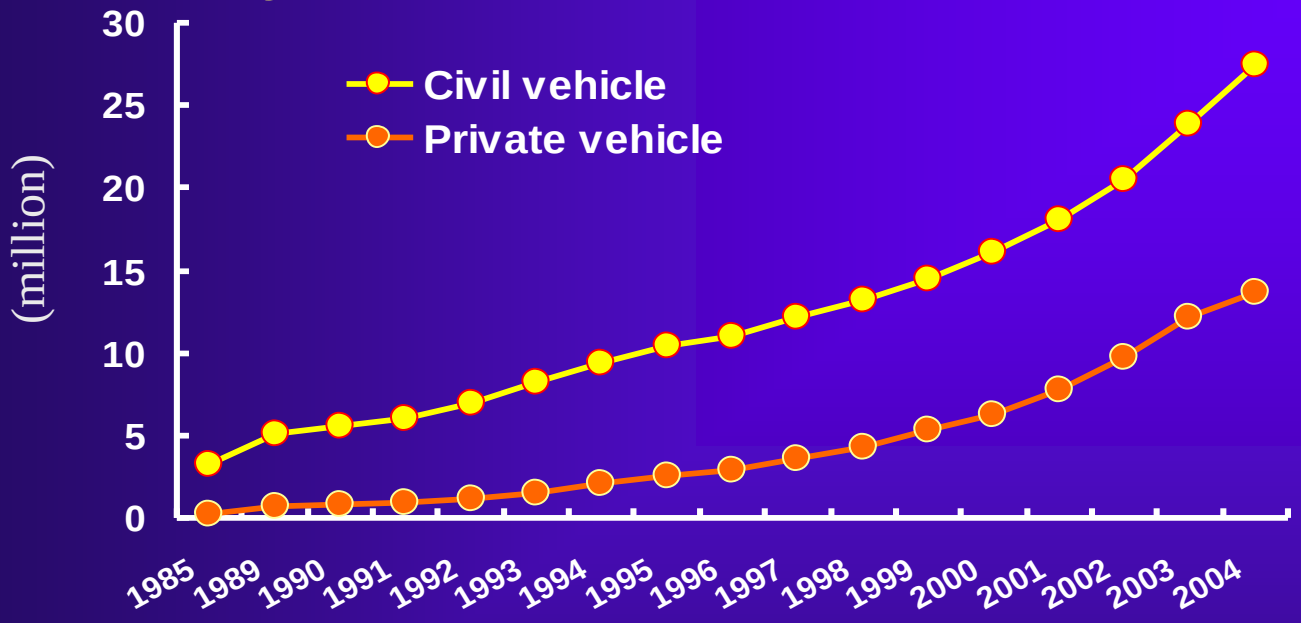


(Source: Municipal construction statistic communique in China, 2005)

As a whole, the urban population density in China shows an increasing trend. In 1998, it was 459/km², and it reached 870 /km² by 2005, increased 89.5% in 6 years.

2. Rapid Increasing of Vehicles

Fig.4 The increase of vehicles in China



(Source：China statistic annals, Municipal construction statistic communique in China，2005)

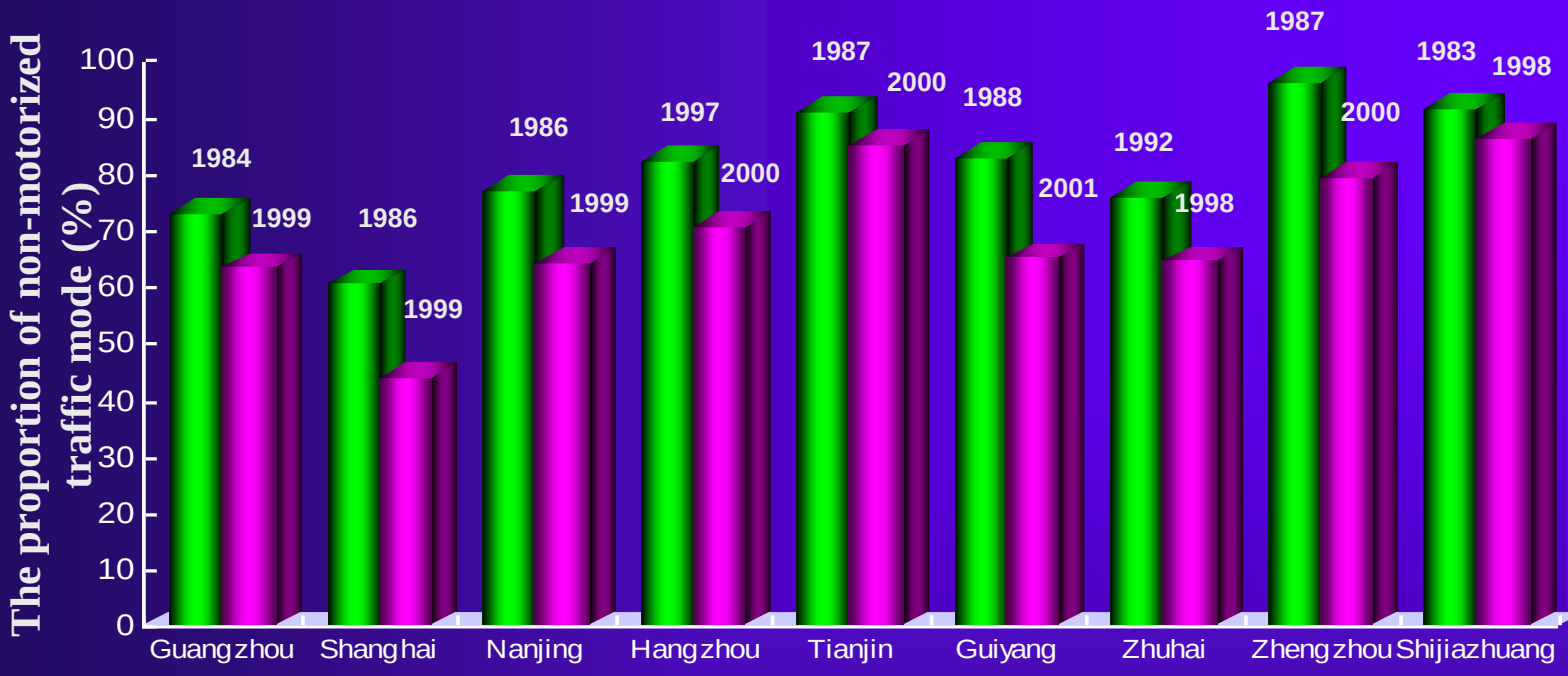
From 1985 to 2004, the numbers of civil and private vehicles increased respectively 8.5 and 47.9 times.

Fig. 5 The average traffic flux in 31 provincial capital cities (1991-2000)

(Source：China statistic annals, 2001)

- **In China, the traffic fluxes of Beijing, Guangzhou and Nanjing were over 3,000 vehicles per hour, the largest average traffic flux in China was in Beijing with 5,822 vehicles per hour.**

Fig. 6 The change of non-motorized traffic mode in some cities

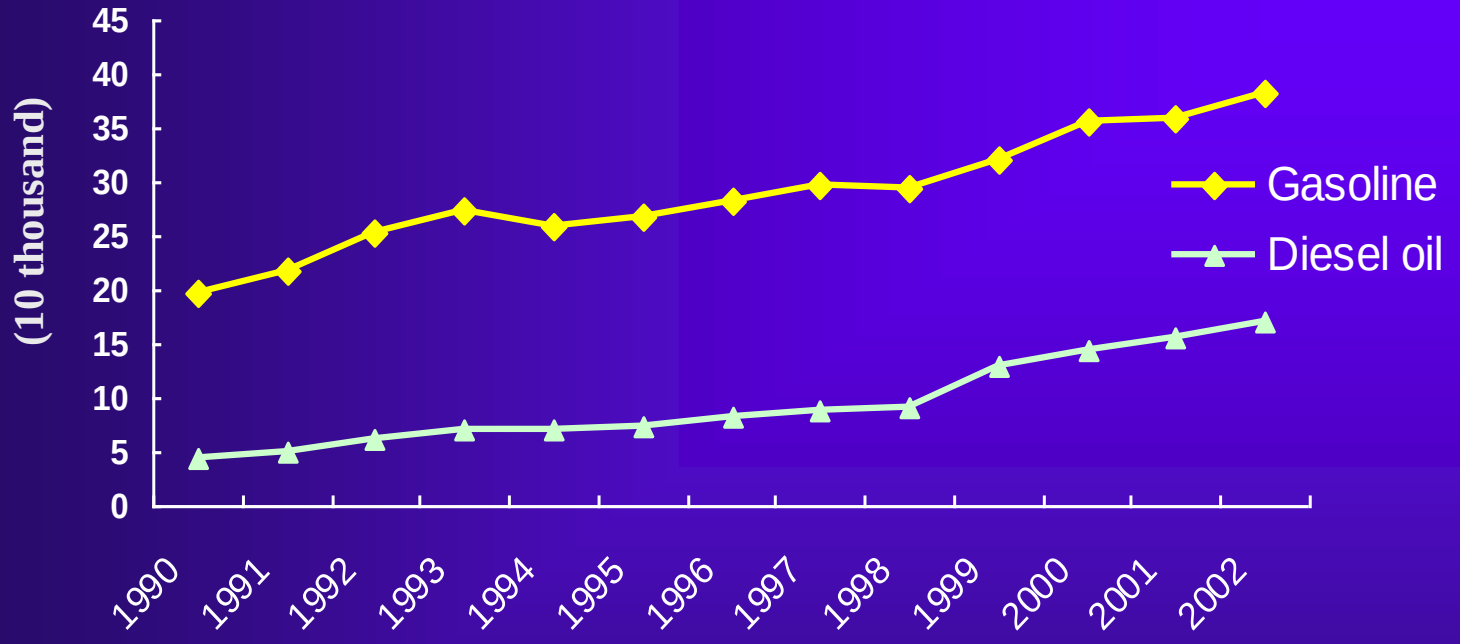


(Source: TIAN Feng. A study of development modes of passenger transport structure in Chinese big cities)

❖ **The proportion of cycling and walking in most big cities has decreased in recent years and will decrease in next 10 years. Therefore, the increase of traffic motorization will have larger expanding room, which would lead to a more serious traffic air pollution.**

3. Increasing of Traffic Energy Consumption

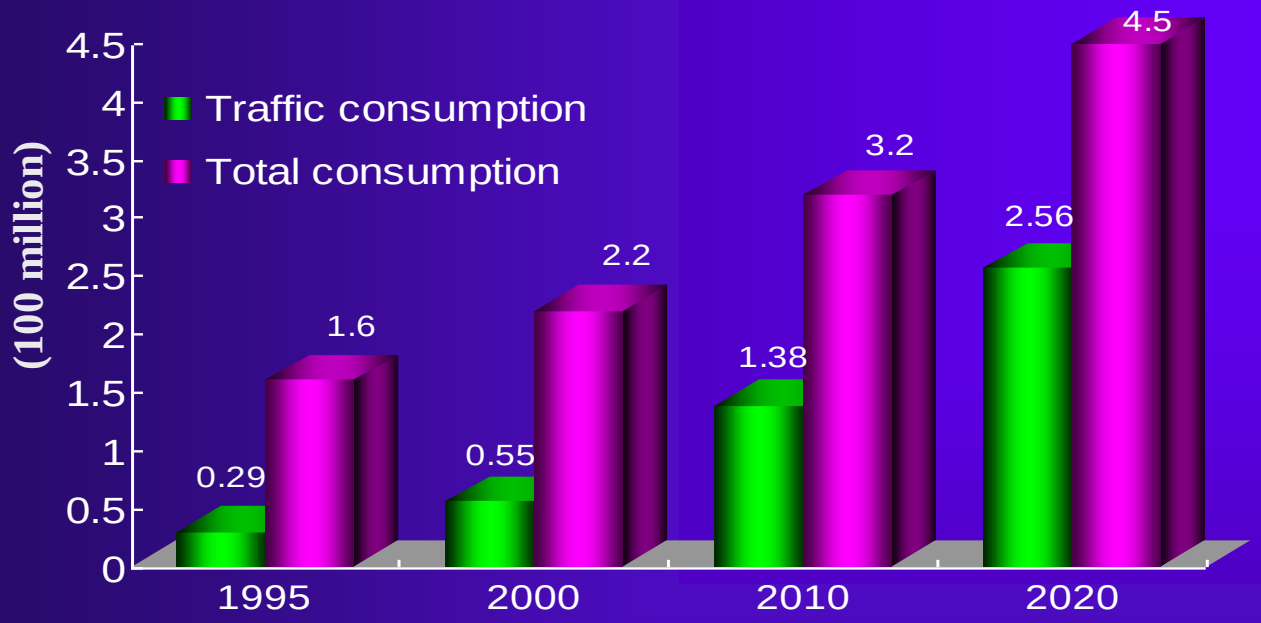
Fig.7 The consumption of gasoline and diesel oil



(Source: National automobile cleaning action)

❖ **From 1990 to 2002, the consumption of gasoline and diesel oil showed an increasing trend. Comparing with 1990, the consumption of gasoline and diesel oil had increased by 92% and 278% respectively.**

Fig.8 The consumption of petroleum on transport



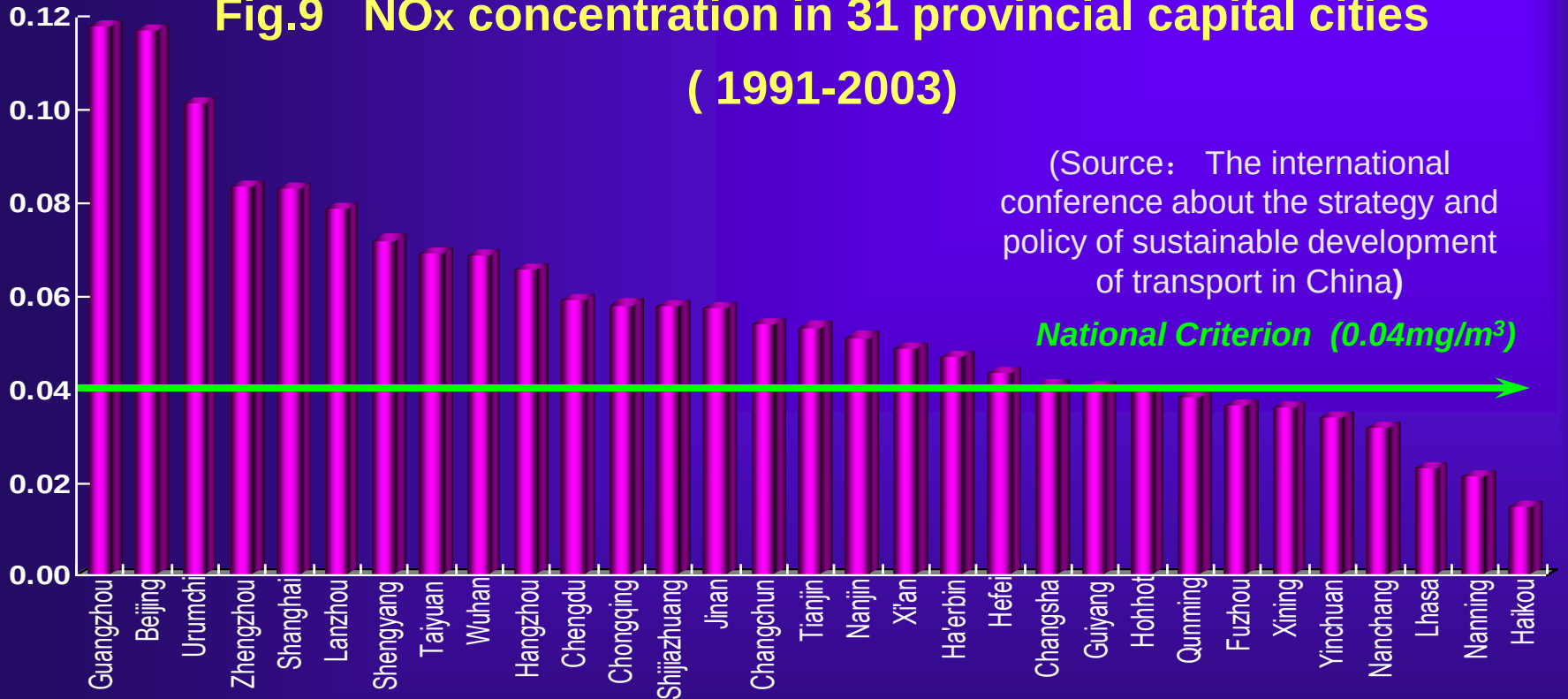
(Source: The international cooperative committee of environment and development in China)

❖ **China is the 2nd largest oil consumption country in the world now. In 2004, the total consumption of petroleum was 310 million tons, 1/3 of them was consumed on traffic, it is estimated that the proportion will reach 43% by 2010 and will be over 50% by 2020.**

Ⅱ. Vehicle Exhaust and Health

1. Status of Traffic Pollution

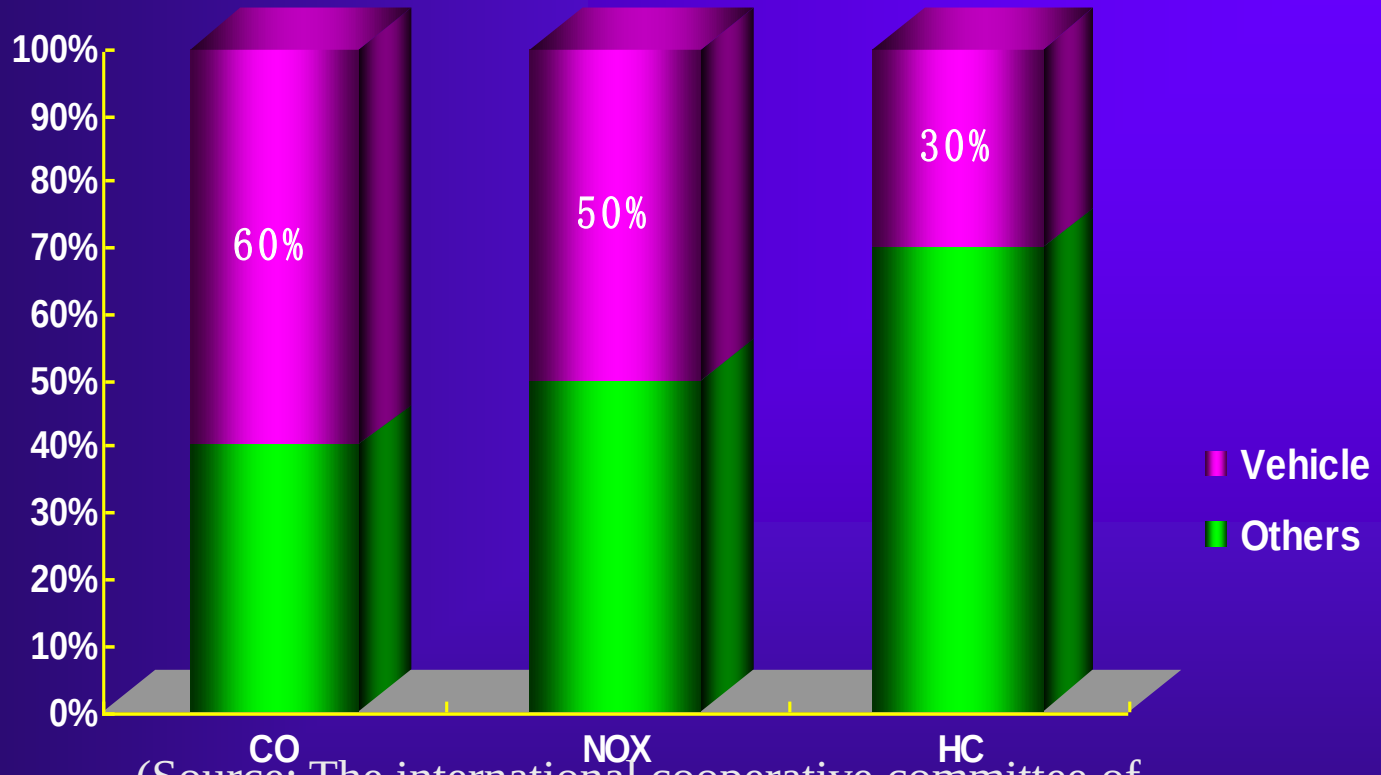
Fig.9 NOx concentration in 31 provincial capital cities (1991-2003)



(Source： The international conference about the strategy and policy of sustainable development of transport in China)

❖ **NOx is a representative of exhaust pollutants in regular monitoring, NOx concentration in 71% of the 31 provincial capital cities of China exceeded the National Criterion (0.04 mg/m3) .**

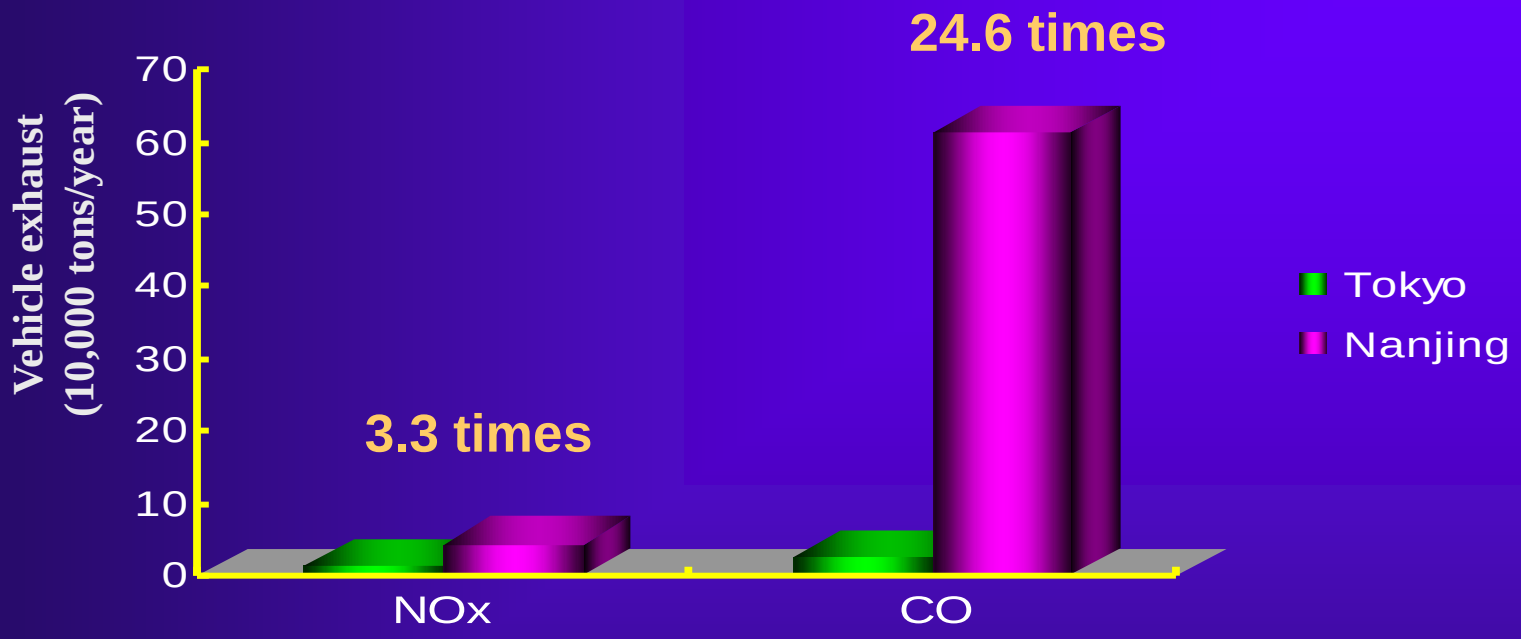
Fig.10 The proportion of the CO, NOx and HC from vehicle exhaust



(Source: The international cooperative committee of environment and development in China)

❖ **A study showed that the contribution rate of CO,NO_X and HC from vehicle exhaust to air pollution was respectively 60%, 50% and 30%.**

Fig.11 A comparison of pollutants emission between Nanjing and Tokyo



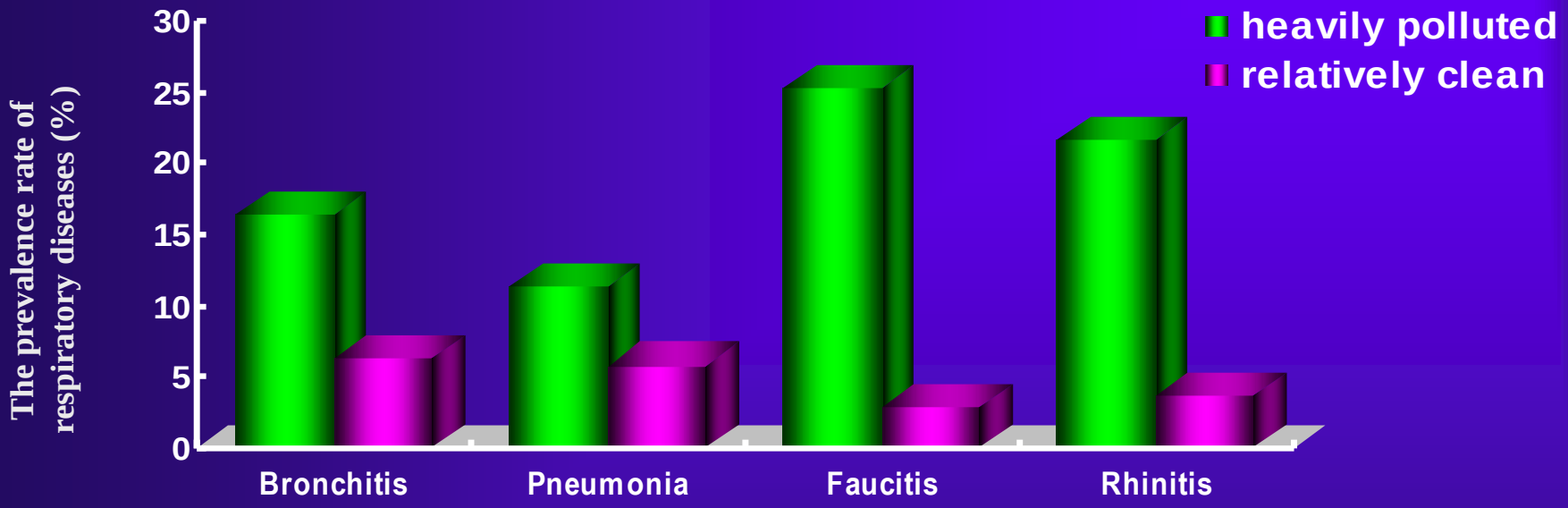
(Source: The international conference about the strategy and policy of sustainable development of transport in China)

❖ **The comparison showed that CO and NOx emission per million vehicles in Nanjing of China were respectively 3.3 and 24.6 times as those in Tokyo of Japan.**

2. Health Impacts of Traffic-related Air Pollution

Some Chinese studies showed that the prevalence rates of respiratory diseases of policemen, neural system symptoms of drivers and conductors and immune function of children were affected in some degree by vehicle exhaust pollution. Here gives some examples.

Fig.12 A comparison of prevalence rate of respiratory diseases of traffic policemen in heavy and light polluted cities



Heavily polluted city: TSP 0.419, NOX 0.078 (mg/m³)
Relatively clean city: TSP 0.223, NOX 0.062 (mg/m³)

The prevalence rates of bronchitis, pneumonia, faucitis and rhinitis of traffic policemen in heavily polluted city were significantly higher than in relatively clean city ($p<0.05$).

The effect of vehicle exhaust on immune indexes of children

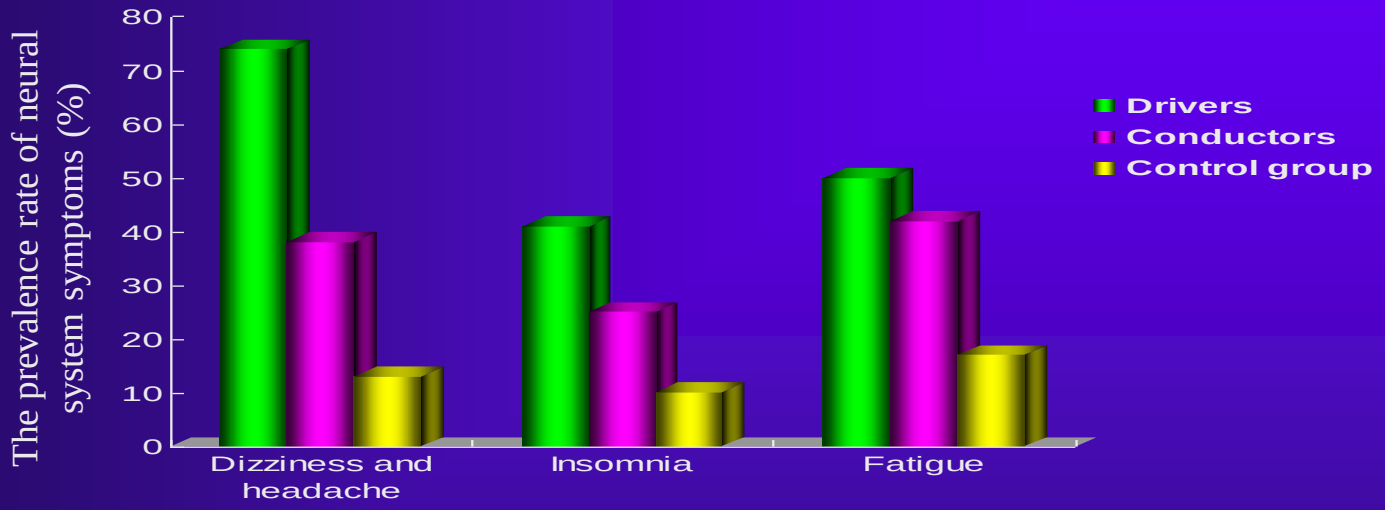
Group	n	Serum IgG * (g/L)	Serum IgM (g/L)	Serum lysozyme * * (mg/L)
Far away from the highway	186	8.64±1.44	1.09±0.32	115.9±46.8
Less than 50m from the highway	174	7.88±1.48	1.01±0.46	76.8±39.0

* * P<0.01, * p<0.05

The immune function of pupils whose schools were less than 50m from the highway was lower than that of pupils whose schools were far away from the highway, especially for the index of Serum lysozyme.

The effect of vehicle exhaust on neural system of drivers and conductors

Fig.13 A comparison of prevalence rate of neural system symptoms of drivers /conductors and control group



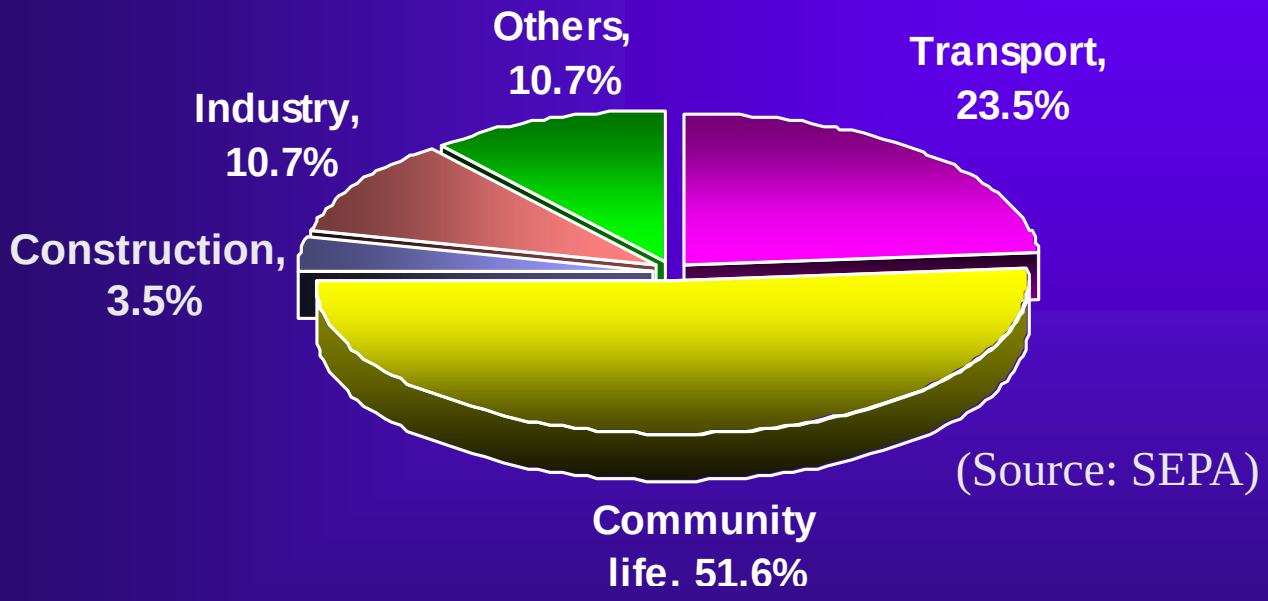
(Source: TONG Ning, The investigation of nervous behavior and function (NBF) on drivers and conductors from bus company in Hefei)

The prevalence rates of neural system symptoms of drivers and conductors were significantly higher than those of the control group ($p<0.05$).

Ⅲ. Traffic Noise and Human Health

1. The status of Traffic Noise

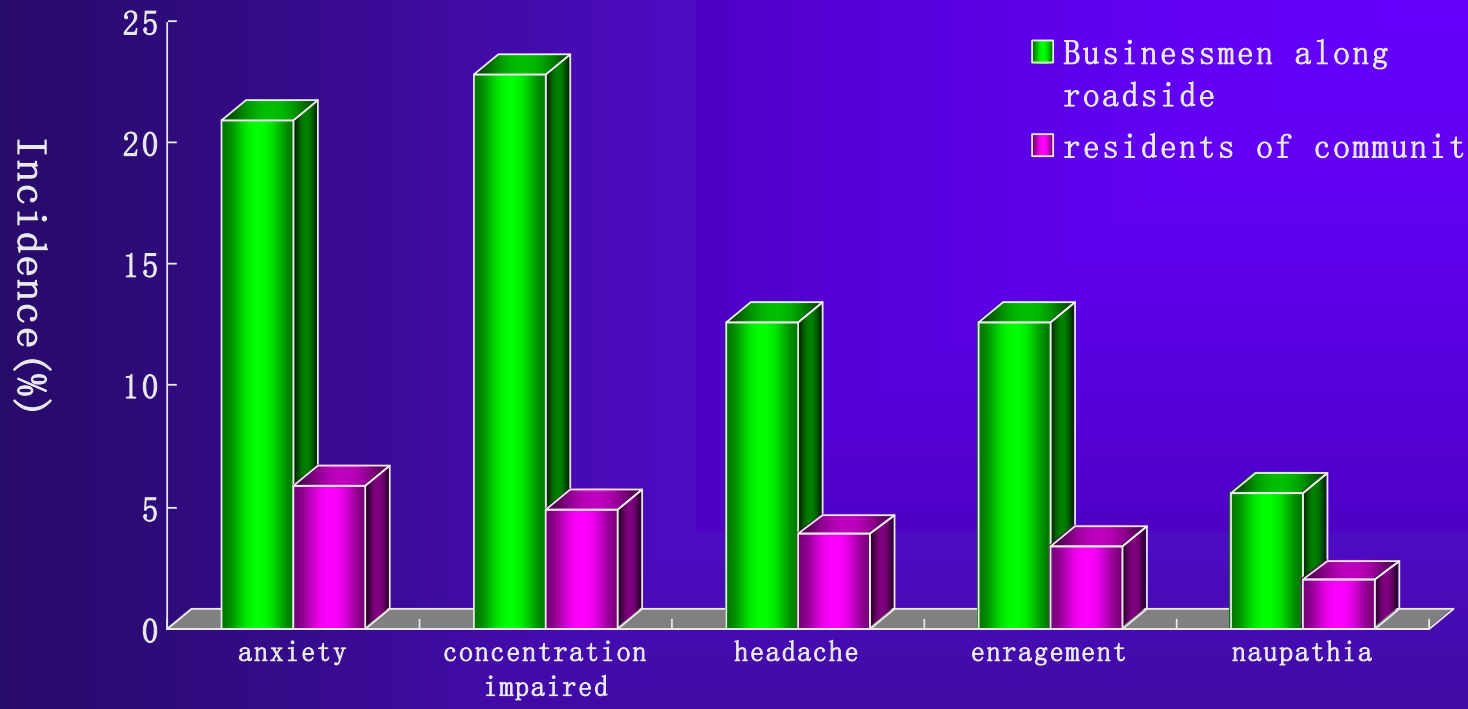
Fig.14 The percentage of urban noise sources in China, 2003



(Source: SEPA)

In China, traffic noise accounted for 23.5% of the urban noise sources in 2003, which ranked as the 2nd leading source of urban noise.

Fig. 15 Incidence of symptom due to road traffic noise in Nanjing

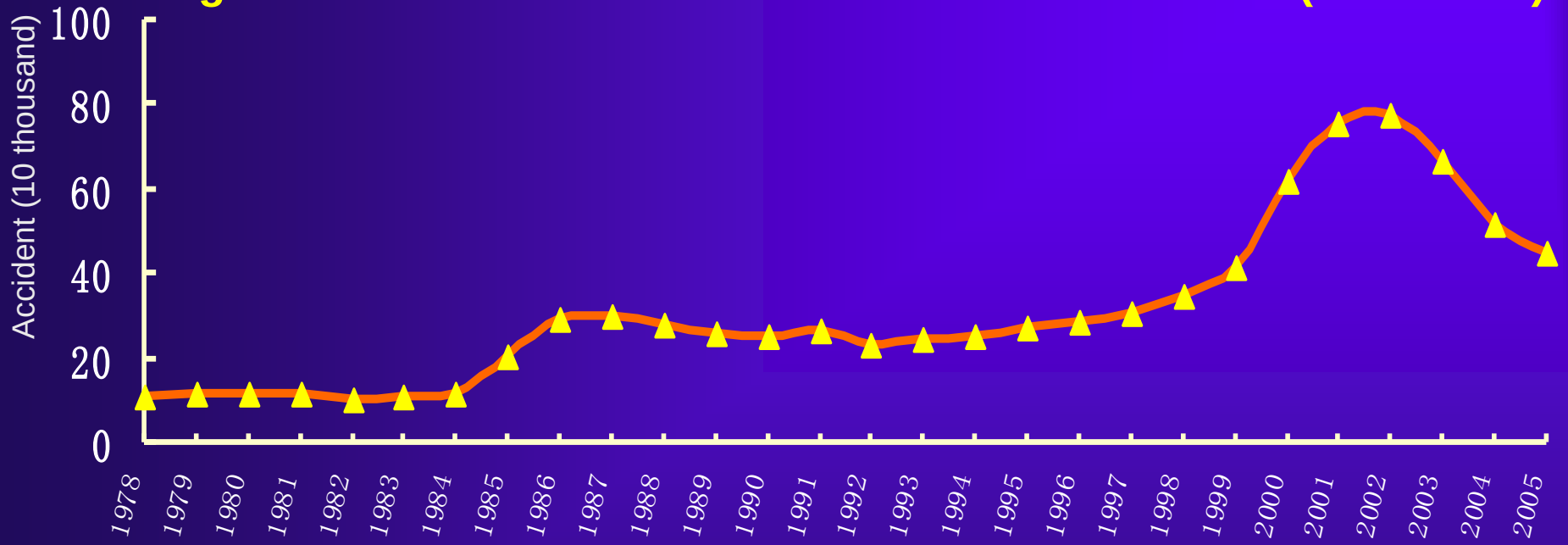


A study in Nanjing supported by WHO in this year showed that the incidences of anxiety, headache, concentration impaired, enragement of the businessmen along roadside were significantly higher than the residents who lived in a community 500m away from the main road in Nanjing.

Ⅳ. Road Traffic Accidents and Injuries

1. The trend of road traffic accidents and injuries in China

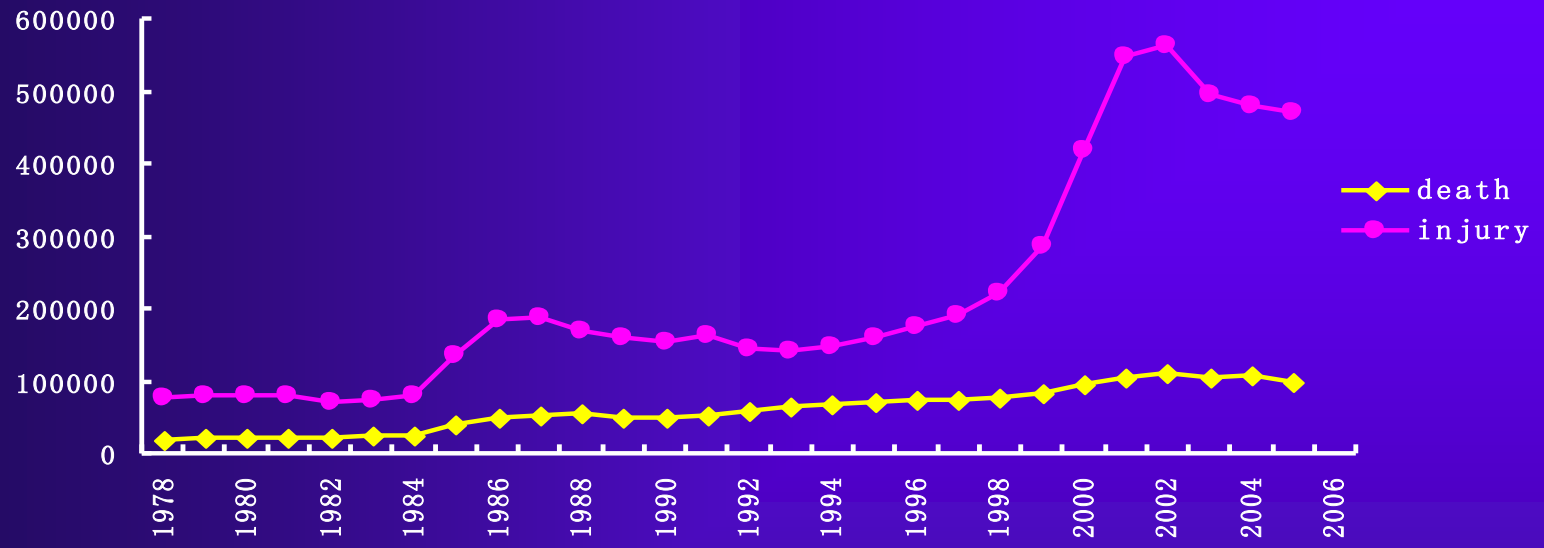
Fig.16 The number of road traffic accidents in China (1978-2005)



(Source: Ministry of Public Security administration of transportation "annual statistic report of road traffic accidents, 2005")

The total number of road traffic accidents presented a fluctuant increasing trend and had risen from 107,000 in 1978 to 450,000 in 2005, which increased 321%.

Fig.17 Casualties caused by road traffic accidents (1978-2005)



(Source: Ministry of Public Security administration of transportation "annual statistic report of road traffic accidents, 2005")

Since 1978, the number of victims of road traffic accidents showed a fluctuant increasing trend: The number of deaths increased from about 20,000 in 1978 to about 100,000 in 2005, increased 461%; and the number of injuries increased from about 80,000 to nearly 500,000, increased 488%.

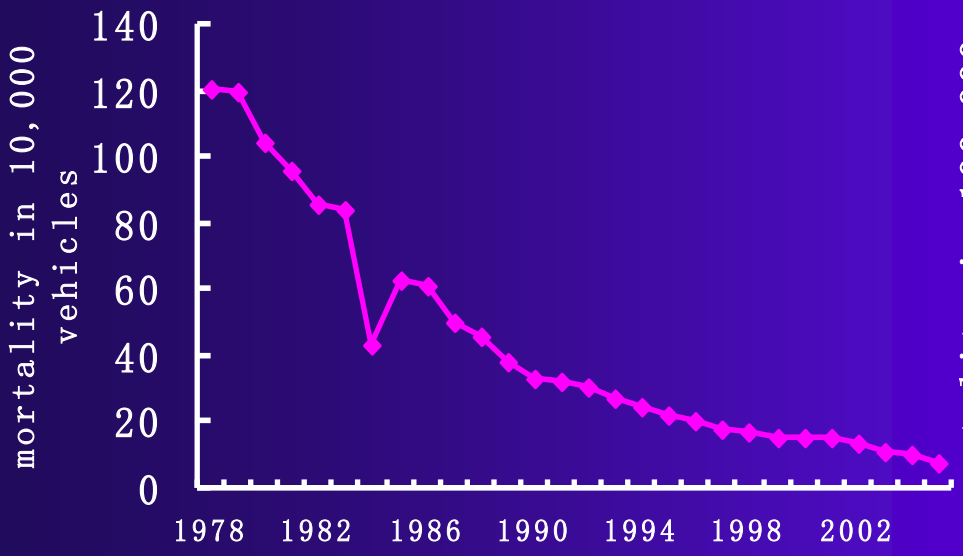


Fig.18 Mortality in 10,000 vehicles (1978-2005)

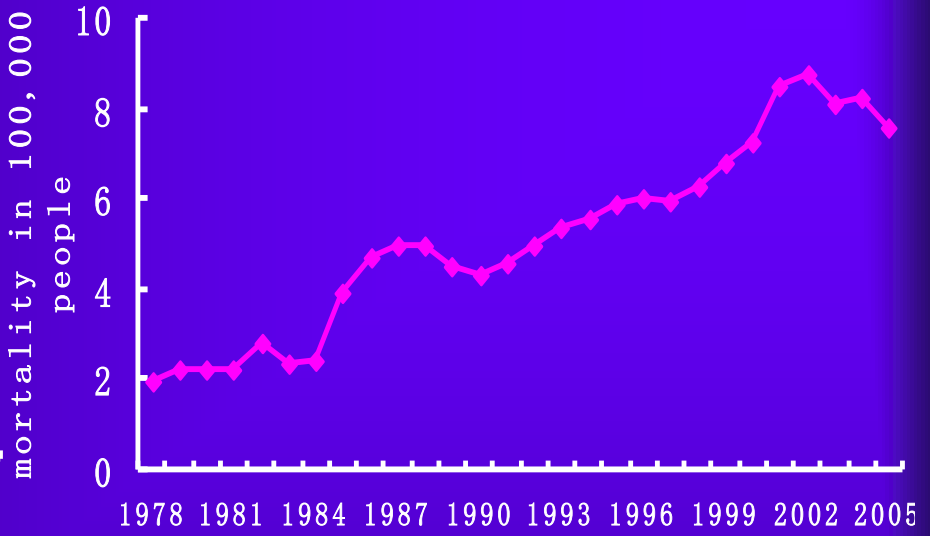
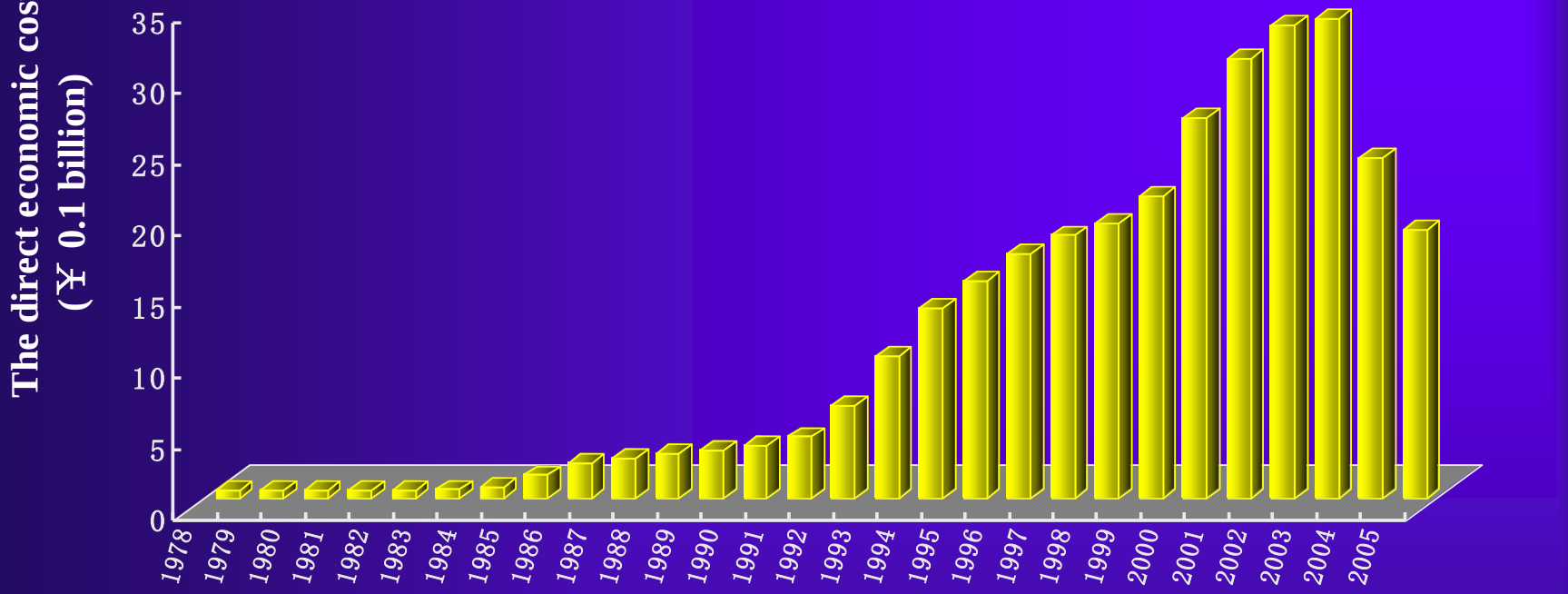


Fig.19 Mortality of 100,000 People (1978-2005)

According to the data of Ministry of Public Security, it showed a decreasing trend of the mortality of 10,000 vehicles from 1978 to 2005, the rate had decreased 97.3%. Meantime，the mortality of 100,000 people showed a fluctuant increasing trend which had increased 284%.

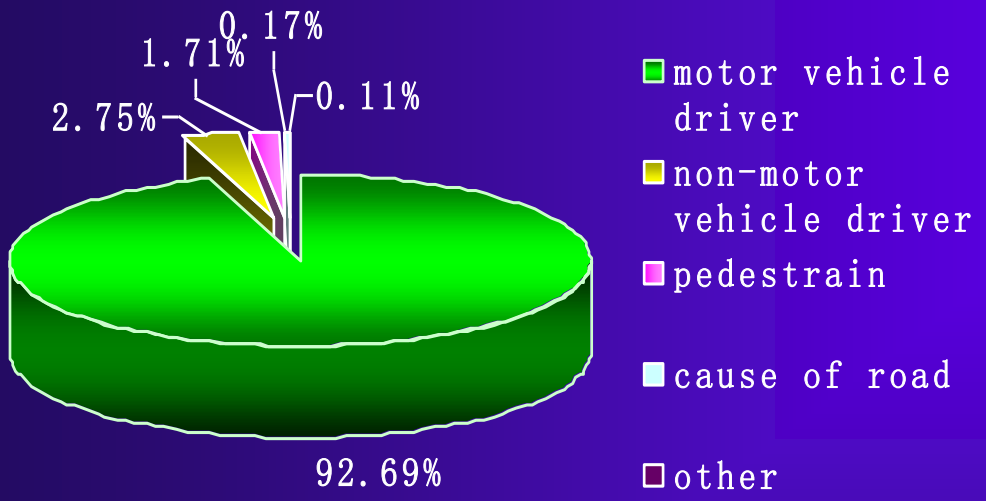
Fig.20 Direct economic losses caused by road traffic accidents (1978-2005)



(Source: Ministry of Public Security administration of transportation "annual statistic report of road traffic accidents, 2005")

According to the data of Ministry of Public Security, the economic losses of road traffic accidents showed an increasing trend in China. The direct economic losses was about ￥ 50 million in 1978 and about ￥ 2 billion in 2005, the average rate of increase was 20% per year.

2 . Cause-analysis of Road Traffic Accidents

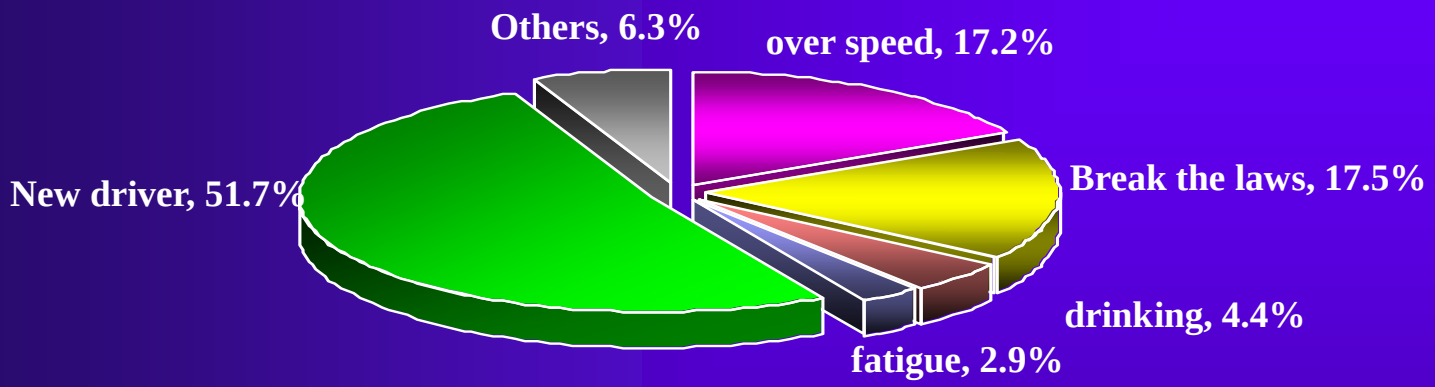


(Source: Ministry of Public Security administration of transportation “annual statistic report of road traffic accidents, 2005”)

Fig.21 Cause of the road traffic accidents

According to the data of Chinese Ministry of Public Security in 2005, man-made factors accounted for 97.3% of the total accidents. In the accidents, 92.69% caused by vehicle drivers, 2.75% by non-vehicle drivers and 1.71% by the pedestrians.

Fig.22 The proportion of deaths from different behavioral factors in 2005



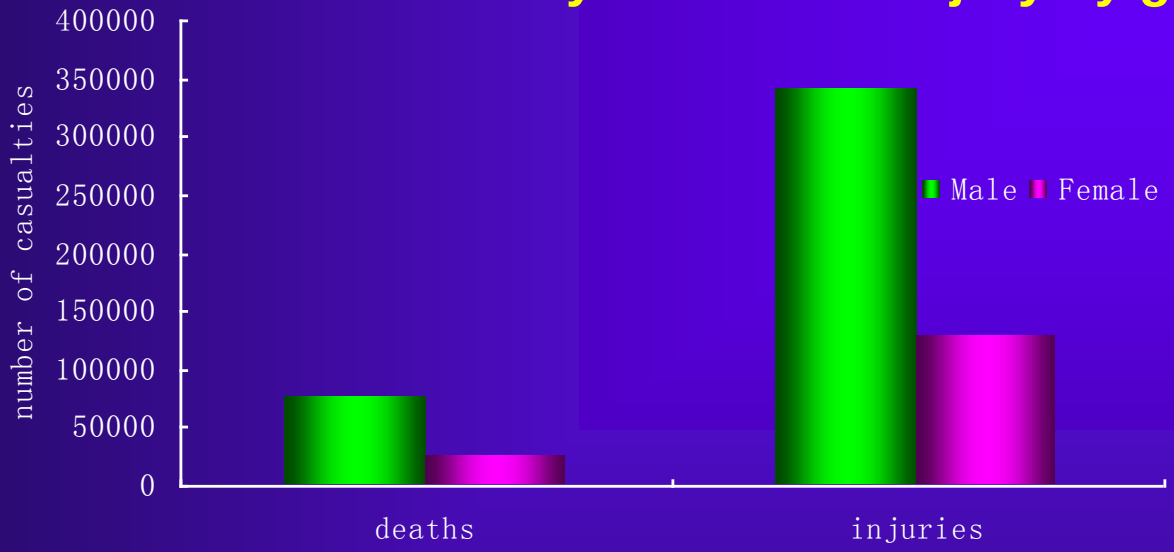
(Source: Ministry of Public Security administration of transportation "annual statistic report of road traffic accidents, 2005")

New drivers accounted for 51.7% of the total deaths caused by traffic accidents, which was the highest proportion. Break the laws accounted for 17.5%, over speed, 17.2%, drinking and fatigue, 4.4% and 2.9% respectively.

3. High Risk Population

Gender and road traffic injuries

Fig.23 The casualties caused by road traffic injury by gender in 2005

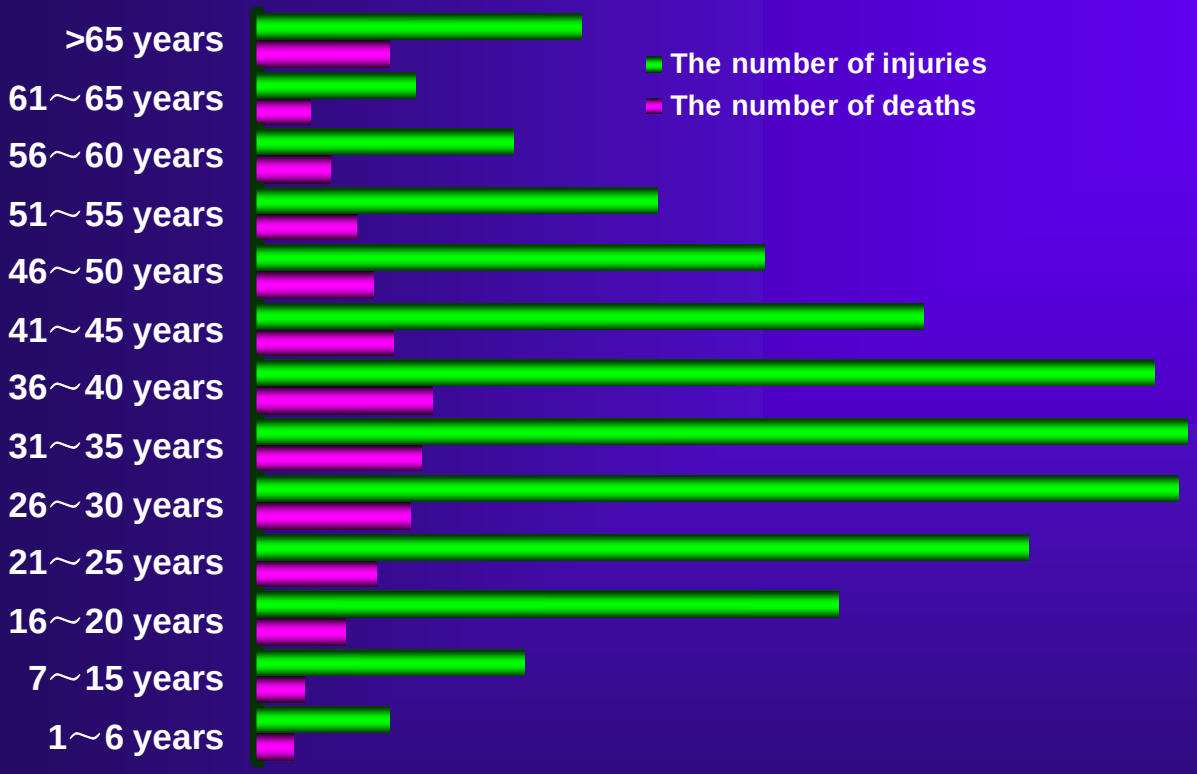


(Source: Ministry of Public Security administration of transportation "annual statistic report of road traffic accidents, 2004")

Statistical data showed a gender difference in road traffic injuries, males occupied the majority of casualties. In 2004, the number of deaths of male was 75,140 and female was 23,598, the ratio of the male and female was 3.2：1; the number of injuries of male was 340,722 and female was 129,189, the ratio was 2.6: 1.

Age and road traffic injuries

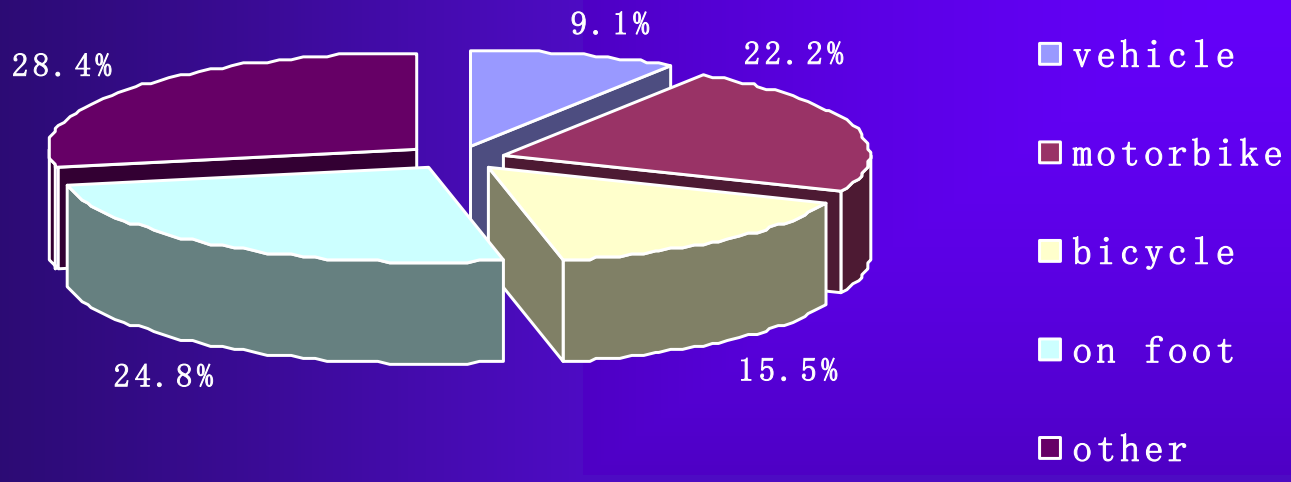
Fig.24 The casualties by age group, 2005



(Source: Ministry of Public Security administration of transportation "annual statistic report of road traffic accidents, 2005")

According to the statistic of the Ministry of Public Security ,In 2005, 61.6% of deaths and 68.7% of injuries due to road traffic accidents occurred in age group of between 21 and 50.

Fig.25 accident death due to different travel modes



(Source: Ministry of Public Security administration of transportation "annual statistic report of road traffic accidents, 2005")

According to the data of Ministry of Public Security in 2005,of the different travel modes, the pedestrians, the motorbike riders , the bicycle riders were at high risk , which respectively occupied 24.8%、22.2% and 15.5% of the total death in traffic accidents.

Ⅴ. Main transport-related laws and Regulations

(7) Laws	Issue date
Environmental Protection Law of the People's Republic of China	1989
City Planning Law of the People's Republic of China	1989
Law of the People's Republic of China on Prevention and Control of Pollution From Environmental Noise	1996
Production Safety Law of the People's Republic of China	2002
Law of the People's Republic of China on Environmental Impact Assessment	2002
Law of The People's Republic of China on Road Traffic Safety	2003
Highway law of the People's Republic of China	2004

(5)

Regulations	Issue date
Regulations on Domestic Communications Health Quarantine	1998
Regulations on the Administration of Construction Project Environmental Protection	1998
Regulation on the Implementation of the Law of the People's Republic of China on Road Traffic Safety	2004
Regulation of the People's Republic of China on Road Transport	2004
Measures for the Administration of Urban Buses and Trolley	2005

Ⅵ. Recommended Actions

1. Enact and perfect relative regulations and laws to control vehicle exhaust and noise pollution.

2. Enhance supervision and control on traffic pollution, establish forecast and alarm system and assessment system of traffic pollution.

3. Establish evaluation system of health impacts and traffic pollution.

4. Establish the emergency responses system of traffic casualties.


Thank you