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# **Urbanisation, Vulnerability and Sustainability in Asian Cities: A Transport Perspective**

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# Presentation



## Background: UN Habitat Reports

(2009) Planning sustainable cities

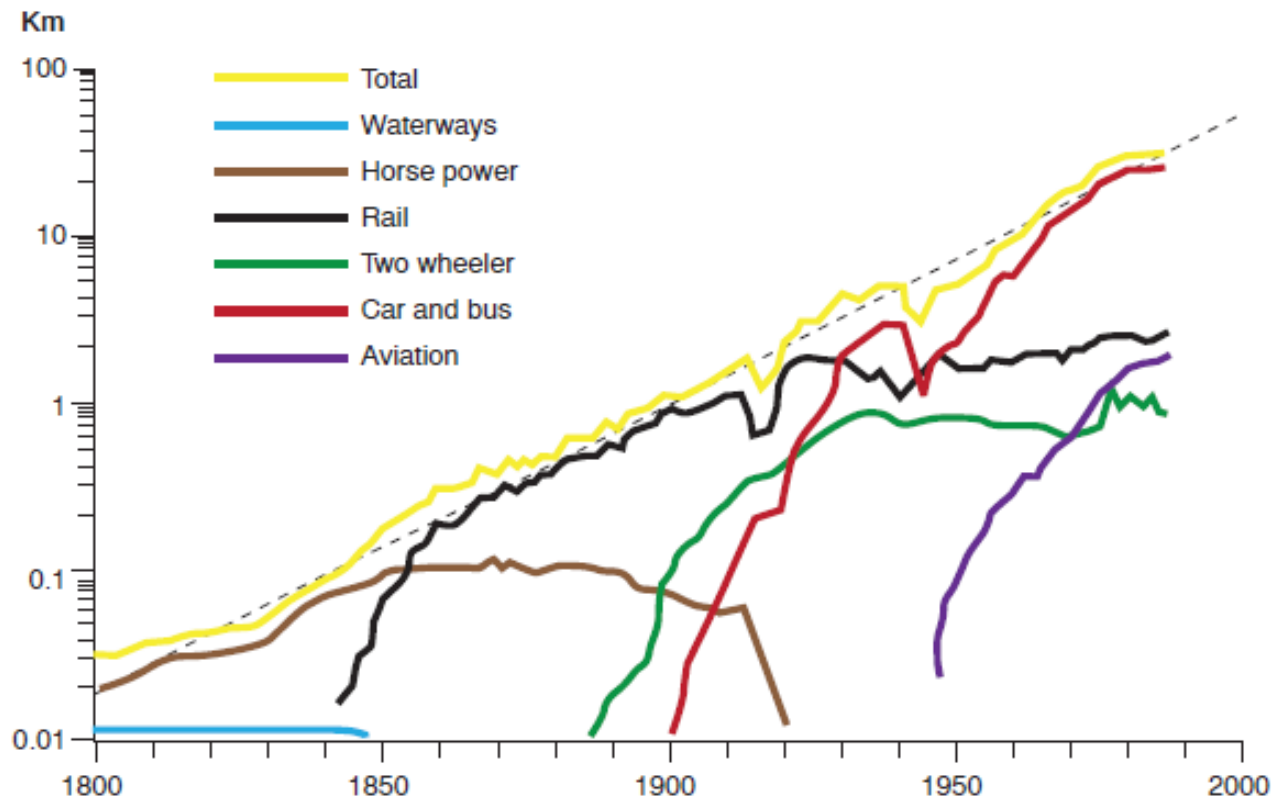
(2011) Cities and climate change

(2013) Sustainable urban mobility

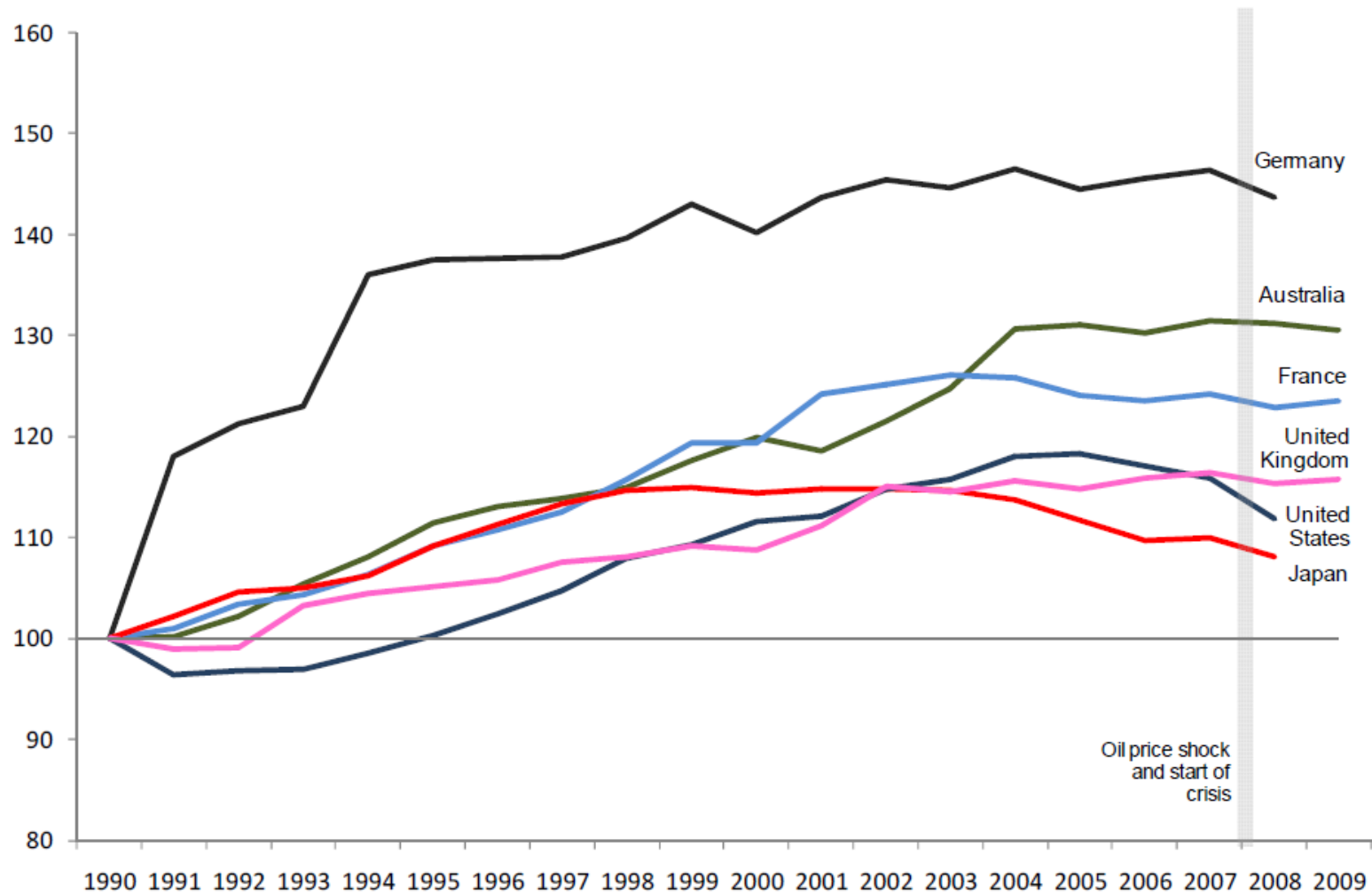
1. Growth in travel distances – more energy use and carbon emissions – taking examples from the developed countries
2. Choices and pathways – inevitability and innovation
3. Comparison of growth and development – the rate and scale of change
4. Urban development patterns in China
5. Vulnerabilities and sustainability
6. Comments and conclusions

# 1. Growth in travel distances – the experience from the developed countries

Distance travelled in France during the last two centuries  
(Km/person/day –excluding walking and cycling)

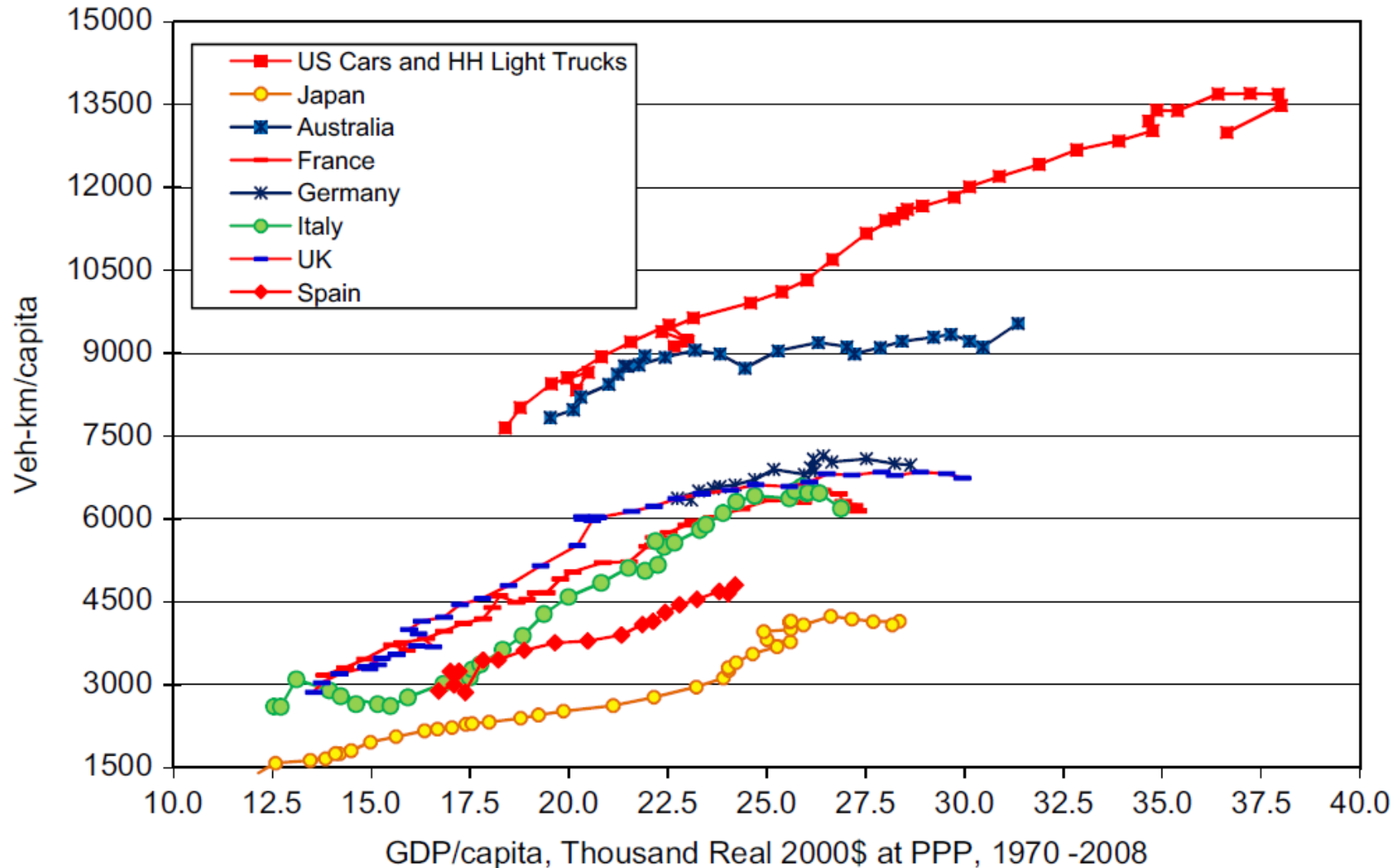


# Passenger – kilometres by private cars and light trucks in the developed countries: 1970-2009 Indexed to 1990



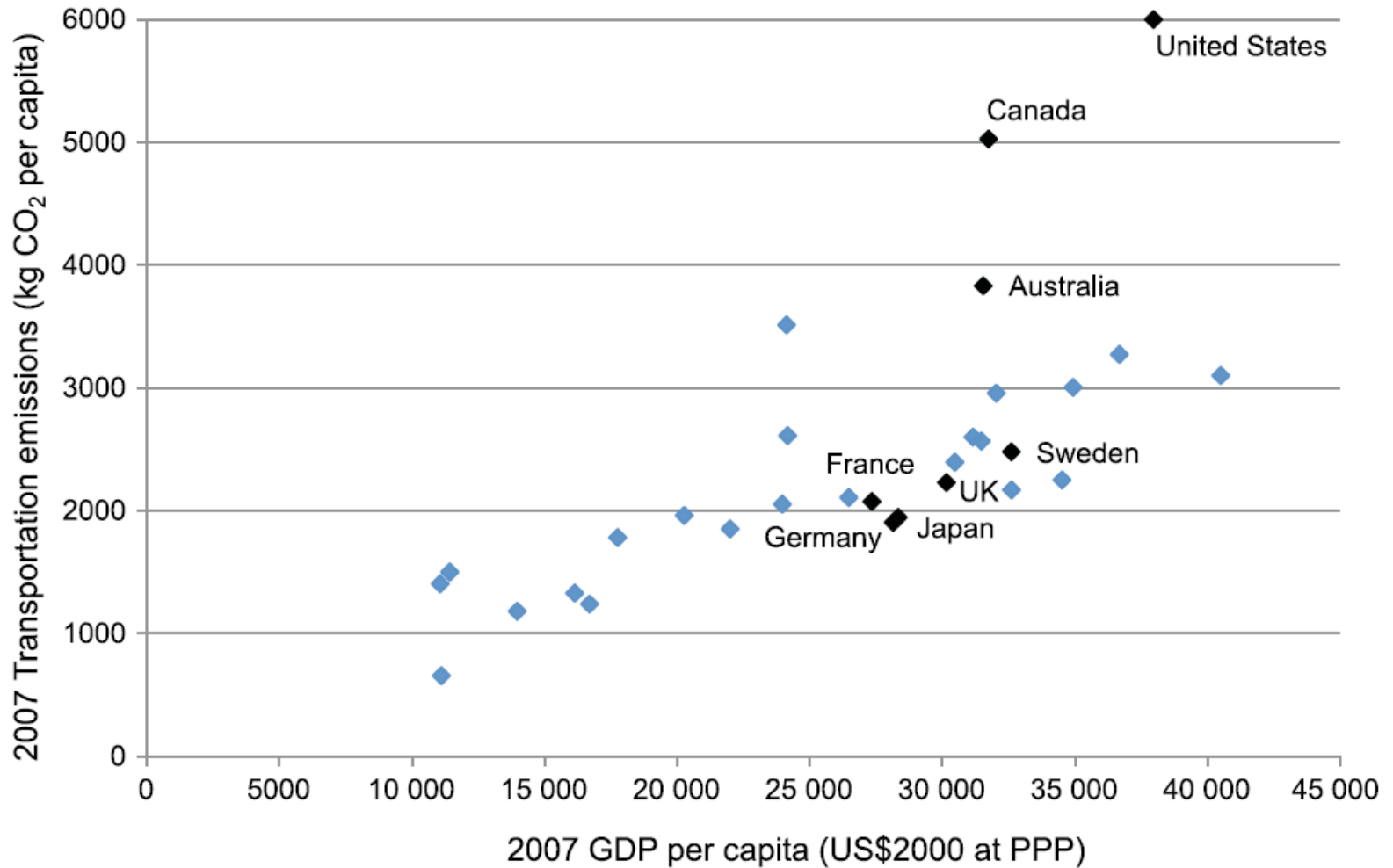
Source: International Transport Forum (2010)

# Vehicle kilometres travelled/capita for cars and household SUV or light trucks vs GDP per capita in 2000 US \$, converted to PPP

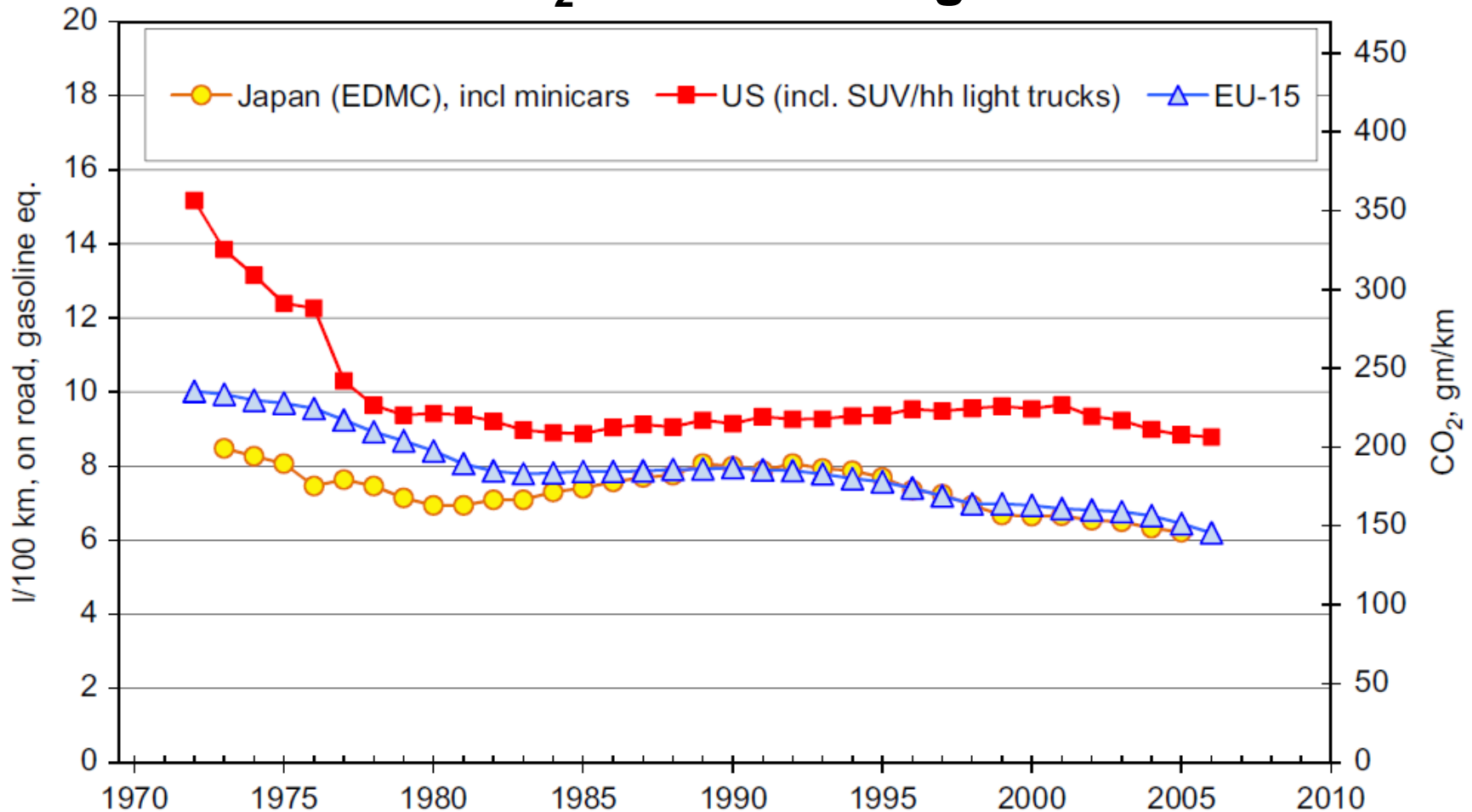




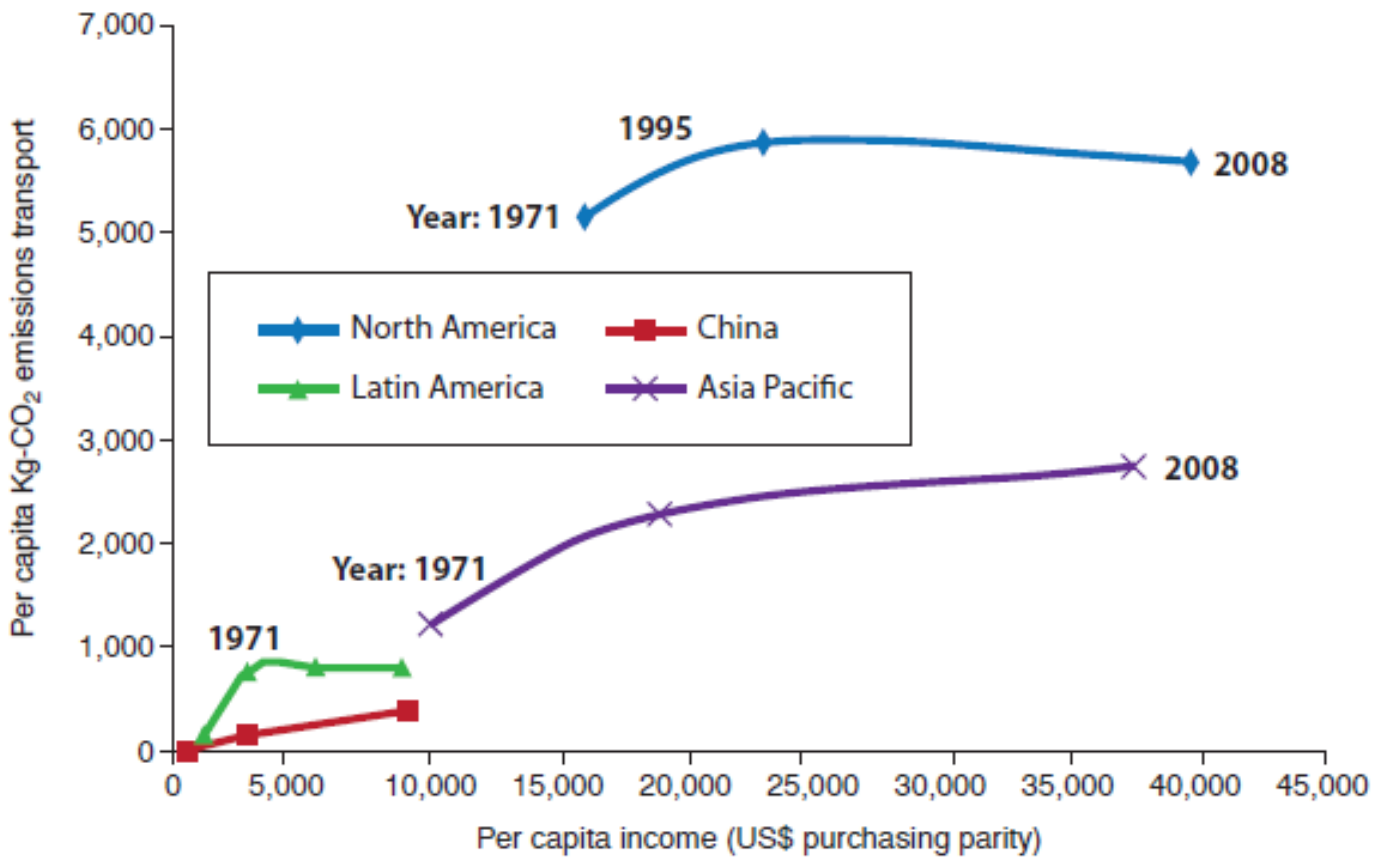
## GDP and transport CO<sub>2</sub> emissions in OECD countries 2007



# New vehicle sales-weighted economy petrol equivalents by year – converted to litres of petrol equivalent and approximate CO<sub>2</sub> emissions in g/km



# 2. Choices and pathways

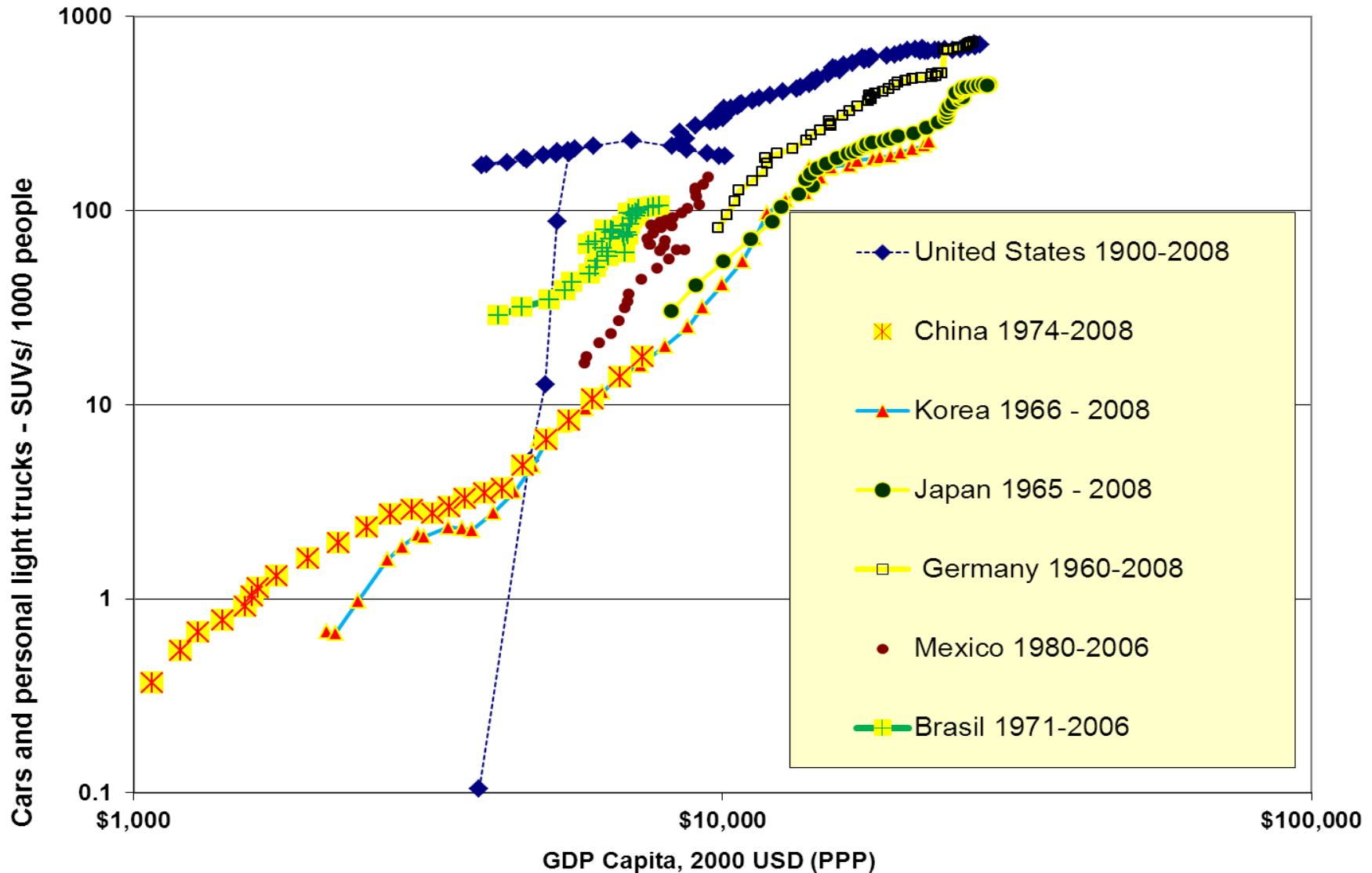


Note: North America covers US and Canada; Asia Pacific covers Japan, S Korea, Australia and NZ





# Motorization and Economic Growth: China Car Ownership 2008 = US 1924!



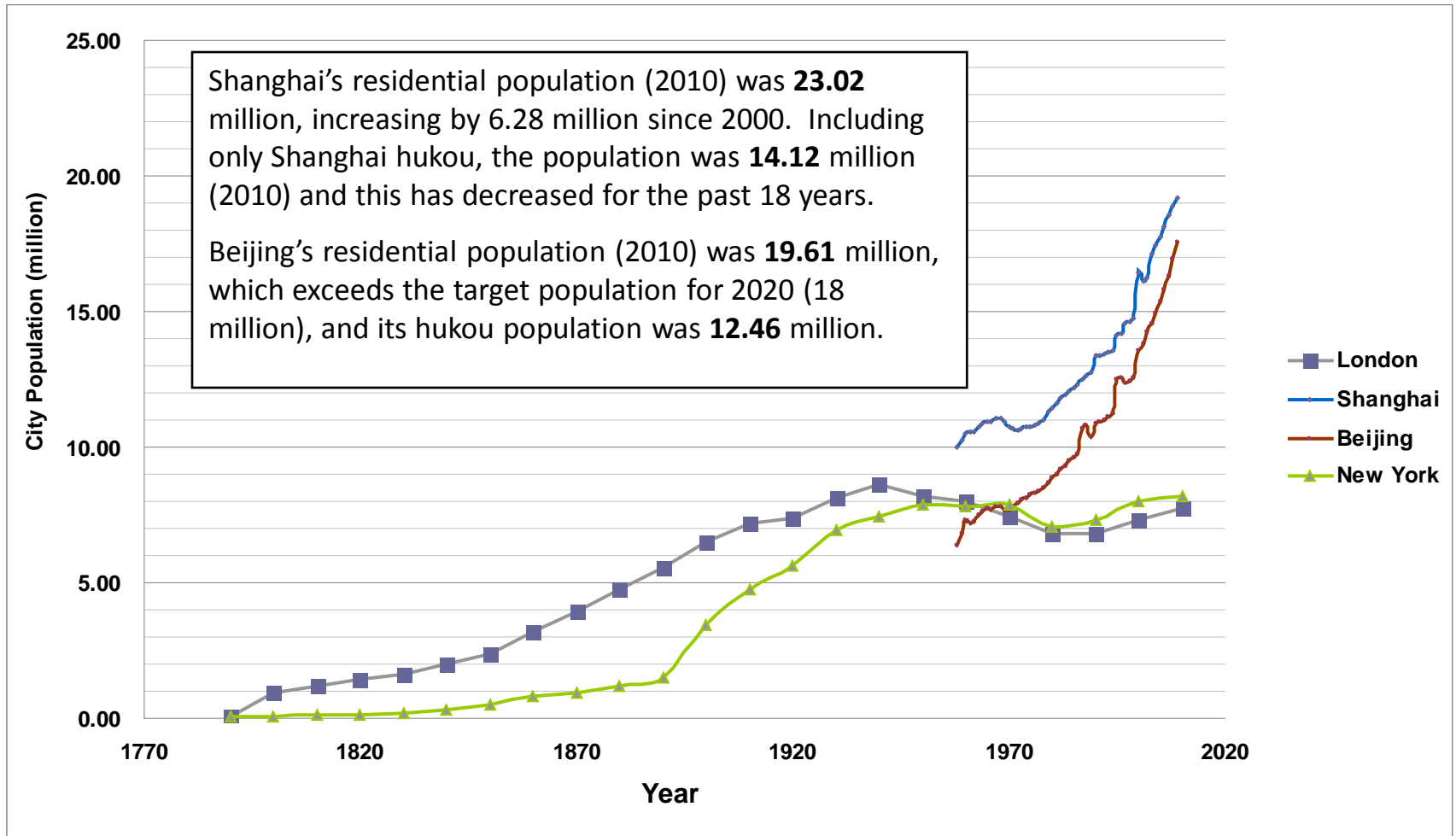


# 3. Comparison of growth and development phases in China and the USA

Figures are all indicative estimates		Industrial based	Service based	Knowledge and Information base
China	Population Time Per capita GDP	1-2 million 40 years < \$2000	2-15 million 15 years \$2,000-6,000	>15 million 10 years >\$6,000
USA	Population Time Per capita GDP	100,000-200,000 200 years < \$20,000	200,000-500,000 75 years \$20,000-40,000	500,000-8 million 50 years > \$40,000



# Population Growth in Four World Cities





## 4. Urban Development Patterns in China



### China – Urban population

1990            254 million (20%)

2005            572 million (44%)

2025            926 million (64%)

Migration (2005-2025) 243 million (69% of growth)

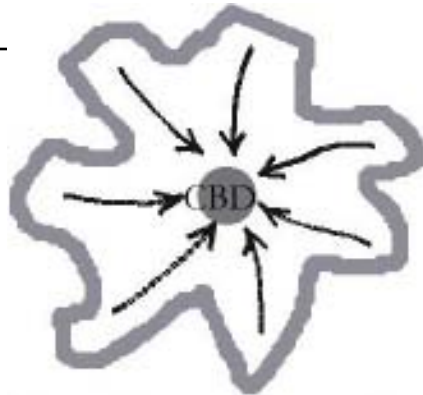
Currently 145 million migrant workers (11% population)

Income levels in urban areas 3x rural incomes

2025    221 cities in China with populations over 1 million

# Three types of Urban Development in China

<b>4.1 Six Radial Cities in China</b>	Urban Area population	Metropolitan area population	Average commute time by car
Wuhan	5.15 m	8.36 m	31 mins
Xian	5.62 m	7.82 m	29 mins
Zhengzhou	2.85 m	7.31 m	29 mins
Changsha	2.41 m	6.52 m	27 mins
Kunming	2.50m	5.34m	29 mins
Lanzhou	2.10m	3.24m	25 mins



Comment: Potential for future axial growth between Wuhan and Changsha (380km) and from Zhengzhou to Jinan (430km) and Shijiazhuang (440km) both facilitated by new high speed rail links.

Notes: Population data 2009 from the China Bureau of Statistics (2010) and the commute data is from a Deloitte Survey (2011)

## 4.2 Three City Clusters in China

**Pearl River Delta** – total population 36 million  
– all cities within 120km of each other

Guangzhou	6.55m (7.95m)
Shenzhen	2.46m (2.46m)
Dongguan	1.79m (1.79m)
Foshan	1.1m (5.4m)
Zhaoqing	0.5m (1.9m)
Zhongshan	1.48m (1.48m)
Jiangmen	1.38m (3.96m)
Huizhou	1.09m (2.59m)
Zhuhai	1.03m (1.03m)
Hong Kong	7.0m

Average commute times 48 minutes

**Yangtze River Delta** – total population 37 million

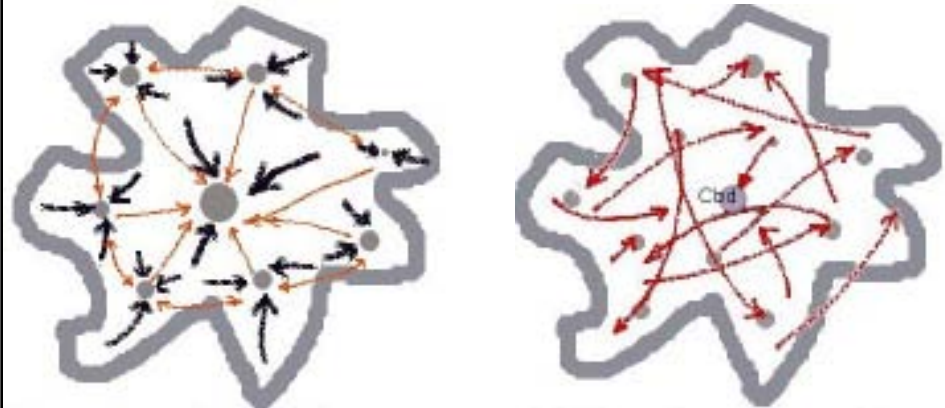
Shanghai	13.32m (14.01m)
190km to Hangzhou	4.29m (6.83m)
280km to Nanjing	5.46m (6.30m)
Changzhou	2.27m (3.60m)
Suzhou	2.40m (6.33m)

Comment: Possible extension inland to Heifei (2.09m: 4.91m) about 420km from Shanghai. Average commute times are about 47 minutes.

**Beijing – Tangshan – Tianjin** – total population 30 million – all cities about 120-150km apart

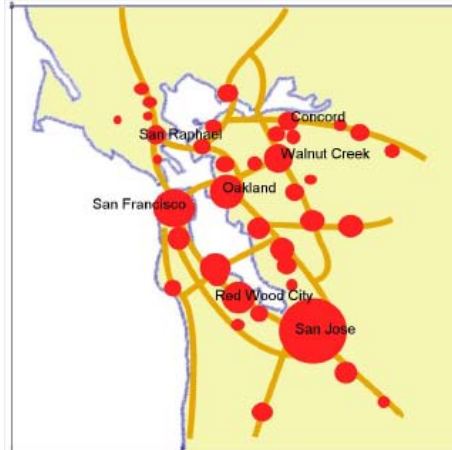
Beijing	11.75m (12.46m)
Tangshan	3.07m (7.34m)
Tianjin	8.03m (9.80m)

Average commute time 52 minutes in Beijing and 40 minutes elsewhere

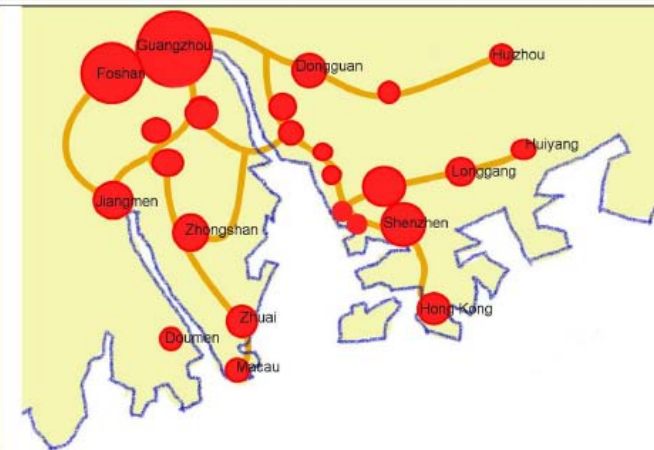




# The Pearl River Delta



San Francisco Bay Area



The Pearl Delta

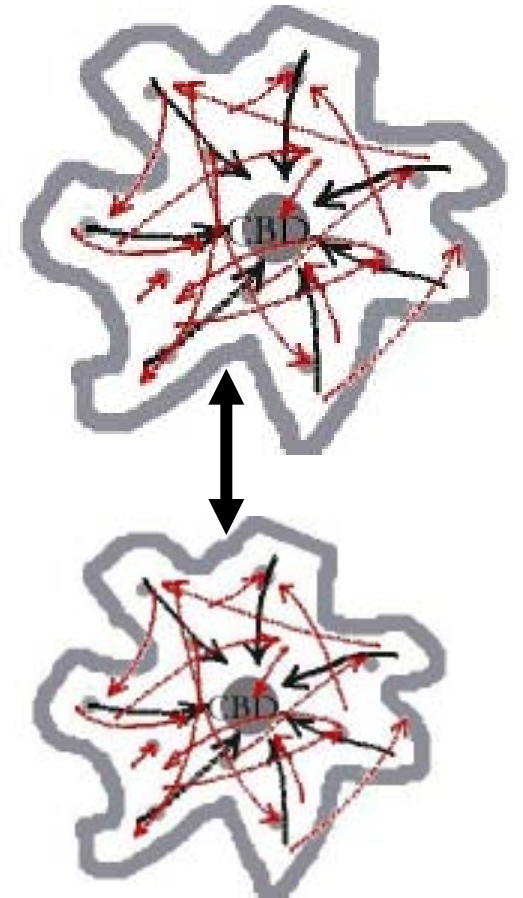
## 4.3 Four Axial Cities in China

Jinan 3.48m (6.03m) 320km to Qingdao 2.75m (7.63m)  
[intermediate cities Zibo 2.79m (4.21m) and Qingzhou  
1.35m (3.71m)]. Commute time 29 and 28 minutes.  
Total population: 22 million

Chengdu 5.21m (11.40m) 340km to Chongqing 15.43m  
(32.76m)  
[intermediate city Neijiang 1.42m (4.26m)]. Commute time  
31 and 35 minutes. Total population: 48 million

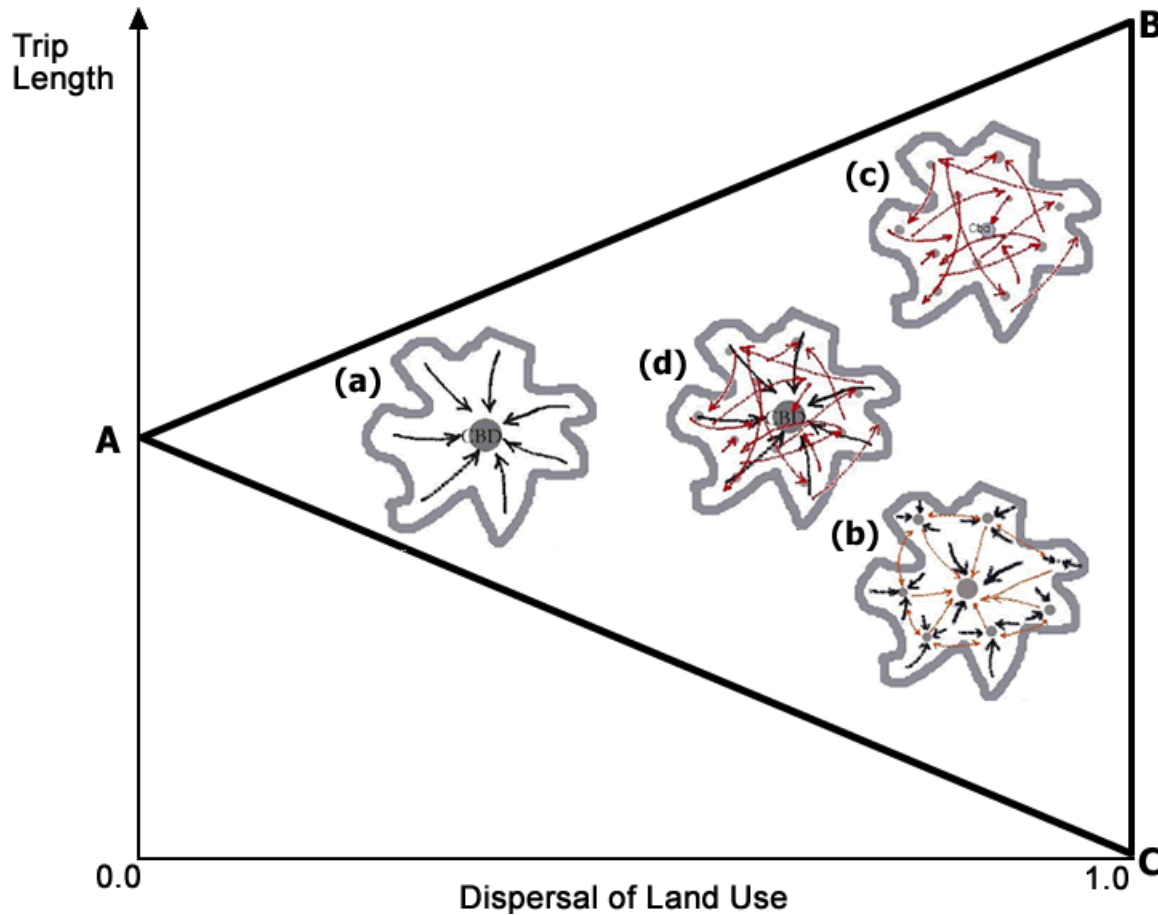
Shenyang 5.12m (7.17m) 390km to Dalian 3.02m (5.85m)  
[possible extension to Changchun 3.62m (7.57m) 330km to  
north of Shenyang]. Commute time 34 and 29 minutes.  
Total population: 13 million

Xiamen 1.77m (1.77m) 280km to Fuzhou 1.87m (6.38m).  
Commute time 26 and 25 minutes. Total population: 8  
million





# The relationship between trip length, dispersal and urban form



Notes: City (a) is the monocentric model with a strong central city and a radial pattern of travel; City (b), the polycentric model, with a cluster of surrounding cities; City (c), the polycentric model, with random movements, and City (d), the multicentred city with simultaneous radial and random movement. Diagram based on Bertauld (2002).



# 5. Vulnerabilities and Sustainability



2005		2070	
Top 10 cities by exposed population	Top 10 cities by exposed assets	Top 10 cities by exposed population	Top 10 cities by exposed assets
Mumbai Guangzhou Shanghai Miami Ho Chi Minh City Kolkata New York-Newark Osaka-Kobe Alexandria New Orleans	Miami New York-Newark New Orleans Osaka-Kobe Tokyo Amsterdam Rotterdam Nagoya Tampa-St Petersburg Virginia Beach	Kolkata Mumbai Dhaka Guangzhou Ho Chi Minh City Shanghai Bangkok Miami Hai Phong (Vietnam) Alexandria	Miami Guangzhou New York-Newark Kolkata Shanghai Mumbai Tianjin (China) Tokyo Bangkok New Orleans
These cities are split almost equally between developed and developing countries.	These 10 cities account for 60% of total exposure, and are based in 3 wealthy countries (USA, Japan, and the Netherlands).	The exposed population has increased by 3 times to 150m – almost all the cities are in developing countries.	The total exposed assets have increased by 10 times to \$35,000 billion (2005 prices) or 9% of global GDP.

Note: Total exposed assets in 2005 for all 20 cities is \$3000 billion (2005 prices) or 5% global GDP. The main driving forces of the 2070 Scenarios are population growth, economic growth and urbanisation, and these factors are exacerbated by climate change (sea level rises and increased storminess) and subsidence.

Source: Based on Nicholls et al., 2008



## 6. Comments and Conclusions



1. Key differences between the European and US traditions
2. Cities in Asian countries are following the same pathway
3. Critical choices on pathways
4. Challenge is one of leadership and action – supported by institutional and governance structures to accommodate the rapid growth in urban populations and wealth
5. Cities not built for motorised traffic – the high motorised mobility option is costly – implications for social welfare, environmental quality and health – poverty alleviation and sustainable transport must work together
6. Accessibility and demand management controls essential, along with strong land use policy – to shorten trip lengths – this is the sustainable mobility paradigm (Banister, 2008).