International Air Transport and Climate Change: From A Chinese Perspective

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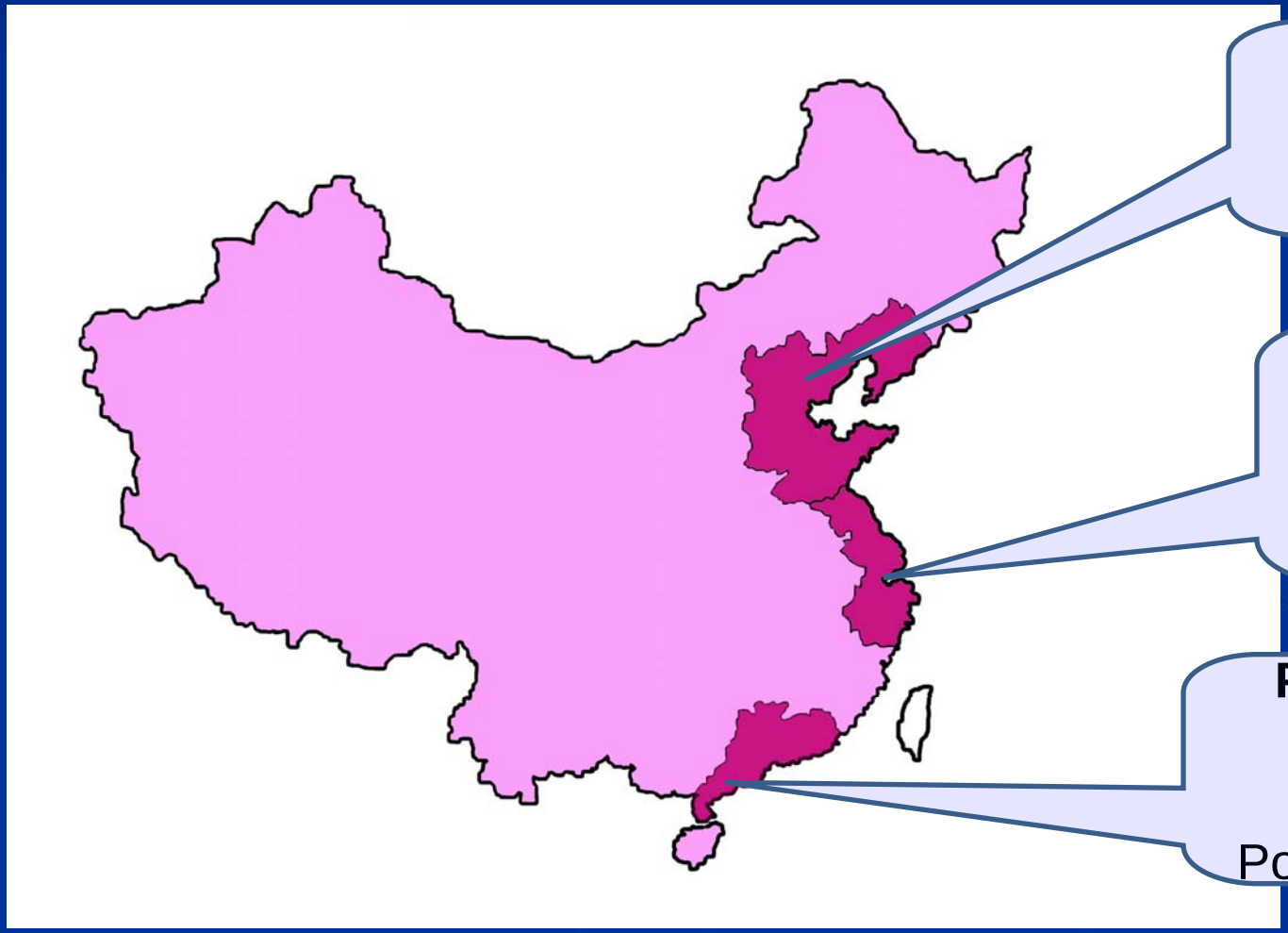
Overview

- China's stake in the global climate change
- Current status of China's aviation emission
- China's efforts in emission reduction
- China's action plan and international policy

China's Stake in the Global Climate Change

- Effects of rising sea level
  - Major harbors in the coastal region are the pillars of China's economic growth
  - Most developed region and highest population density
  - Pearl-River Delta area
  - Yangtze-River Delta area
  - Bohai-Rim area

China's economic pillars



Bohai Rim
GDP: 24%
Population: 18%

Yangtze River Delta
GDP: 21%
Population: 11%

Pearl River Delta
GDP: 10%
Population: 7%

Effects of climate change

- Traditionally, China has dry weather in the northern and central regions, but more precipitation in the south

- Global warming on water resources
  - Himalaya Glacier melting fast
  - Northern China will see more drought
  - Southern China more flood

Northern and central China threatened by drought

China's food supply

- If global warming continues and average temperature rises by 2.5-3C
  - Main food production in China (rice, wheat and corn) will decline
  - There will be shortage of food supply in 2030 in China
  - International market is insufficient: World trade in rice is only 1/10 of Chinese domestic consumption

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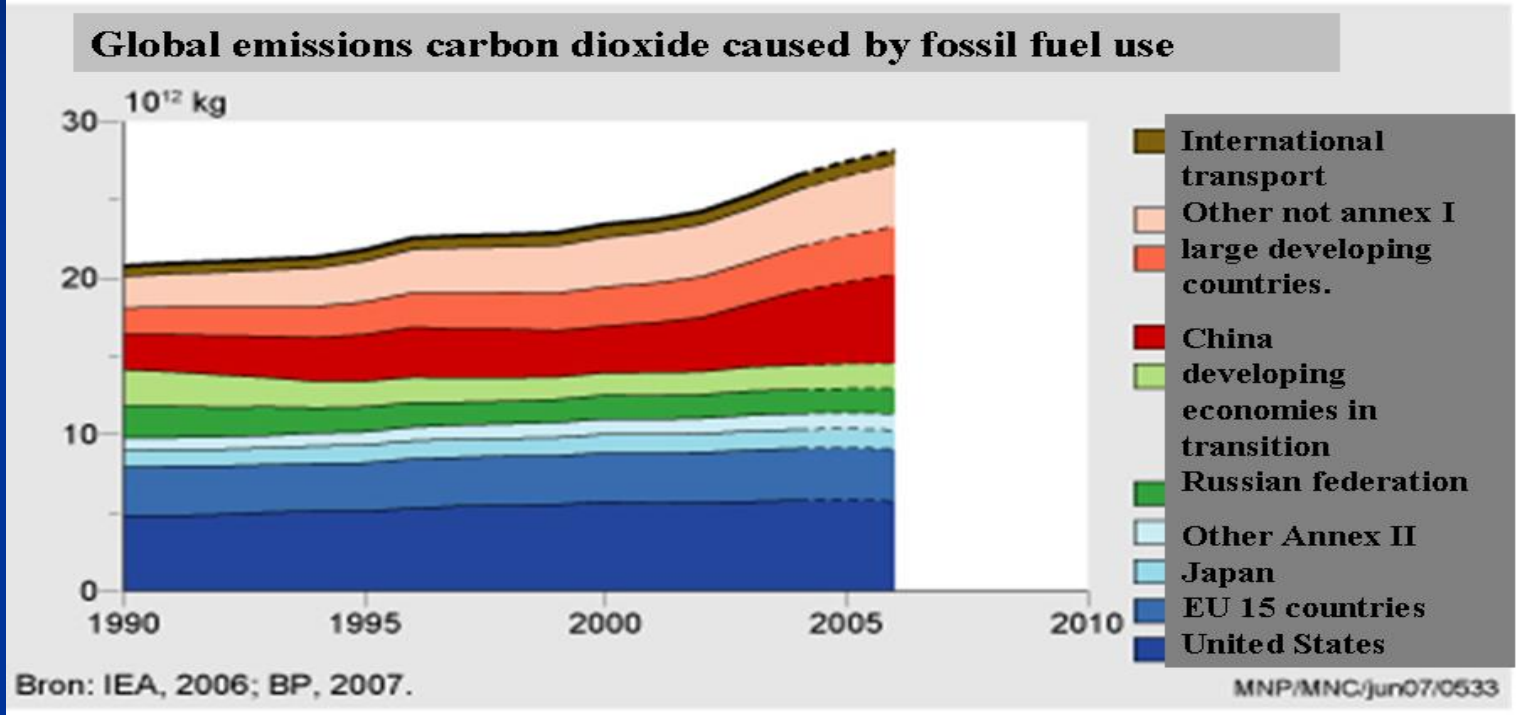
Current status of China's emission

- Estimation by Netherlands Environmental Assessment Agency (NMP)
  - Total emission of China exceeded US in 2006
- While these statistics are under heavy debate on its reliability, the upward trend of China's total emission is undeniable

NMP estimation

China is becoming No 1 carbon dioxide emitter



Sources: NMP, British Petroleum (BP) statistical review and International Energy Agency

Accumulated US/China emissions = 4

From EarthPortal

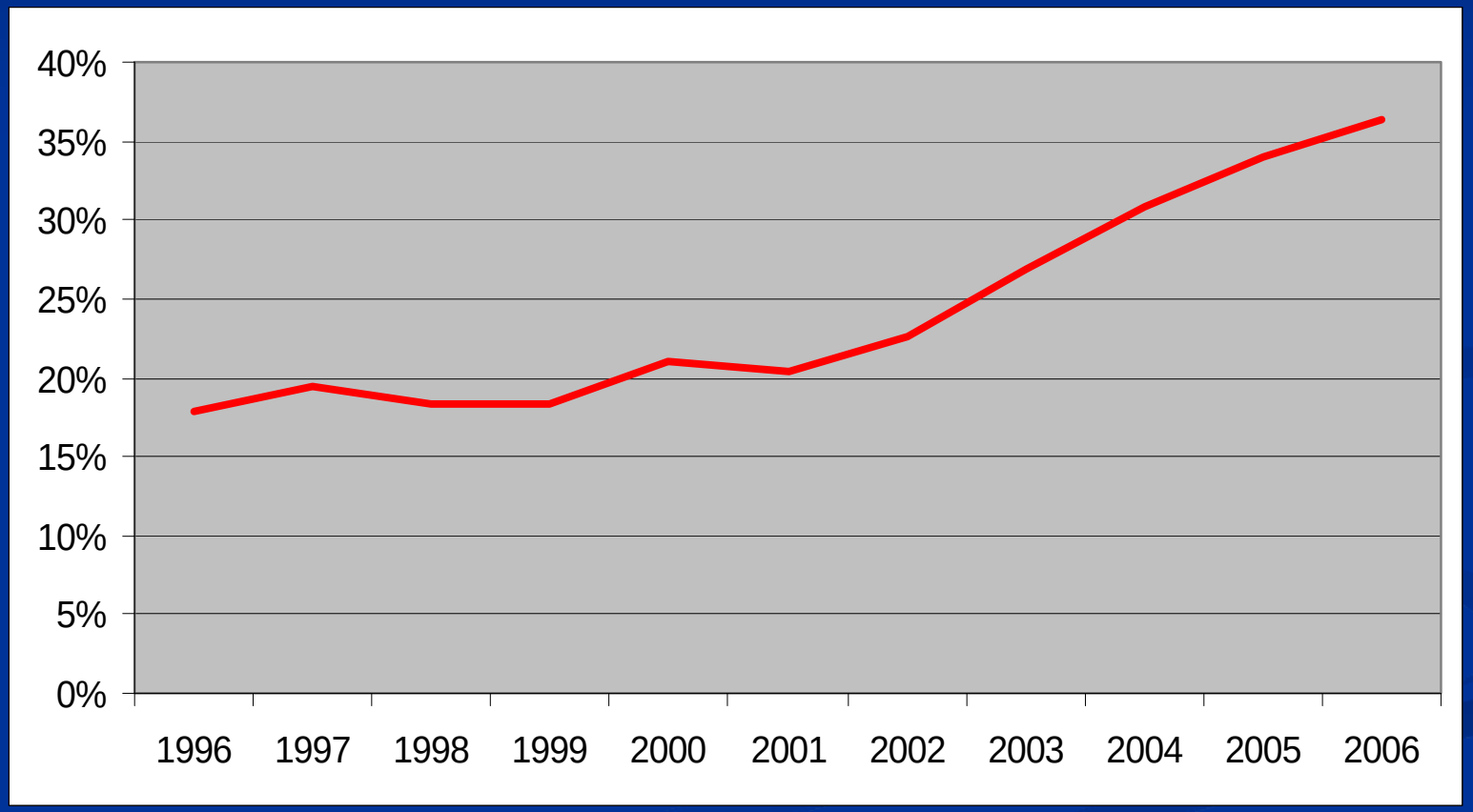
Issues on China's emission

- Even if NMP estimation is taken at face value, the per capita emission of China is still a fraction of that of US, EU and other developed countries

- Most emissions by China are from manufacturing of goods rather than consumption

- A large portion of manufactured goods are for export

China's exports to GDP

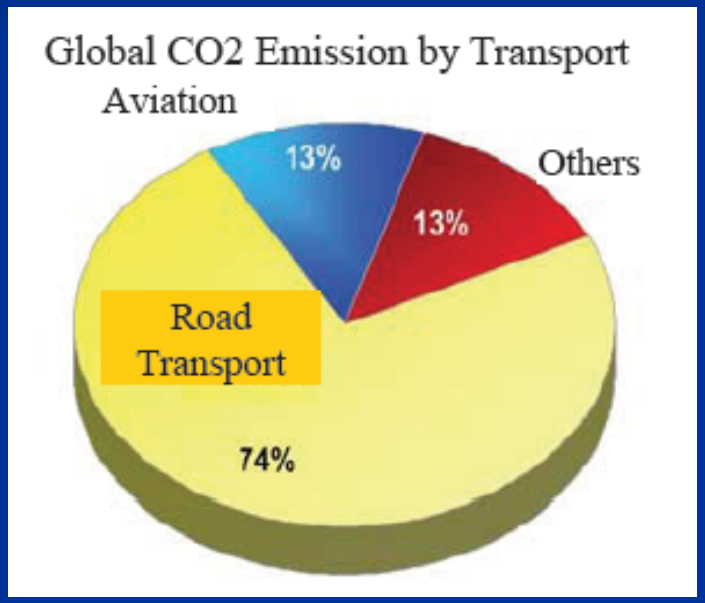


Production vs consumption

- GHG emissions not only be allotted according to production, but also according to consumption?

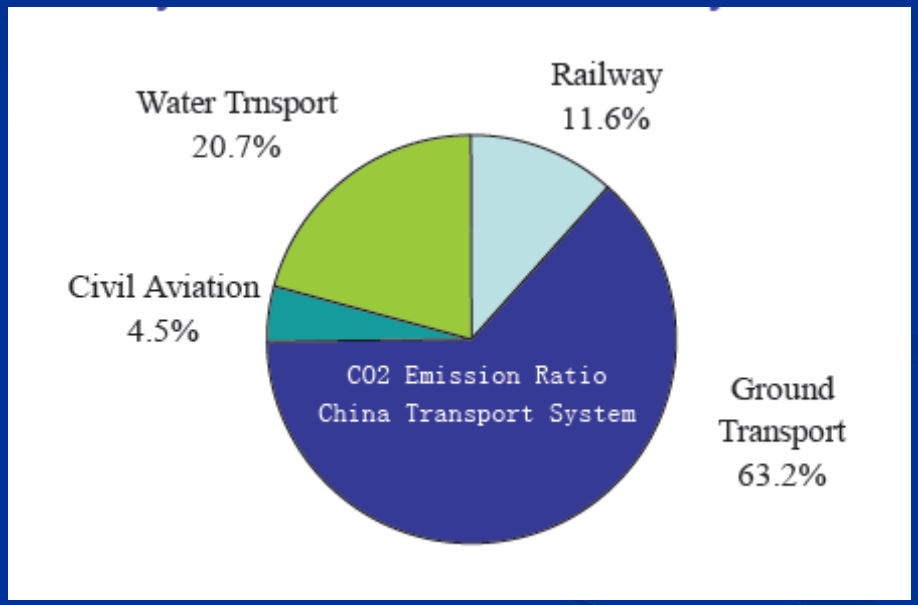
Civil aviation emission

1999 world average



Source: IPCC

2000 China



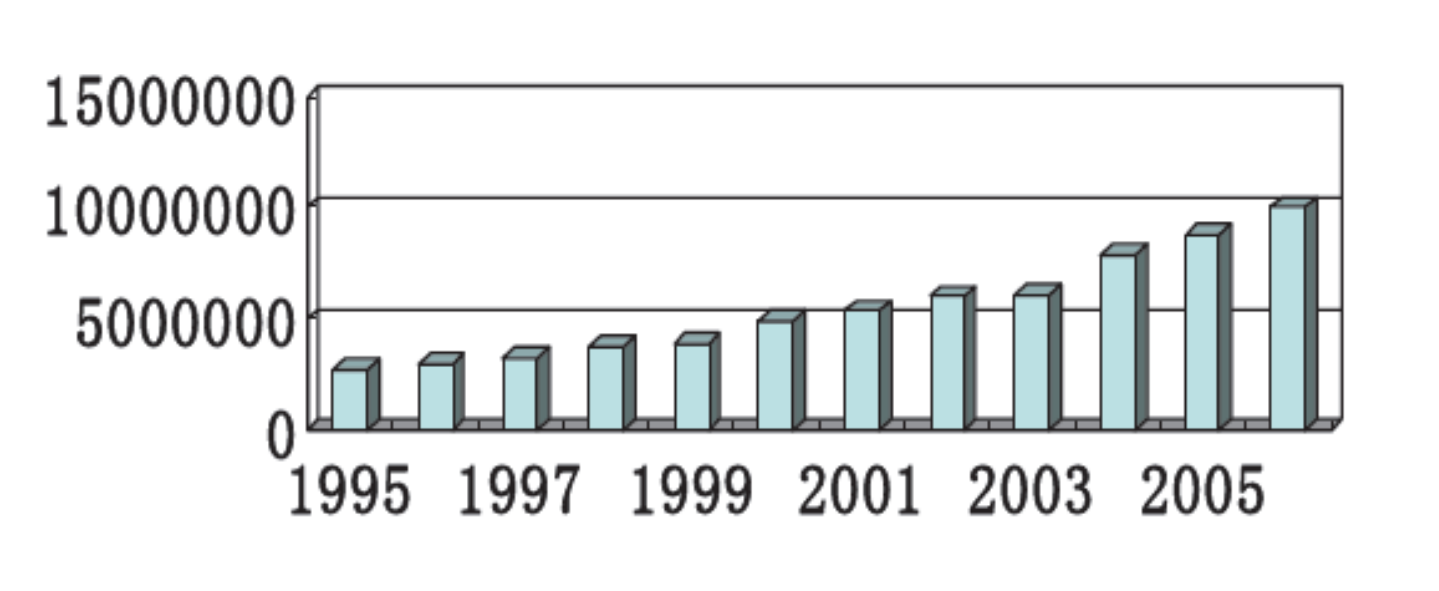
Source: CAAC

China's transportation emission

- In 2007, total emission of CO2 by China was about 5.8 billion tons
- 2007 emission by the transportation sector in China was about 9.8% of total emission
- 2007 emission by civil aviation in China was about 0.6% of total emission
- The weight of air/total transport is still low in China, but is growing

Total aviation fuel consumption in China

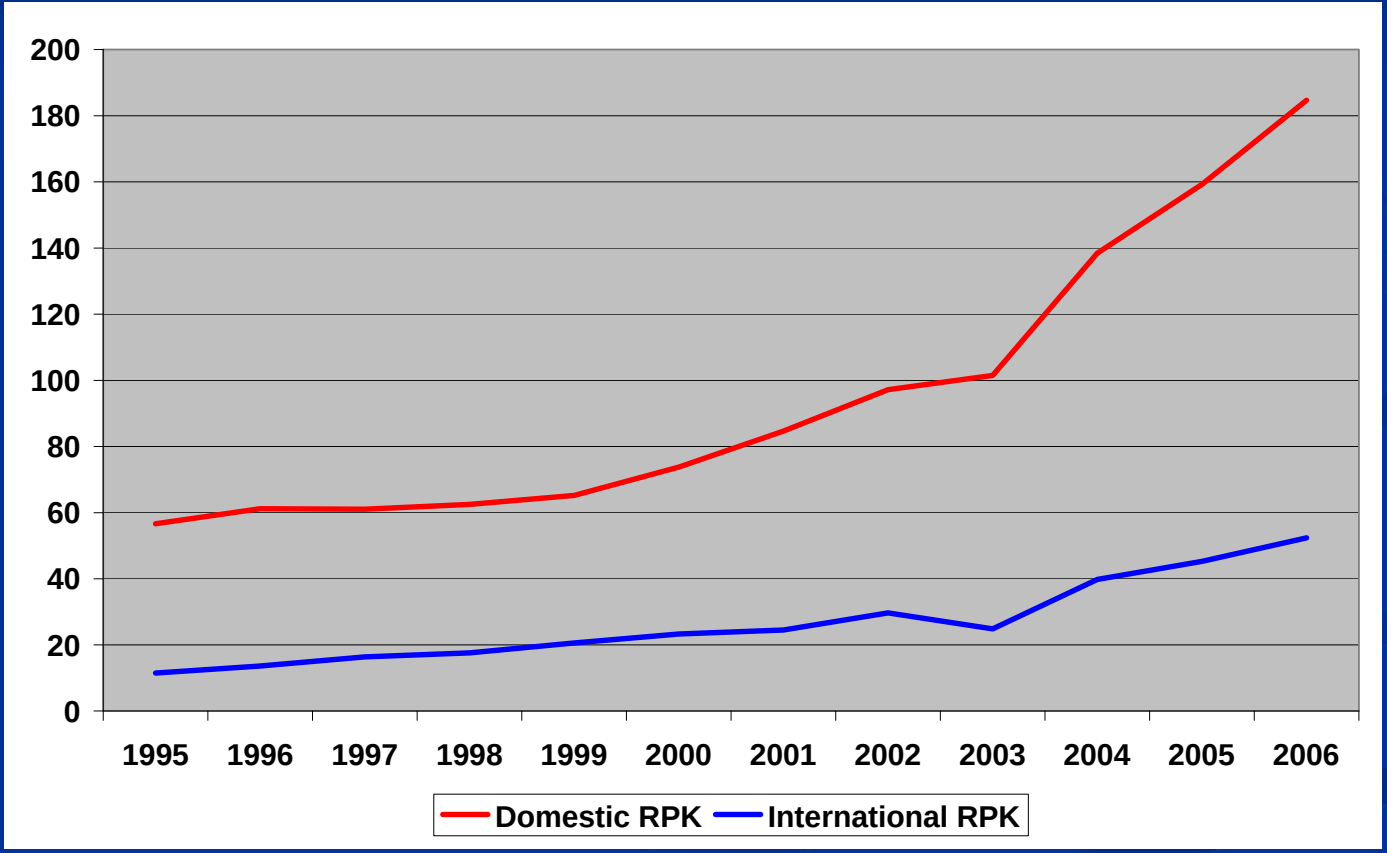
In tons



Source: CAAC

Growth in China's air traffic

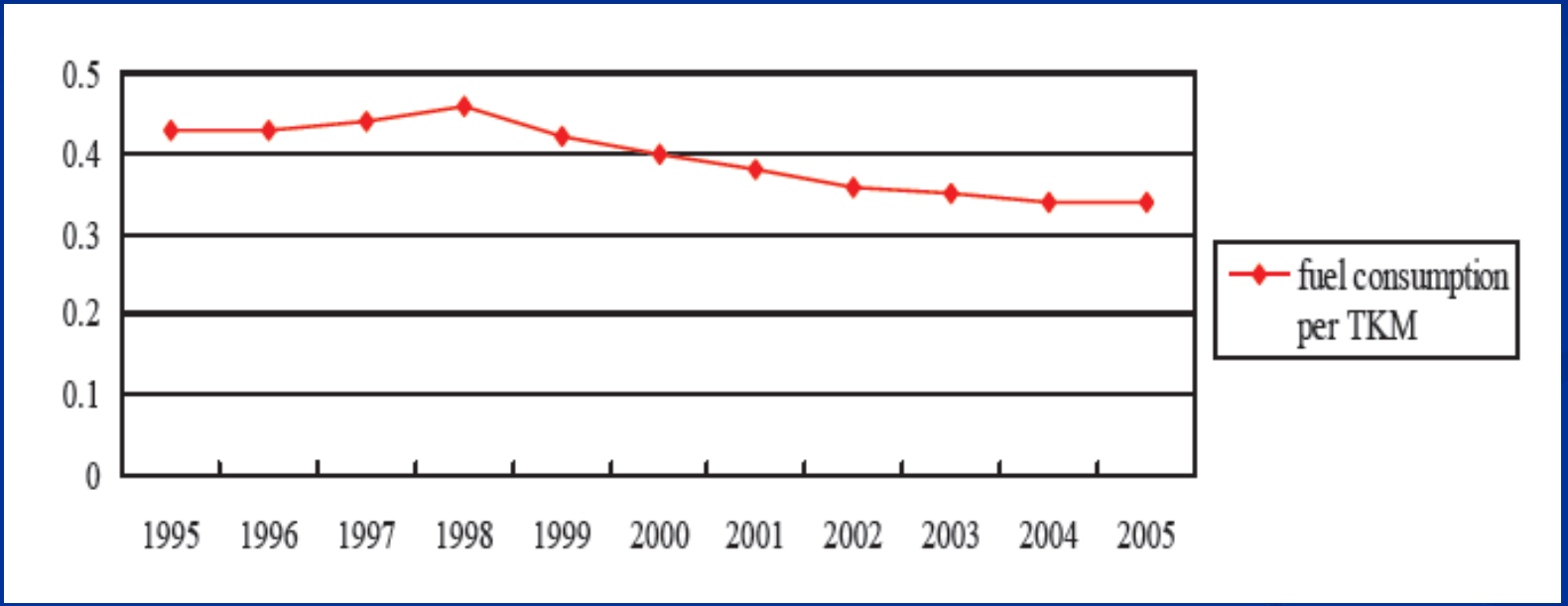
in million



Source: CAAC

Energy efficiency of China's civil aviation

In kg/RTK



Source: CAAC

Fuel efficiency of Chinese airlines (kg/RTK)

- 1995-2000, average fuel consumption reduced by 1.2% annually
- 2000-2005, average fuel consumption reduced by 2.5% annually
- By first half of 2009, fuel efficiency reached 0.3kg/RTK
- Compared with 1995, about 30% lower
- But still a long way to go compared with US carriers

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Challenges to China's reduction of aviation emission

- High traffic growth driven by domestic demand
- Insufficient infrastructure
- High concentration in major hub/gateway airports
- Congested airports and airspace
- Increased aircraft waiting time

Air transport infrastructure in China

- There are about 150 airports in China, but heavy concentration of traffic in major hub/gateway airports

- Airports in the Beijing, Shanghai, and Guangzhou accounted for
  - 35% of total passengers
  - 85% of international passengers
  - 57% of total cargo in 2008

Average flight time of a sample airline in China

Routes		2006	2007	2008	2009.06
Beijing-Chengdu (PEK-CTU)	No. flights	4,506	4,486	4,507	2,534
	ave. taxi time	27	30	29	29
	ave. in air time	141	142	146	148
	ave. total flight time	167	172	176	178
Beijing-Shanghai (PEK-SHA)	No. flights	3,805	3,723	3,847	1,959
	ave. taxi time	29	31	29	26
	ave. in air time	95	96	97	96
	ave. total flight time	124	127	126	122

Time in minutes

Source: Zhan Zhong & Chai Yufeng (2009) Guoji Hangkong

China's Efforts in Emission Reduction

- Effort by CAAC
  - Optimize usage of airspace
- Efforts by airports
  - Optimize usage of ground facilities
- Efforts by airlines
  - Optimize operation of aircraft

Efforts by CAAC

- In 2009, opened 35 new domestic direct-flight routes
  - Reduced overall flight distance by about 7000km

- Metric system in RVSM (Reduced vertical separation minimum) adopted in China in October 2009
  - Between 8400 meter to 12500 meter
  - 7 levels increased to 13 levels
  - Expanded airspace for efficient flight

Efforts by airports

- Separation of landing/take-off direction in some busy airports
  - Resulting in more efficient ascending/descending of flight
- Adopted advanced navigation technology in some busy airports
  - Resulting in more efficient flight routes
- Optimize ground operations in multi-runway airports
  - Resulting in reduced taxi time

Efforts by airlines

- Adopting advanced technology to optimize pay-load and reduce fuel consumption
- Fitting wingtip to B-737 aircraft to reduce fuel consumption
- Minimize use of APU (Auxiliary Power Unit)

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China's action plan

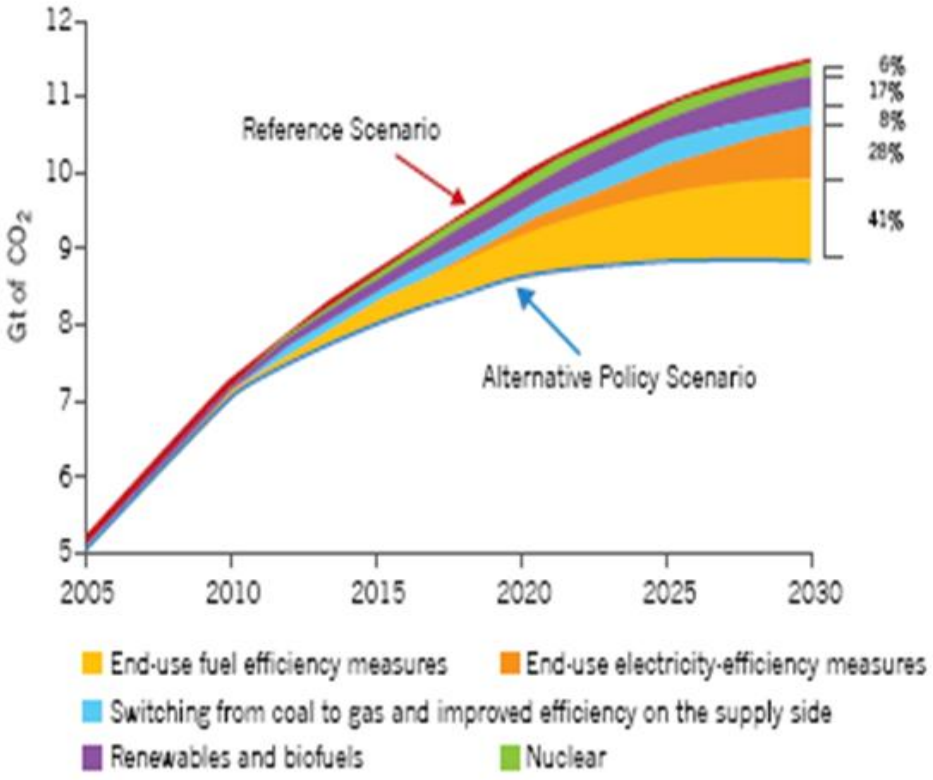

Figure 3: China's CO_2 Emissions in the Alternative Policy Scenario Compared with the Reference Scenario
Source: IEA 2007

Current Policies: China released a national climate change assessment in December 2006.
Released a climate action plan in June 2007.
Set binding domestic target to reduce energy intensity by 20% per unit GDP by 2010, and plan to obtain 15% of primary energy from renewables by 2015.
It is called energy efficiency plan

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China's target by 2020

- Emission intensity of GDP in 2020 to reduce by 40-45% compared with 2005
- Department of Transportation target (2008)
  - Reduction in unit fuel consumption compared with 2005

Mode	By 2010	By 2020
Truck	-5%	-16%
Ocean shipping	-11%	-20%
River shipping	-8%	-20%

CAAC target by 2015

year of 2005	year of 2015
Energy consumption per ton kilometer	reducing 15% compare to 2005
CO_2 emission per ton kilometer	Reducing 15% compare to 2005

Source: CAAC

CAAC's long-term plan

- By 2015 a sound system of energy conservation and emission reduction be built including data collection, monitoring and evaluation
- New progress be made in research and application of technology in energy conservation and emission reduction
- Establish the culture of energy conservation and emission reduction in the industry

The Way Forward: Chinese Perspective

- China has huge stake in climate change and environment damage
- China has made great efforts to improve efficiency and control GHG emission, including civil aviation sector
- But the current level of efficiency is still low and China still has a long way to go

The Way Forward: Chinese Perspective

- Climate change is not only an environmental issue. It is also a development issue
- At per capital GDP about $3,000, China is still a developing country with limited resources and low efficiency
- For further social/economic development while continue reducing GHG emission, China needs international assistance/cooperation

The Way Forward: Chinese Perspective

- As a developing country, China insists on CBDR (Principle of Common but Differentiated Responsibility), UNFCCC and Kyoto Protocol

- In international civil aviation, China insists on global measures rather than regional measures

Thank you!