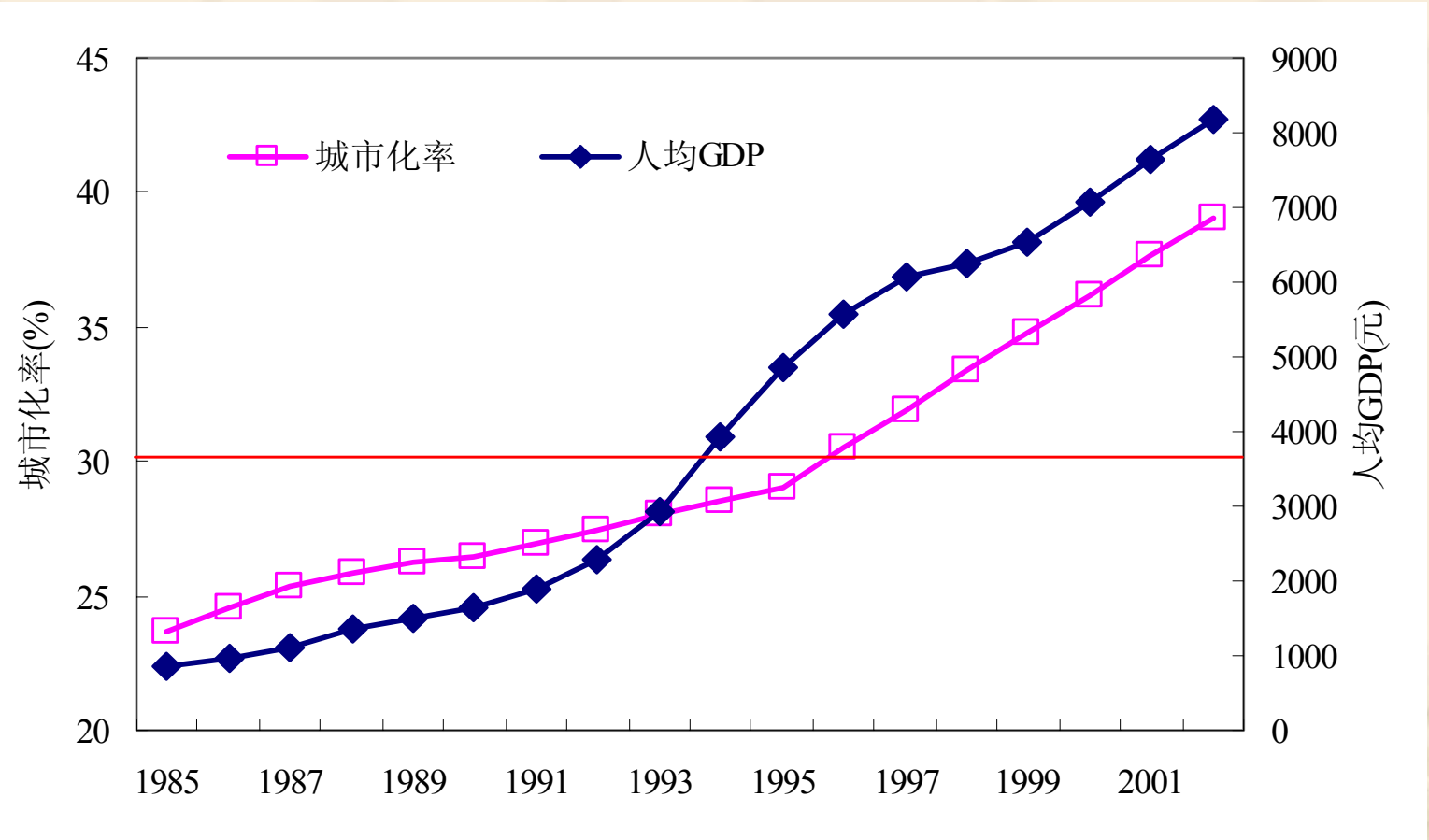
Challenges to and Opportunities for Urban Sustainability in China

QIAN, Yi
Tsinghua University
China

Jan. 2006

Rapid Economic Growth and Urbanization in China



Prediction: GDP per capita will be US$2800 and urbinization rate will be 60% in 2020

Challenge facing China

- Lack of resources
- Environmental problems
- Insufficient infrastructure
- Poor management

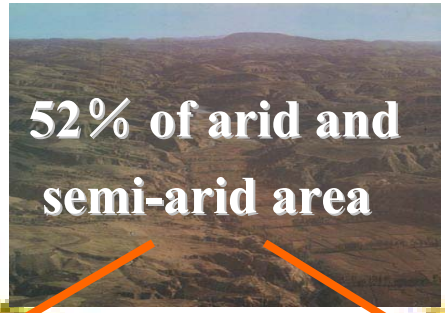
Comparison of Natural resources available for per capita in China and the world

- Water 25%
- Arable land <40%
- Petroleum 8.3%
- Natural gas 4.1%
- Copper 25.5%
- Aluminum 9.7%

Resource Constrictions on Urban Sustainability

- 300 cities out of 600 cities are short of water resources
- Many cities are short of energy supply in summer and winter time
- Limited land area for urbanization

Inherent Shortage of Natural Environment



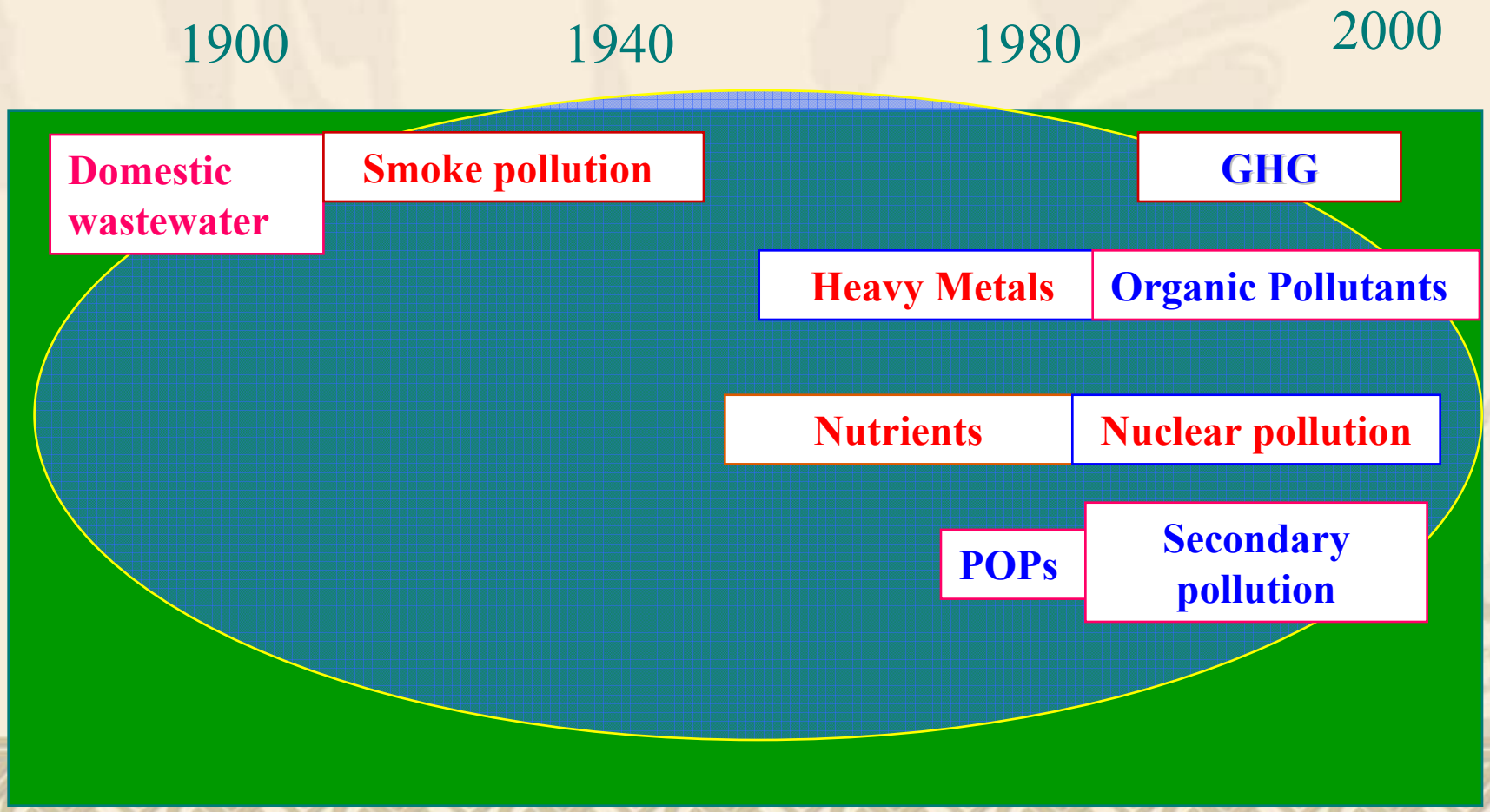
Loess Plateau

0.64 Million Km ^{2}

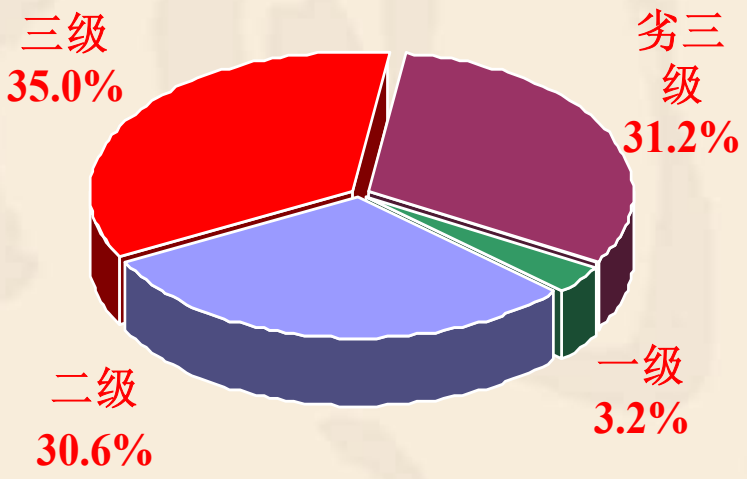
Karst area

0.9 Km 2

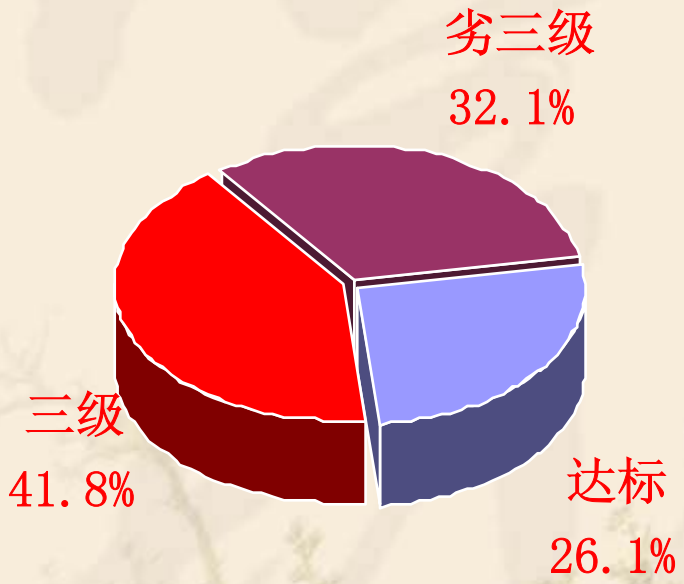
Environmental Problems appeared in different periods of 20 century in developed countries concentrated in China in recent 20 years



Among 340 cities monitored, more than 66% cities can not meet the air quality standard for healthy living of people.



空气质量达标城市比例



不同空气质量状况下人口比例

73.9%of the population in cities are living in unqualified air quality condition.

Water quality classification of 7 major river basins in China

	I	II	III	VI	V	>V
2000	16.3	25.8	15.5	21.6	6.9	13.8
2001	1.5	18.0	10.0	17.7	8.8	44.0
2002	2.7	13.8	12.6	18.9	11.1	40.9
2004	4.6	20.9	16.3	21.6	8.7	27.0

- A tendency of deterioration of water quality appeared since 2000.
- Water quality improvement appeared in 2004, but still worse than 2000.
- 57.3％of monitored sections can not meet standard for drinking water resource's quality.

Increased Solid Wastes

- Domestic solid wastes
- Industrial solid wastes
- Hazardous wastes
- Medical wastes

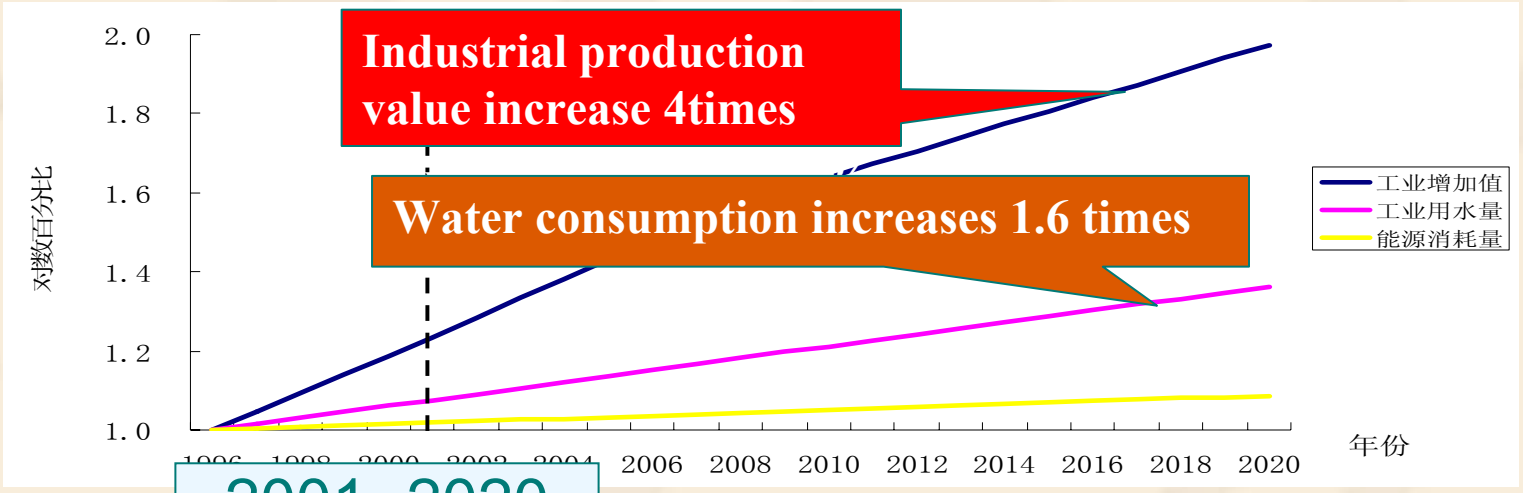
- Lack of safety treatment and disposal facilities

Green House Gases Emissions in China and the World (million tons)

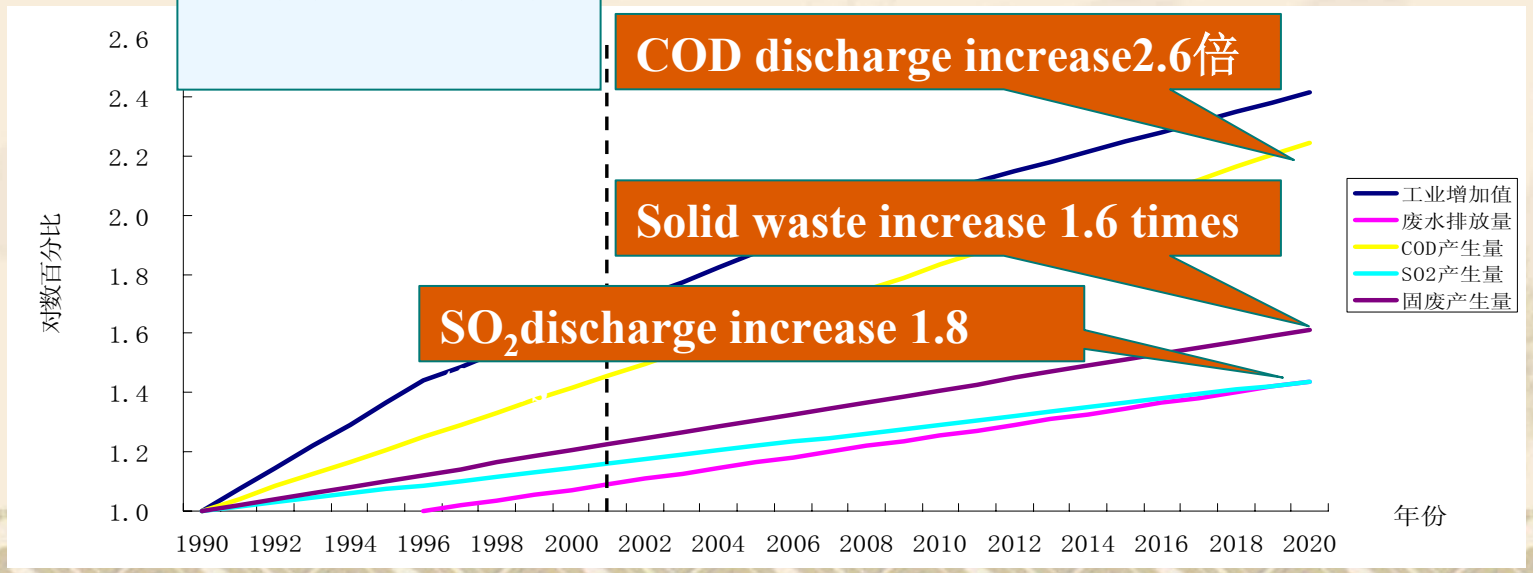
	CO_2	CH_4*	NO*	dust	C	SO_2
China	3051	959	538	800	1.19	19.95
World	23172	6340	3570	3000	6.63	105
No.	2	1	1	1	1	1

* Million tons CO_2 equivalent

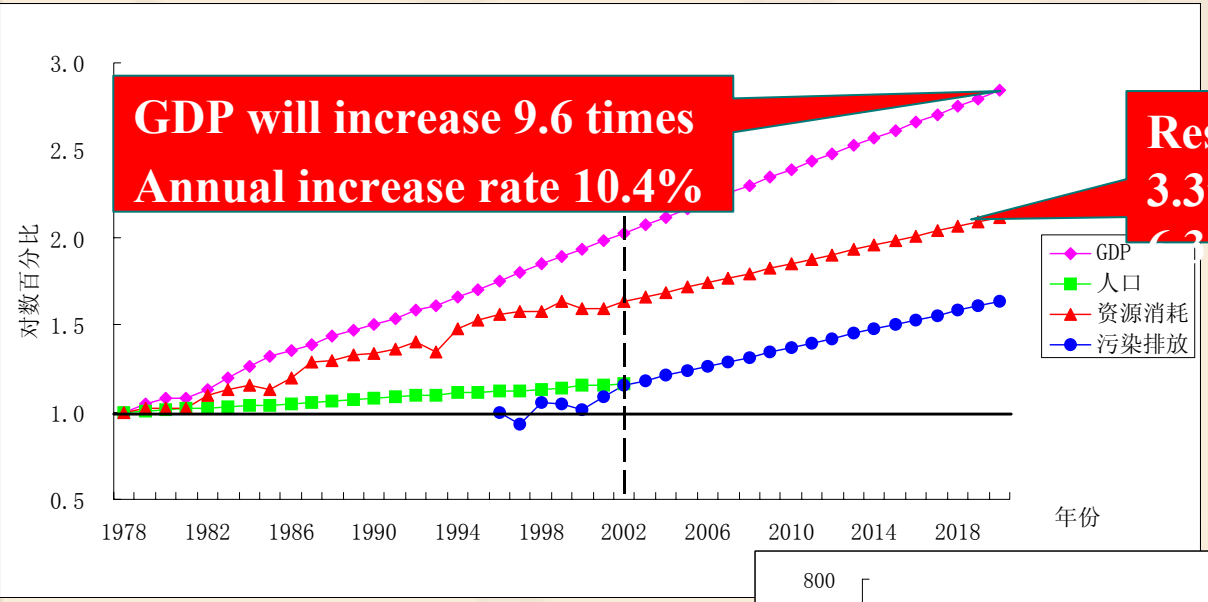
Description of the Development Pattern in Jiangsu Province



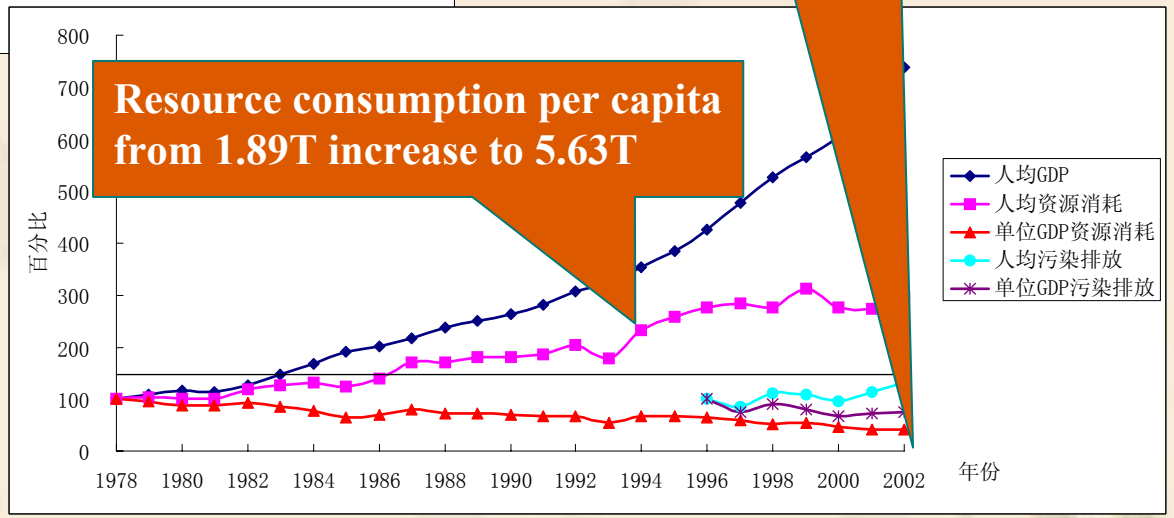
2001- 2020



Description of the Development Pattern in GuiYang City



Resource consumption per unit GDP decrease by 60%



Fast economic growth accompanied by great amount of resource consumption and pollution discharge.

It is not sustainable.

Formula of Environmental Impact

$$I = PAT$$

I：Environmental Impact

P：Population

A：GDP per capita

T：Environmental Impact per unit GDP

What will happen in China

	Population	GDP per capita
2000	1.2 billion	US$ 800
2050	1.6 billion	US$ 3200

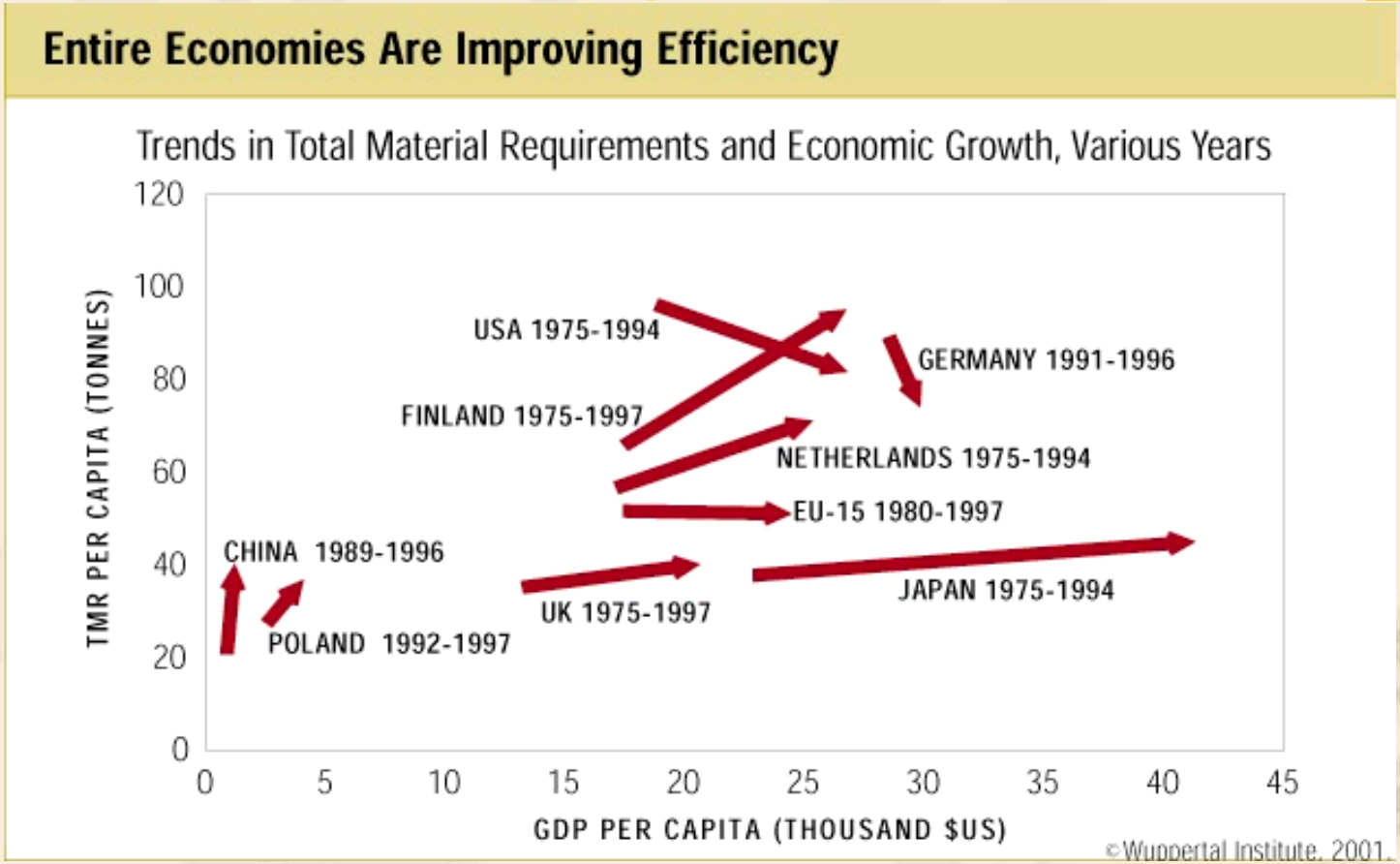
- Environmental Impact per unit GDP needs to be reduced to 1/5.32 for keeping present status;
- For improving environment quality and sustainable development, reduction of 1/10 is required.
- Is it possible? How to make it possible?

Growth creates environmental risks...

…but also opportunities for innovation and reformation

Challenges and opportunities for developing countries:
new development models for "leapfrog" !

Already some good examples

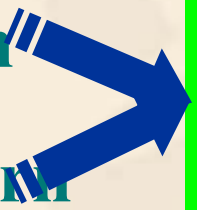


Change of Development Pattern

*To change development pattern is the key issue

Change of production pattern

Change of consumption pattern



Circular Economy

*GOALS:

Increase resource utilization efficiency for reducing material consumption

Reduce pollution discharge and improve environmental quality

What is doing in China now?

- Cleaner production implementation
- Ecological industrial park establishment
- Promoting ecological agriculture and village
- Circular economy practice in different levels and scopes

---

to build a resources conservating and environmental friendly society.

建设资源节约、环境友好型社会。

Cleaner Production

- the continues application of an integrated preventive strategy
- applied to products, production and service
- for maximizing utilization efficiency of resources and minimizing waste discharge
- may reduce risks to human and environment and increases economic benefits.

Ways of Cleaner Production Implementation

- Management practices or housekeeping alternations
- Recycling within processes
- Feedstock substitution
- Equipment replacement or modifications
- Process modification
- Product reformulation and eco-design

Economic and Environmental Benefits

- Lower Energy Bills
- Lower Water Bills
- Cost Savings from
  - Lowering Waste Volume
  - Raw Materials
  - O&M Costs
  - Transportation Costs
  - On-site Storage & Handling
- Reduction of Pollutant Emission

Law on Promoting Cleaner Production has been put into effect since January 1, 2003

- It is the first law on cleaner production promotion in the world;
- Policies, Responsibilities and Incentive measures are defined by the law;
- Relative government agencies and business will take cleaner production promotion into their decision making processes;
- Actions against the law will be punished.

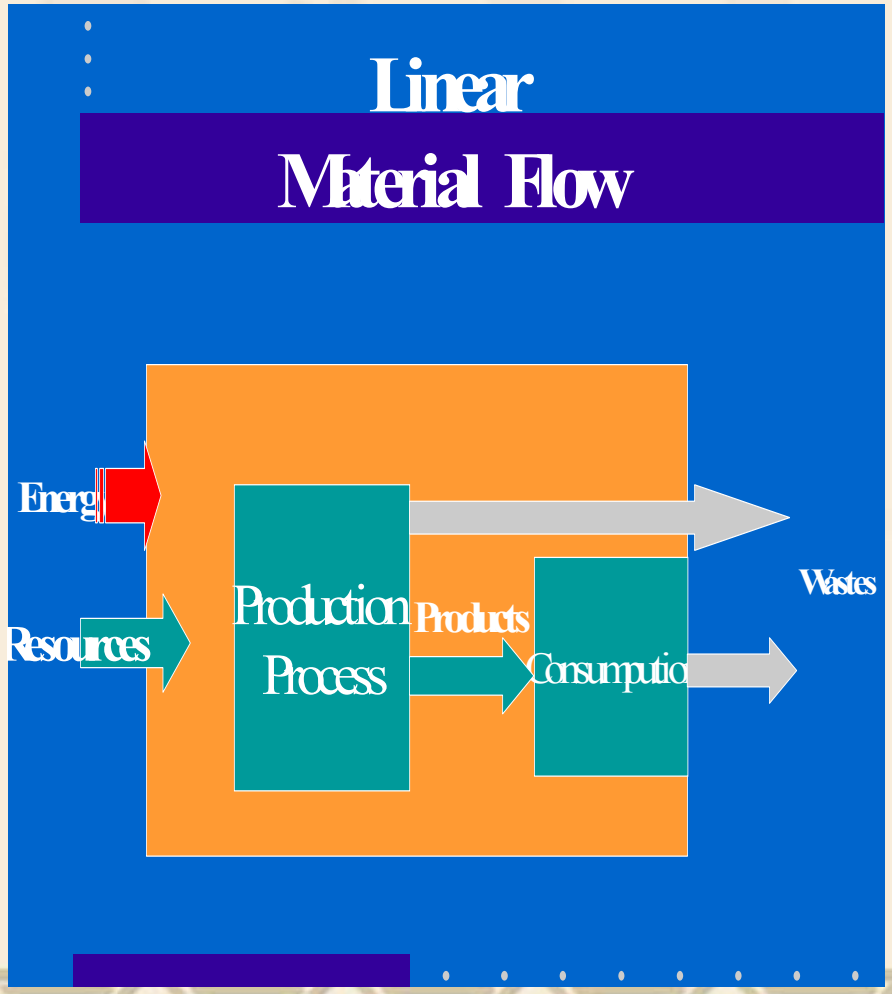
中华人民共和国
清洁生产促进法

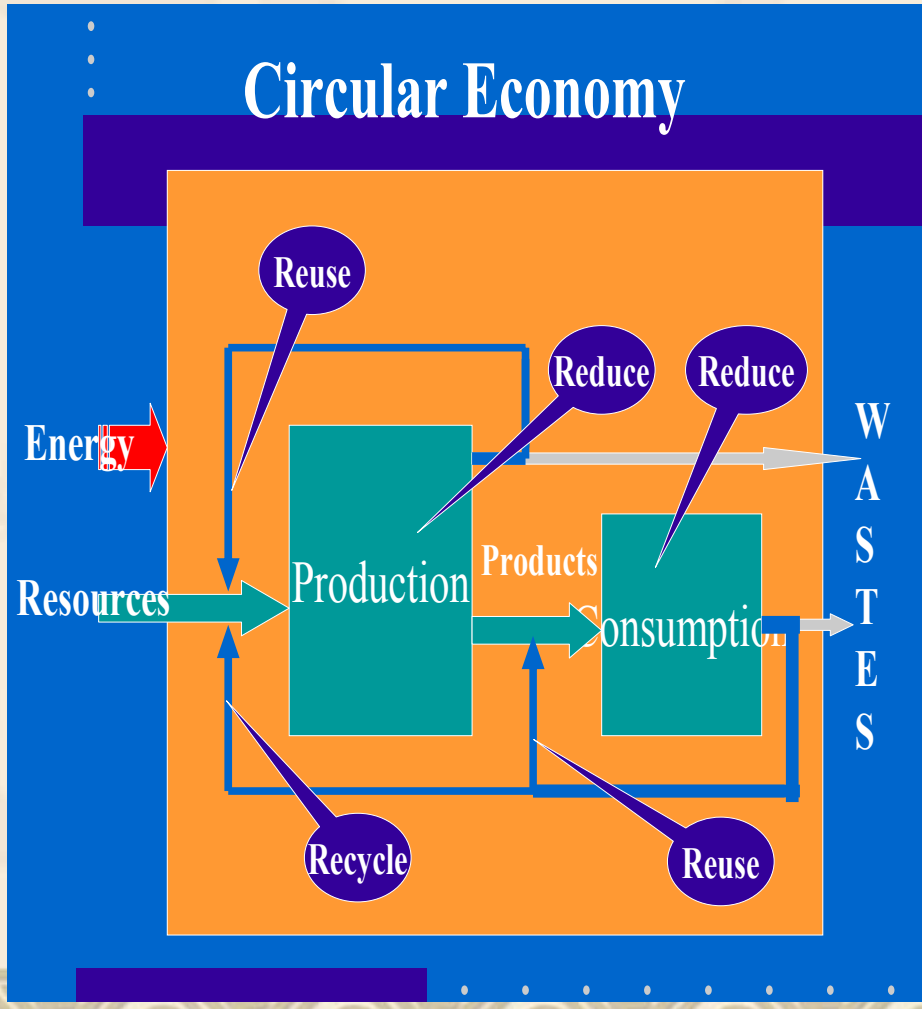
中国法制出版社

Circular Economy is a new stage toward sustainable development with pollution management and cleaner production as foundation.

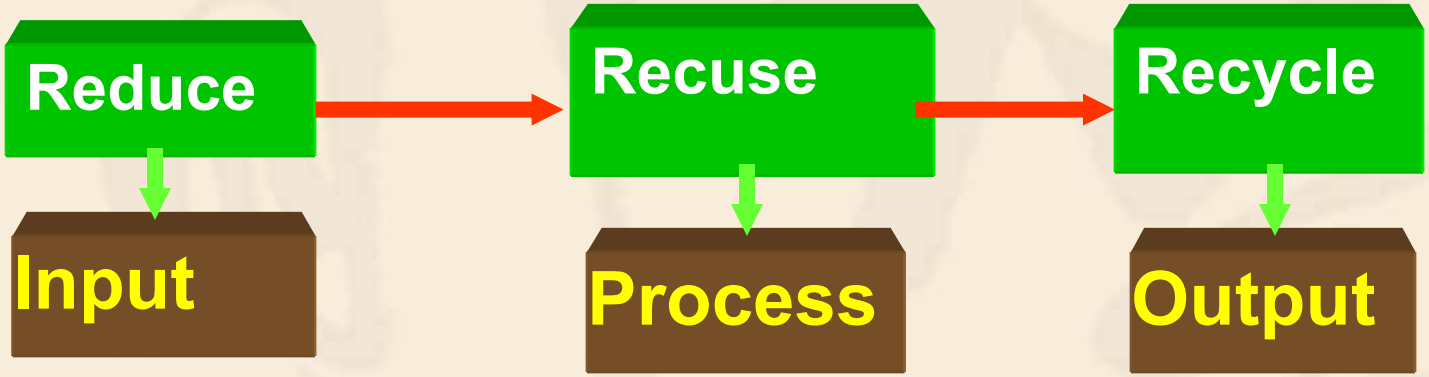
Characteristic of CE

Linear material Material Flow →
Close Loop Material Flow





Principles of Circular Economy



Reduce is the priority
Non-toxic and non-hazardous effects

Circular Economy at Three Levels

- Inside factories or enterprises----

  Cleaner production;

- A set of factories or enterprises----

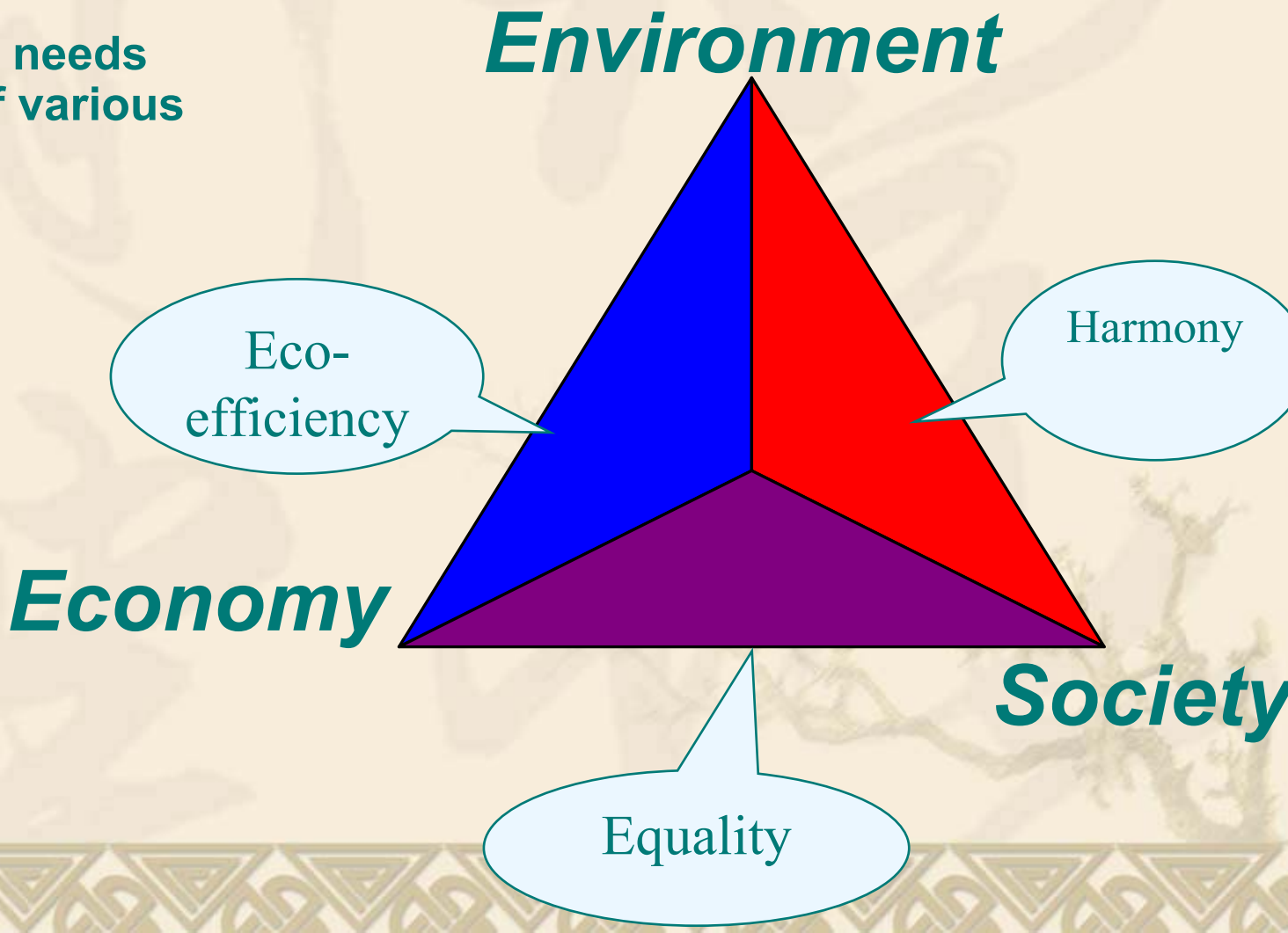
  Eco-Industrial Park;

- Production and consumption----

  Recycling oriented society..

Three Dimentions of Circular Economy---- Economy, Society and Environment

To implement CE needs cooperation of various sections and institutions.



Experiences in Shang Hai

1.Committee for coordinating urban development with environmental protection has been established.

2.Eco-industry and Eco-agriculture are encouraged.

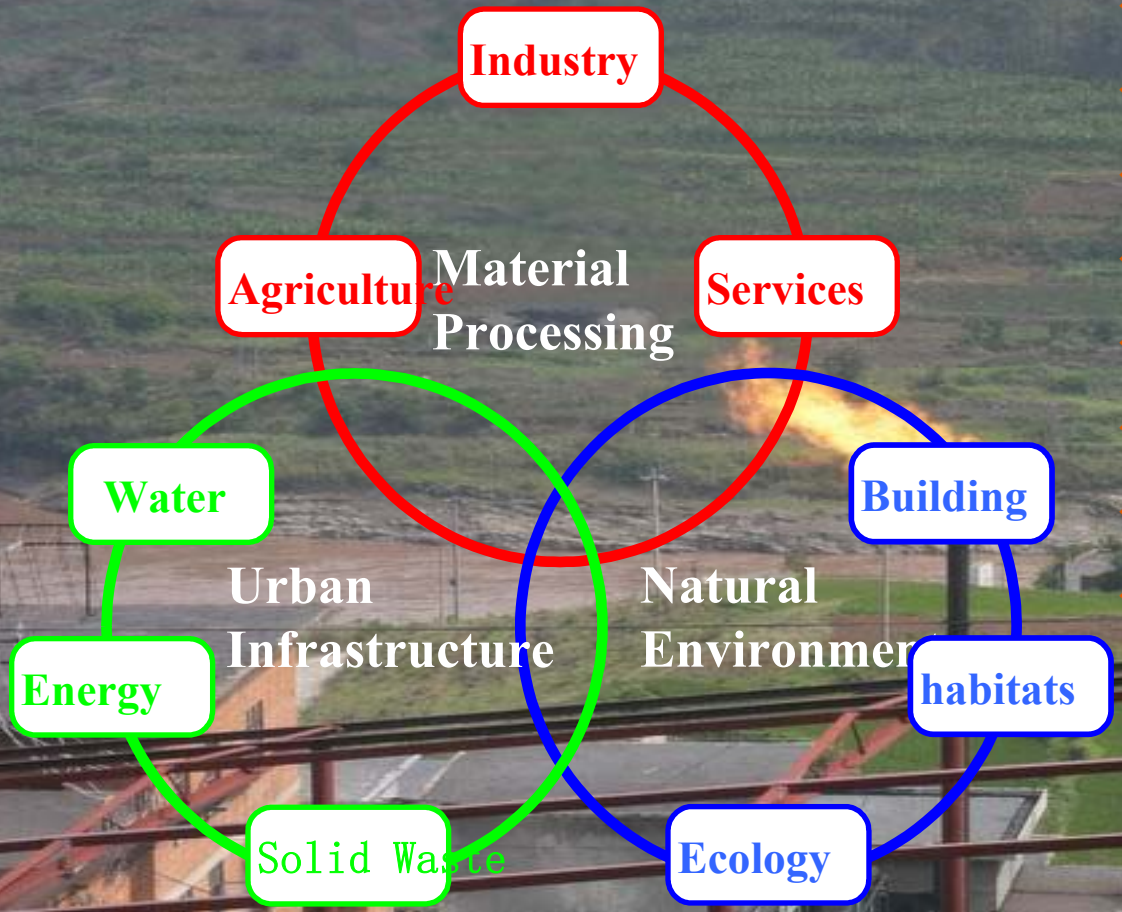
3.Success gained in implementing cleaner production.

4.Technology for reuse wasted foods as fertilizer and feeds have been applied.

Experiences in Liao Ning Province: To rejuvenate the old industrial base

- To increase resource utilization efficiency and create a sets of industries, enterprises and eco-parks based on CE principles.
- To build waste regeneration enterprises and create new economic growth opportunity.
- To encourage public participation and green consumption.

Experiences in Gui Yang City： Build Eco-city through The Implementation of Circular Economy



- Phosphorus industry
- Aluminum industry
- Chinese herbs
- Coal- chemical industry
- Eco-agriculture
- Urban infrastructure
- Green tourism
- Green Consumption

Jiangsu Province: Development of Circular Economy

To change industrial development pattern

Policy for supporting Eco-industries

Government - Enterprises - Public

More efforts are needed for urban sustainability

- Increase resources utilization efficiency
- Reduce pollution discharge
- Improving urban infrastructure
- Changing consumption pattern
- Building waste recycling and reuse system

Implementing circular economy

Thank you!