

**Resources, Environment and the
Global Energy Crisis:
*Needs and Policy Responses***

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Outline

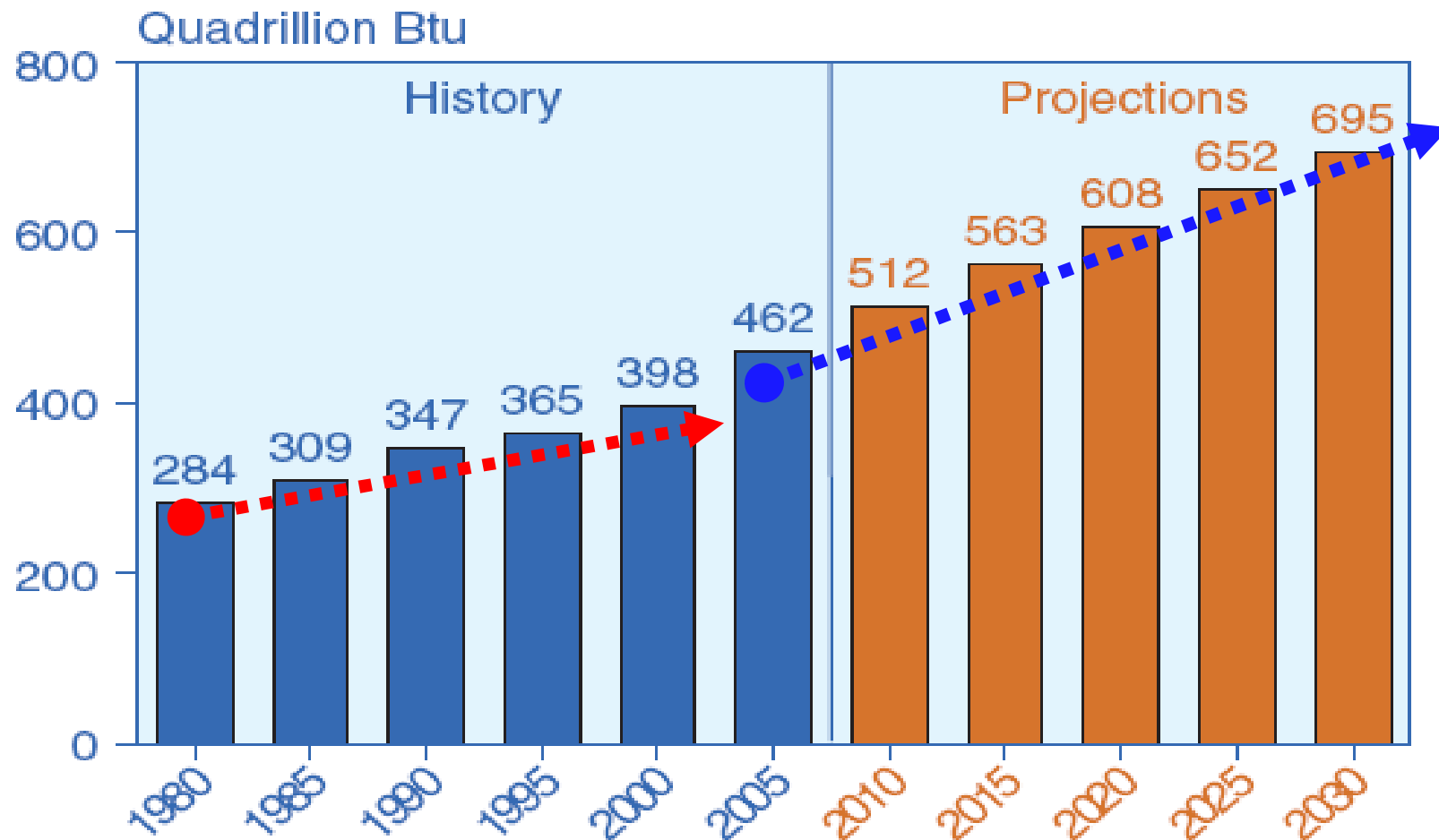
- ❖ 1. Energy Crisis and Sustainability
- ❖ 2. Sustainability Risk and Response
- ❖ 3. Global Consensus and Initiatives on CE
- ❖ 4. China's Policy Initiatives & Implementation
- ❖ 5. Policy Implication for Circular Agriculture

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1.1 Energy Situation for Economic Development (1)

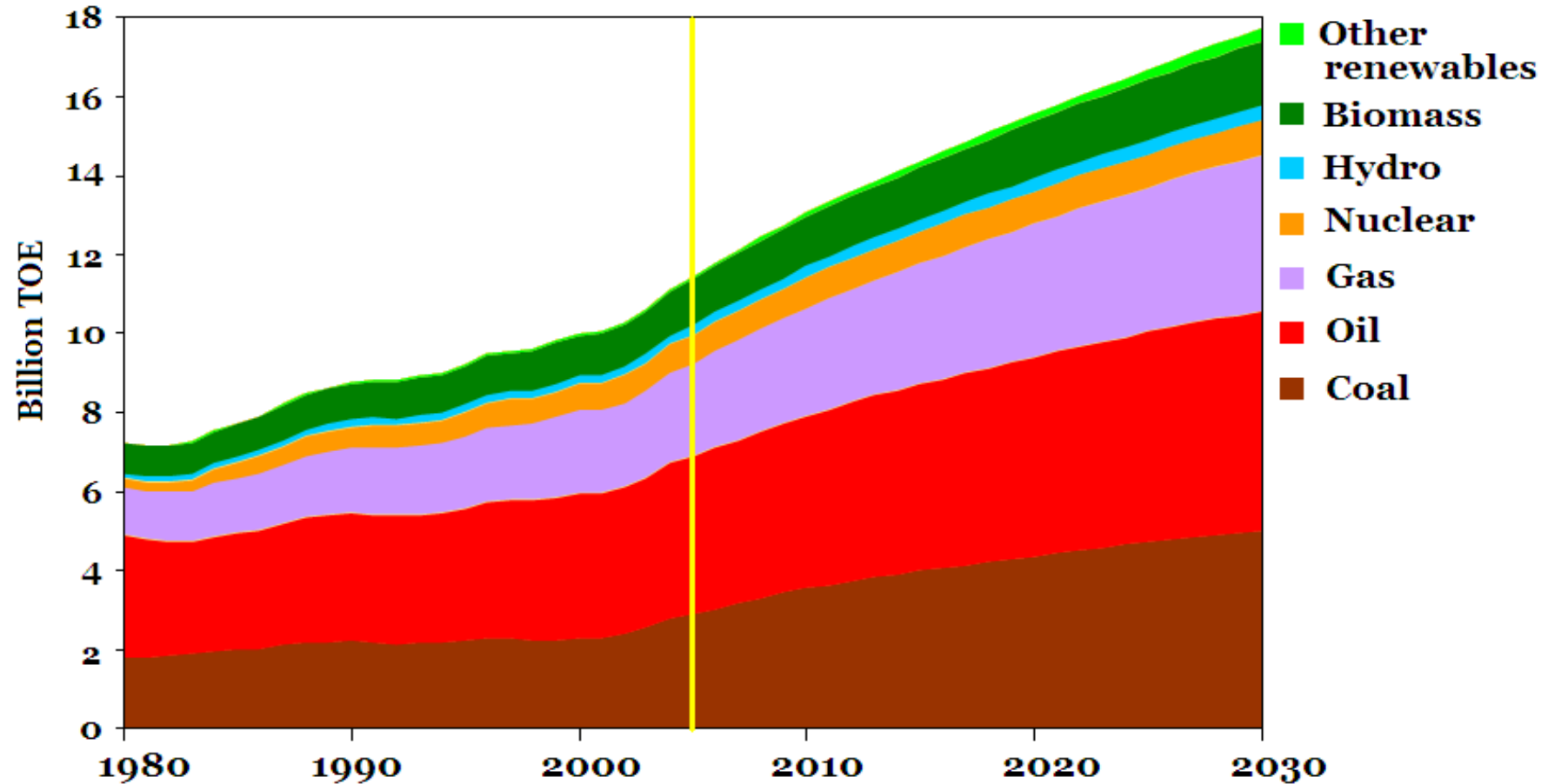
World Marketed Energy Consumption 1980-2030



Sources: Energy Information Administration (EIA), International Energy Outlook 2008

1.1 Energy Situation for Economic Development (2)

World Primary Energy Demand 1980 -2030



Sources: IEA: World Energy Outlook 2007

1.1 Energy Situation for Economic Development (3)

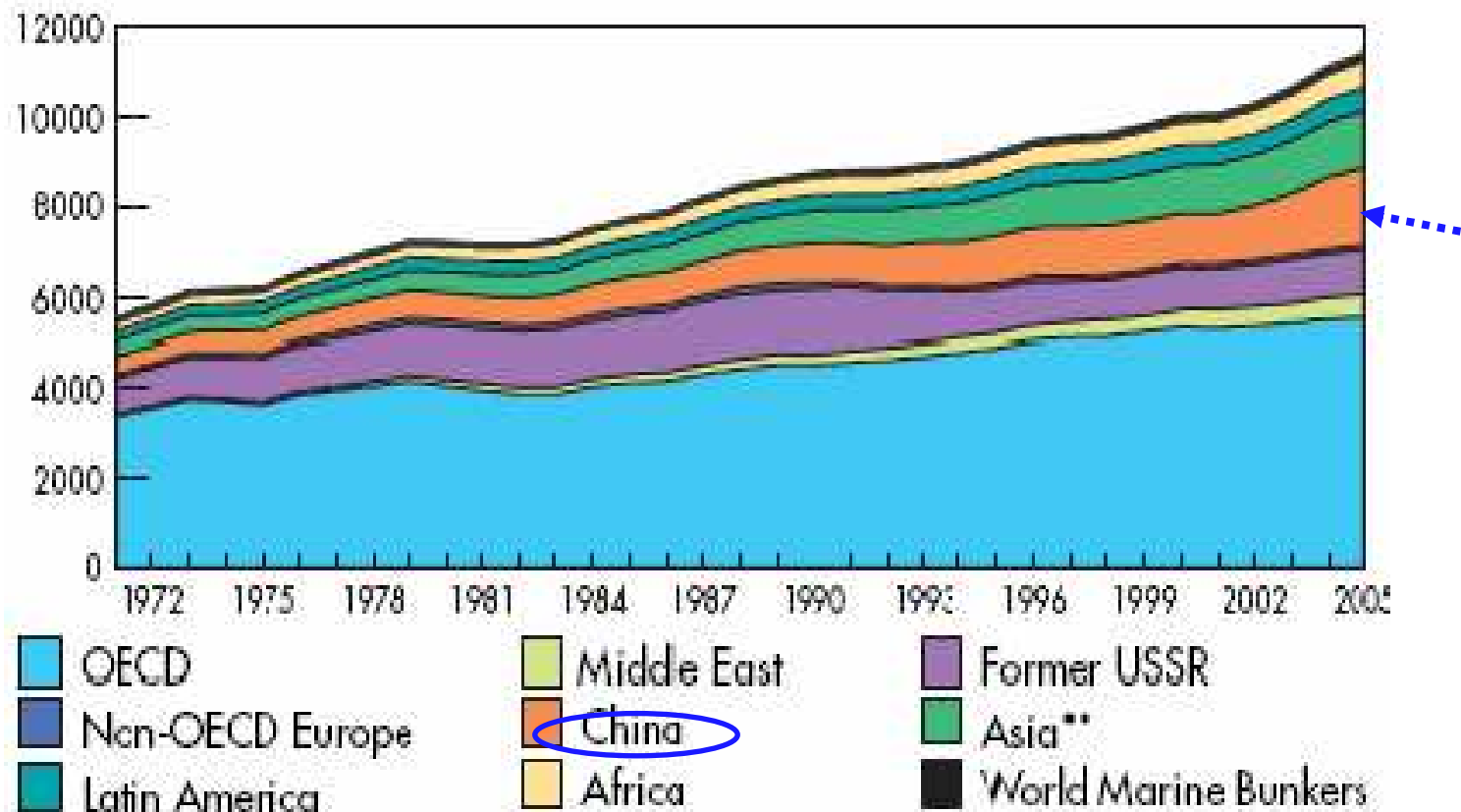
Projection of Global Demand for Energy 2050

year	Actual			growth rate 00-50
	2000	2025	2050	
World Primary Energy Demand (MTOE)	8,667	11710	14087	1.0%
G7 countries	3,500	4045	4407	0.5%
Other OECD countries	1,185	1242	1282	0.2%
Asian countries	1,575	3626	5157	2.4%
China	723	1868	2672	2.6%
Other Non-OECD countries	2,407	2796	3241	0.6%
World Crude oil Production (Mt)	3,550	4961	5326	0.8%
OPEC	1,453	3455	4662	2.4%
Non-OPEC	2,097	1505	664	-2.3%
World Primary Energy Prices				
Crude Oil ^a (US\$/bbl)	30.4	40.5	103.1	2.5%
Cude Oil (2002US\$/bbl)	31.6	23.6	36.8	0.3%
Steam Coal ^b (US\$/t)	36.0	67.8	81.0	1.6%
Steam Coal (2002US\$/t)	37.5	39.5	28.9	-0.5%
Asian LNG ^c (US\$/MBtu)	4.7	7.5	18.6	2.8%
Asian LNG (2002US\$/MBtu)	4.9	4.3	6.7	0.6%
World CO₂ Emission (100MtCO₂)	220	330	384	1.1%
Asia (include China, India)	52	117	161	2.3%

Sources: Hoshino, Yuko and Norihisa Sakurai, 2004, *The world energy supply and demand projections to 2050*, CRIEPI Y03027

1.1 Energy Situation for Economic Development (4)

Evolution from 1971 to 2005 of World Total Primary Energy Supply¹ by Region (Mtoe)



Source: International Energy Agency (IEA)

1.1 Energy Situation for Economic Development (5)

- **China's Energy Situation Overview**

- Currently **second-largest consumer** of primary energy in the world (~1000 MTOE) ;
- Also **second-largest energy producer**;
- Energy consumption was growing at 1.6 times of GDP growth rate in 2004;
- China's future primary energy demand growth: 2005-2020, average 3-5% as planned;
- Don't forget: 100 million more cars by 2030

1.1 Energy Situation for Economic Development (6)

- **Bottleneck: We've passed the Peak Oil Point**

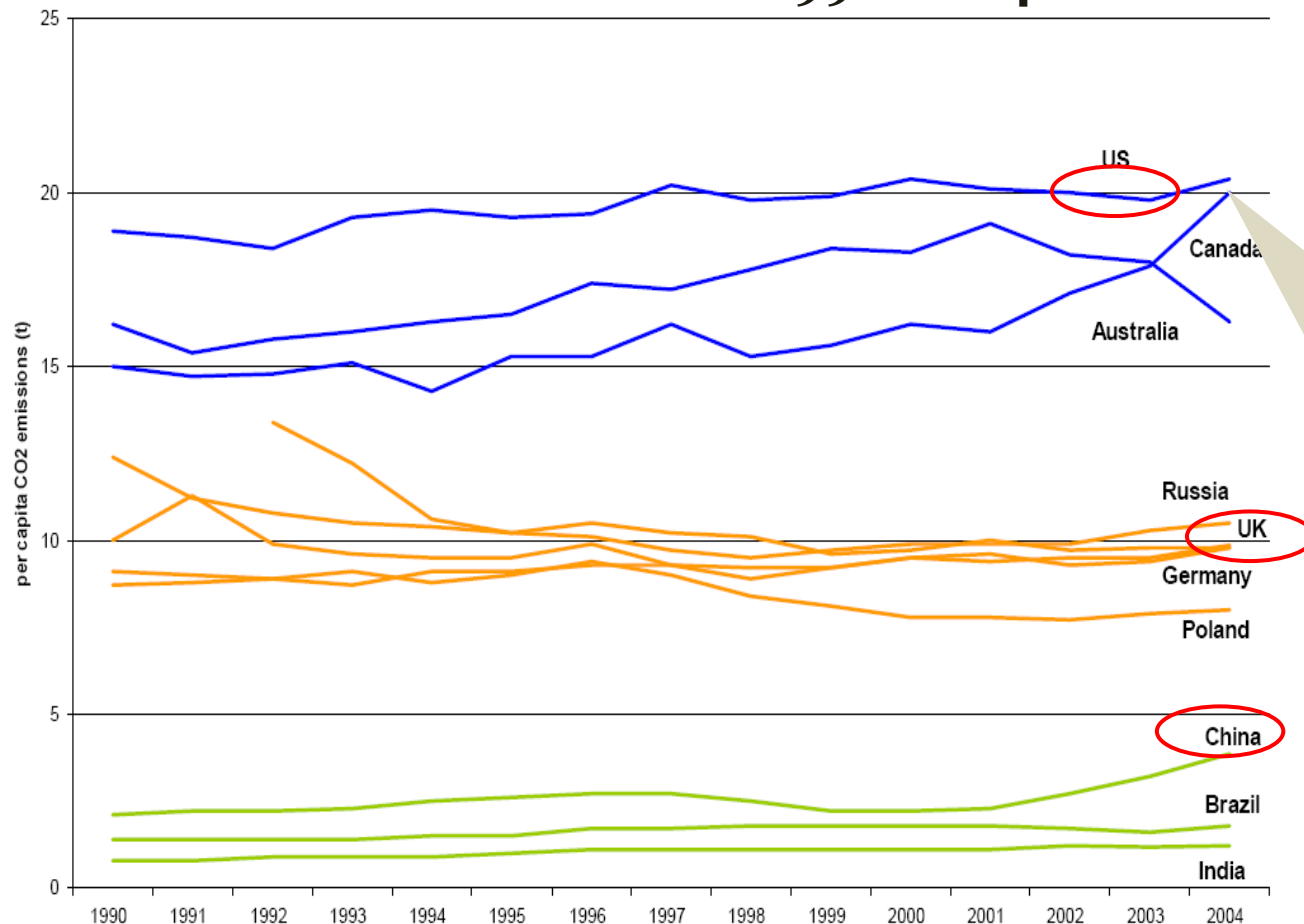
- *What's Peak oil?* A theory states that any finite resource, including oil, will have a beginning, middle, and an end of production, and at some point it will reach a level of maximum output (Hubbert, 1956);
- Today, **half** of the Earth's 2 trillion barrels of original endowment of oil has been rapidly used up.
- **We have passed the Peak Oil point.**
- Currently, consumption is **31 billion barrels per year** and is still increasing.

1.1 Energy Situation for Economic Development (7)

- **The Demand and Supply Gap**
 - the prospect of finding much more oil is dim.
 - Steep declines in some of the world's oil producing regions. E.g., US in 1971, North Sea in 1999, Mexico in 2006.
 - Declines will happen in rest of the world, for example, Middle East and Russia.
 - According to IEA, there will be a 12.5 mb/d (million barrels per day) gap between supply and demand.
- **The same thing is happening to other traditional energy sources.**

1.2 An Ecological Impact Perspective of Sustainability (1)

Total CO2 Emissions 1990-2004

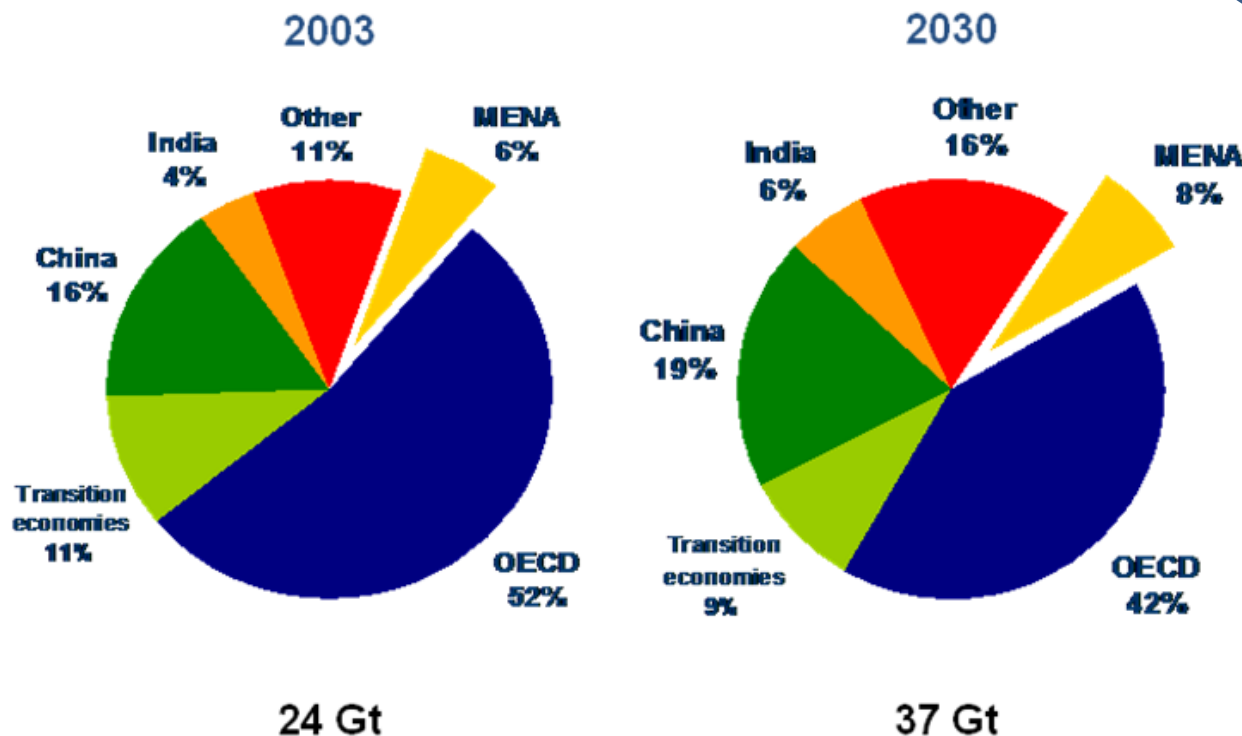


**Contemporary
mode of economic
development
cannot be an
ecological
sustainable one**

Source: US Department of Energy's Carbon Dioxide Information Analysis Center (CDIAC).

1.2 An Ecological Impact Perspective of Sustainability (2)

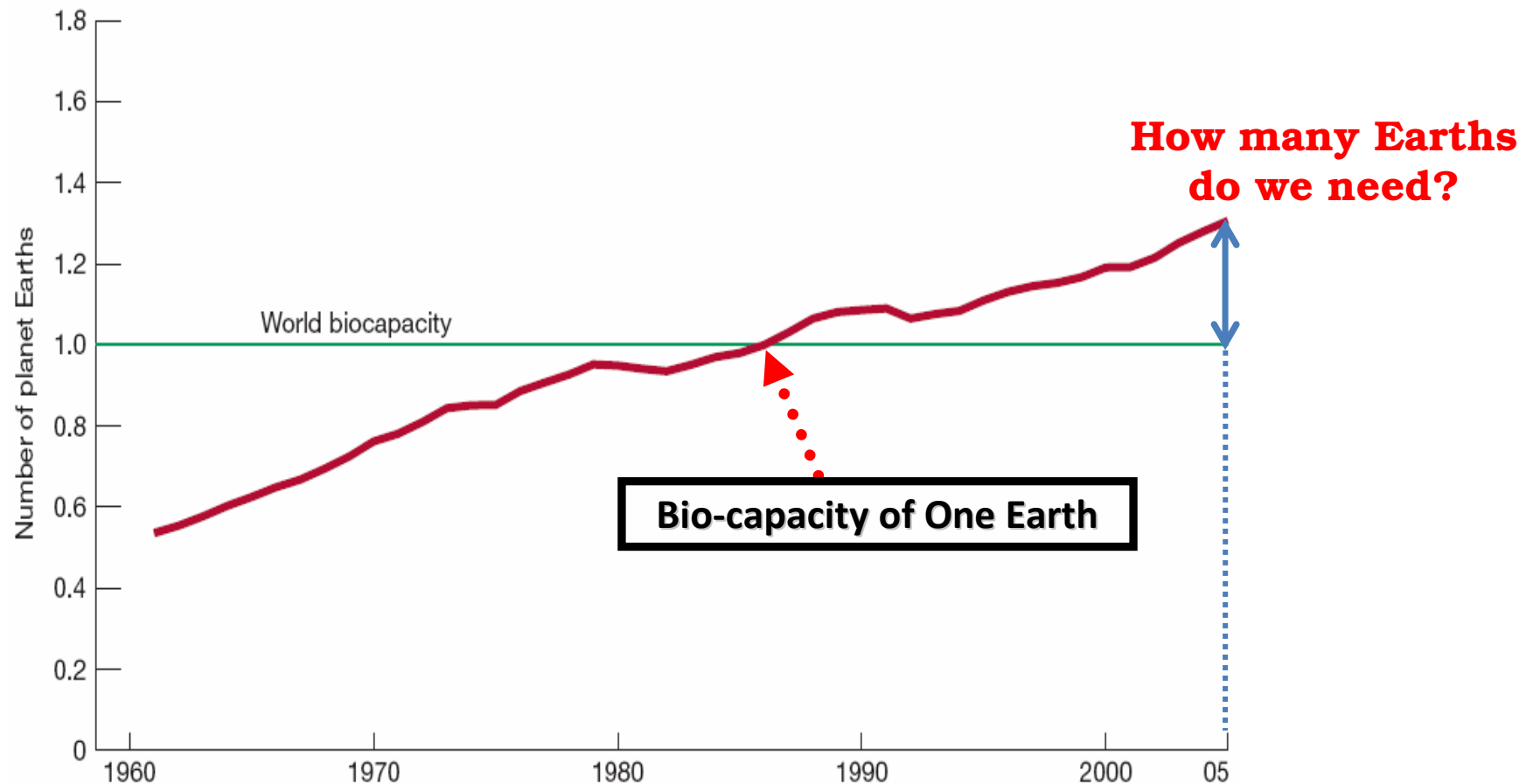
**Energy-related CO₂ Emission by Region
2003-2030**



Global energy-related emissions will probably grow by 50% between 2003 and 2030, with the bulk of the increase coming from developing countries.

1.2 An Ecological Impact Perspective of Sustainability (3)

Humanity's Ecological Footprint 1961-2005



Sources: Global Footprint Network

1.3 A Conclusion

At this level of ecological deficit, exhaustion of ecological assets and large-scale ecosystem collapse become increasingly likely.

We are facing some kind of

Sustainability Risk

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- ❖ 1. Energy Crisis and Sustainability
- ❖ 2. **Sustainability Risk and Response**
- ❖ 3. Global Consensus and Initiatives on CE
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2 Sustainability Risk and Response (1)

We Risk a Global Economic Collapse

- Energy constraint and ecological unsustainability cut off the momentum of development for both LDCs and DCs alike;
- Ecological degradation menace the well-being and existence of human kind;
- The over-population issues in LDCs make the situation even worse;
- The political risk concerning these issues is increasing;

This is a world-wide problem and no country is immune.

2 Sustainability Risk and Response (2)

What should be done?

- Policy initiatives towards sustainable development mode
 - Utilize new sources of energy: Coal, Nuclear energy, etc.
 - Utilize renewable Resources: Ocean, Wind, Solar, Bio-energy, etc.
 - Using energy wisely: promote circular production and consumption (for example, waste to energy), energy and resources conservation, etc.
- **CE is aiming at mitigating or removing the conflicts among economic growth, resources and environment.**

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3.1 Global Consensus on CE

Global Consensus : Kyoto Protocol

- The Kyoto Protocol, signed on 11 December 1997, entered into force on 16 February 2005, is an international agreement linked to the **United Nations Framework Convention on Climate Change (UNFCCC)**.
- The Protocol sets binding targets for 37 industrialized countries and the European community for reducing greenhouse gas (GHG) emissions.
- These amounts to **an average of 5% against 1990 levels over the five-year period 2008-2012.**
- 183 Parties of the Convention have ratified its Protocol to date.
- Difference between UNFCCC and Kyoto Protocol

3.2 Ideas of Circular Economy

CE: Basic Ideas

- Kenneth E. Boulding views the Earth as a spaceship (Boulding, 1965) - the resources of this planet are not infinite.
- The meaning of “Circular”: **3R: Reduce、Reuse、Recycle**
- Change traditional production and consumption pattern towards sustainable one.
- The idea of Circular Economy seems most hopeful and plausible in promoting sustainable development.

3.3 Global Initiatives on CE (1)

German's CE Practices

- **Policy Response towards CE**

- 1971, Environmental program of the federal government;
- 1972, Waste Disposal Act
- 1974, Federal Emission Control Act
- 1986, Waste Avoidance and Waste Management Act
- 1991, Packaging Ordinance
- 1996, Closed Substance Cycle and Waste Management Act (CSCWMA)
- 2000, Act on Granting Priority to Renewable Energy Sources
- 2001, Ordinance on Environmentally Sound Disposal of Municipal Waste

- **Establish Environmental Institutions**

- 1971, Council of Experts for Environmental Issues
- 1971, the Federal Environmental Agency

3.3 Global Initiatives on CE (2)

German's CE Practices

- **Guiding principles for Policy Initiatives**
 - Precautionary protection of the environment;
 - Causal responsibility (i.e. principle of polluter pays);
 - Co-operation;
 - Waste prevention/avoidance is first priority;
 - Re-use has the same priority as recycling;
 - Recycling on-site is prior to recycling off-site;
 - Reduction of toxicity is as important as the reduction of waste quantity;
 - Material recycling is as important as energy recovery;

3.3 Global Initiatives on CE (3)

Japan's CE Practice

- **A Perfect Laws system consists of 3 sub-groups of laws**
 - Basic law
 - Comprehensive law
 - Specialized law
- **Directly concerning Circular Economy among which, to name just a few:**
 - Law concerning the Rational Use of Energy
 - Fundamental Law for Establishing a Sound Material-Cycle Society
 - Law for the Promotion of Effective Utilization of Resources
 - Law for Promotion of Sorted Collection and Recycling of Containers and Packaging
 - Law for Recycling of Specified Kinds of Home Appliances
 - Law for the Promotion of the Utilization of Recyclable Food Resources
 - Law for the Recycling of Construction Materials
 - Law for the Recycling of End-of-Life Vehicles
 - Waste Management and Public Cleansing Law

3.4 What can we Learn from Practice?

What can we learn from these initiatives?

- There are different approaches and different strategies towards a circular economy. CE policy should be based on specific conditions of the country.
- Germany has the more holistic approach toward a sustainable society which as a matter of fact includes a Circular Economy, while Japan has a comprehensive law system.
- Circular Economy is beyond reduction or control of waste, it should cover the ecosystem management aspects like biodiversity, water protection, land use, and a society motivation.
- Policy mechanism such as law and regulation system and government intervention such as societal education can play crucial roles in the development of CE.

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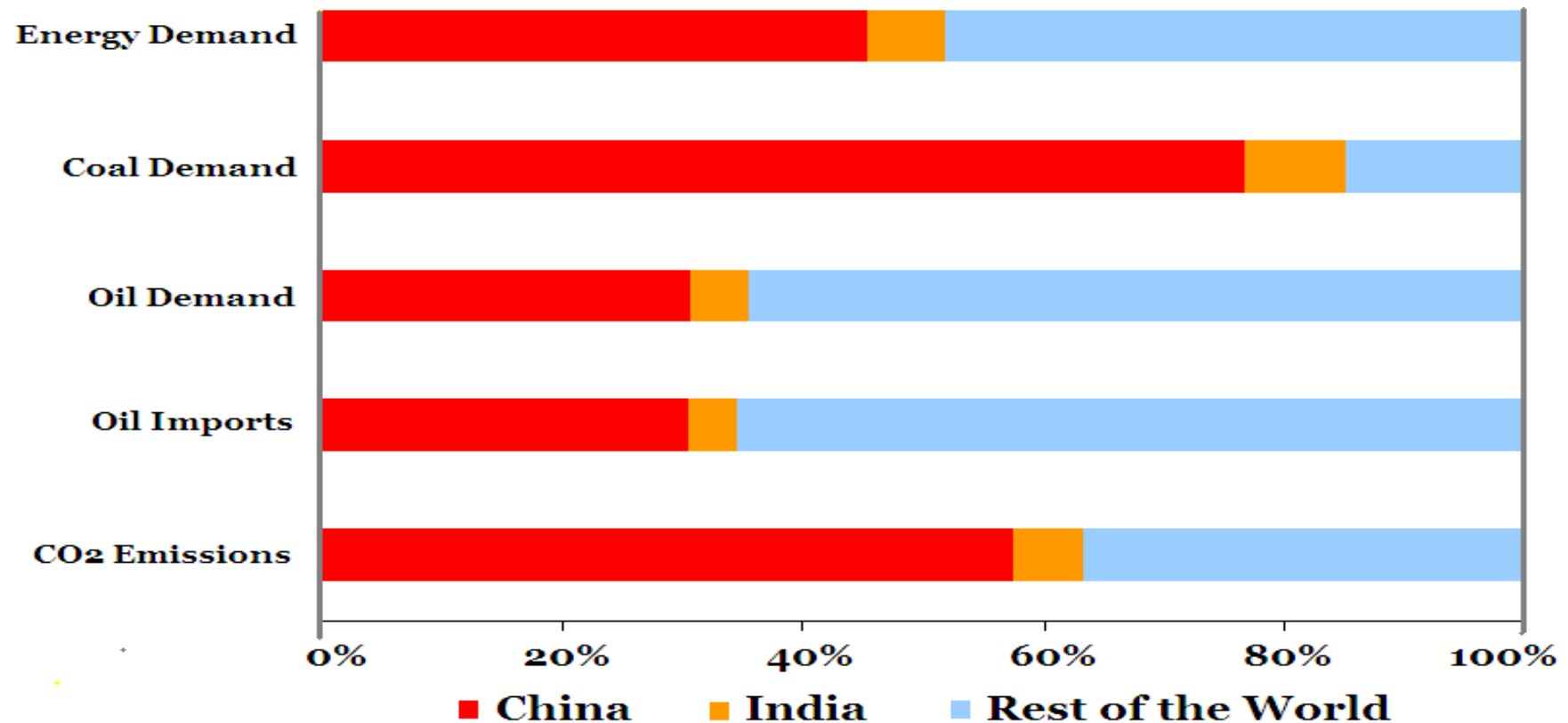
4.1 Motivations for China's CE Policy

Outstanding GDP growth in past decades



4.1 Motivations for China's CE Policy

A great part of the increase in global demand for energy and CO₂ since 2000.

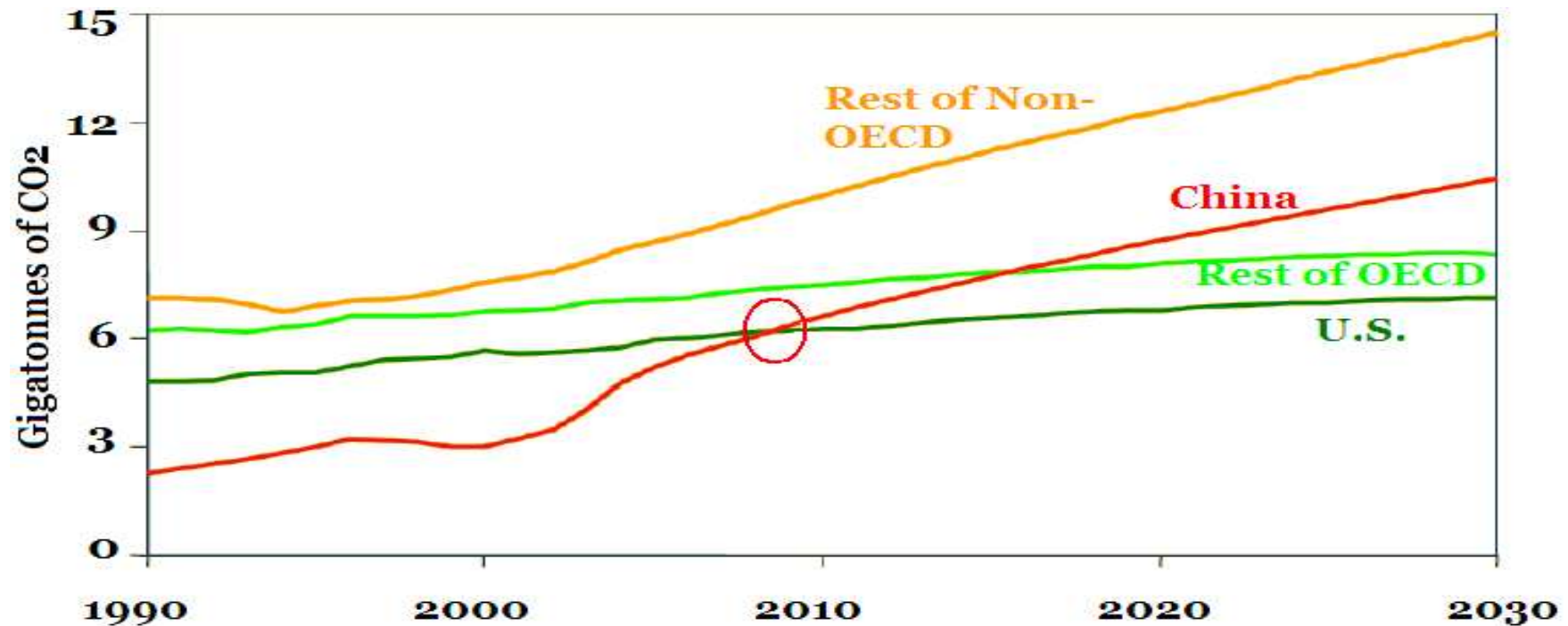


Sources: IEA: World Energy Outlook 2007

4.1 Motivations for China's CE Policy

- The energy-related ecological and environmental cost is also quite high.

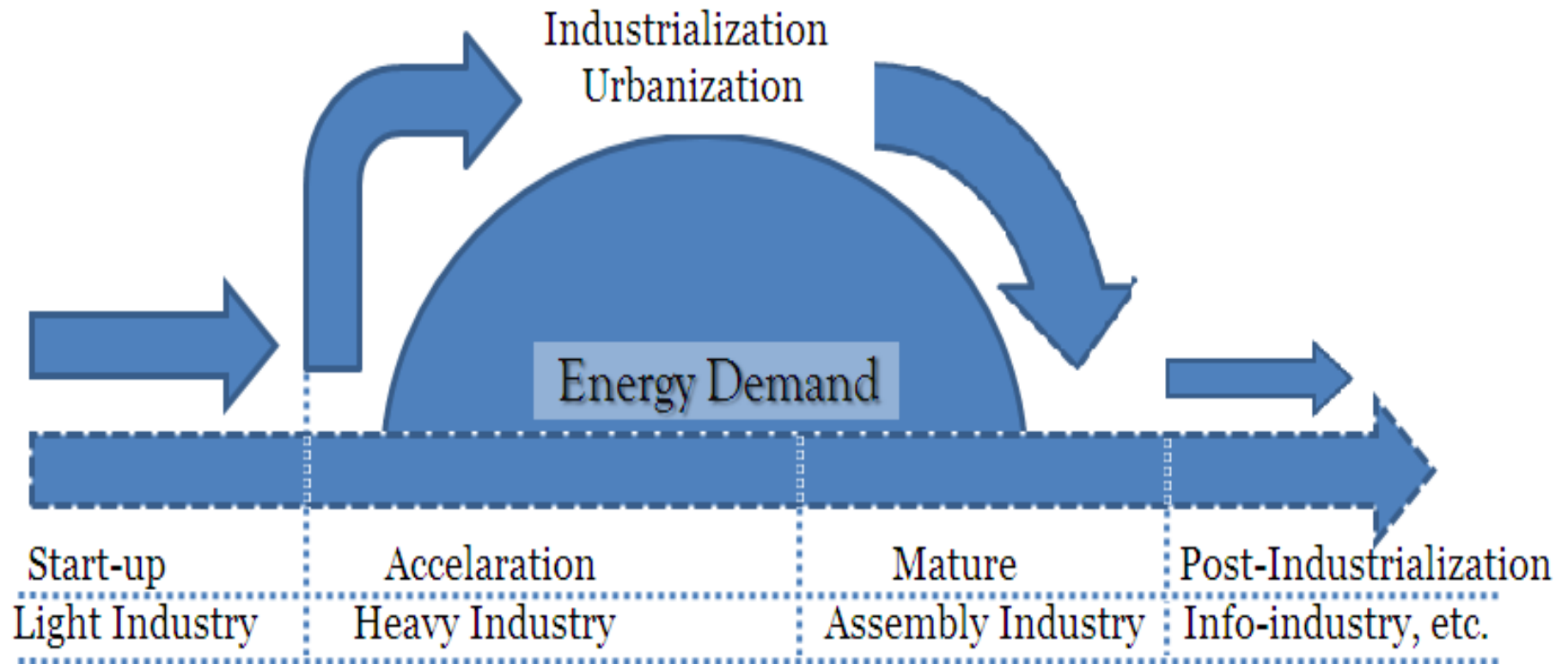
IEA Reference Scenario: Energy-Related CO₂ emission by Region



Source: IEA: World Energy Outlook 2006

4.1 Motivations for China's CE Policy

China is coming from Acceleration period of Industrialization into Mature and Post-Industrialization era of development, the demand for energy is still at the peak but there's an urgent need to and also a prospect of lowering it down.



Source: Drawn by Author.

4.1 Motivations for China's CE Policy

Following problems also need to be tackled along with its efforts in stimulate the economic engine.

- Meet a higher standard of living for a growing population
- Seeking for higher resource efficiency and lower pollution
- Improving industrial competitiveness upon the entrance into WTO
- Respond to the responsibility in the global effort regard climate change

All of above adds to the motivation for China to adopt a sustainable way of economic development.

4.2 Policies for China's CE Development

Strategies for CE development:

- Energy-saving and High-efficiency
- Diversified Development
- Environment Protective
- Technology Guidance
- International Cooperation

Objectives of 11th-Five Year Plan (2005-2010)

- Energy consumption per GDP decrease by 20%
- Total emissions of main pollutants decrease by 10%
- Forest coverage from 18.2% to 20%
- Comprehensive utilization of industrial solid wastes increase to 60%

4.2 Policies for China's CE Development

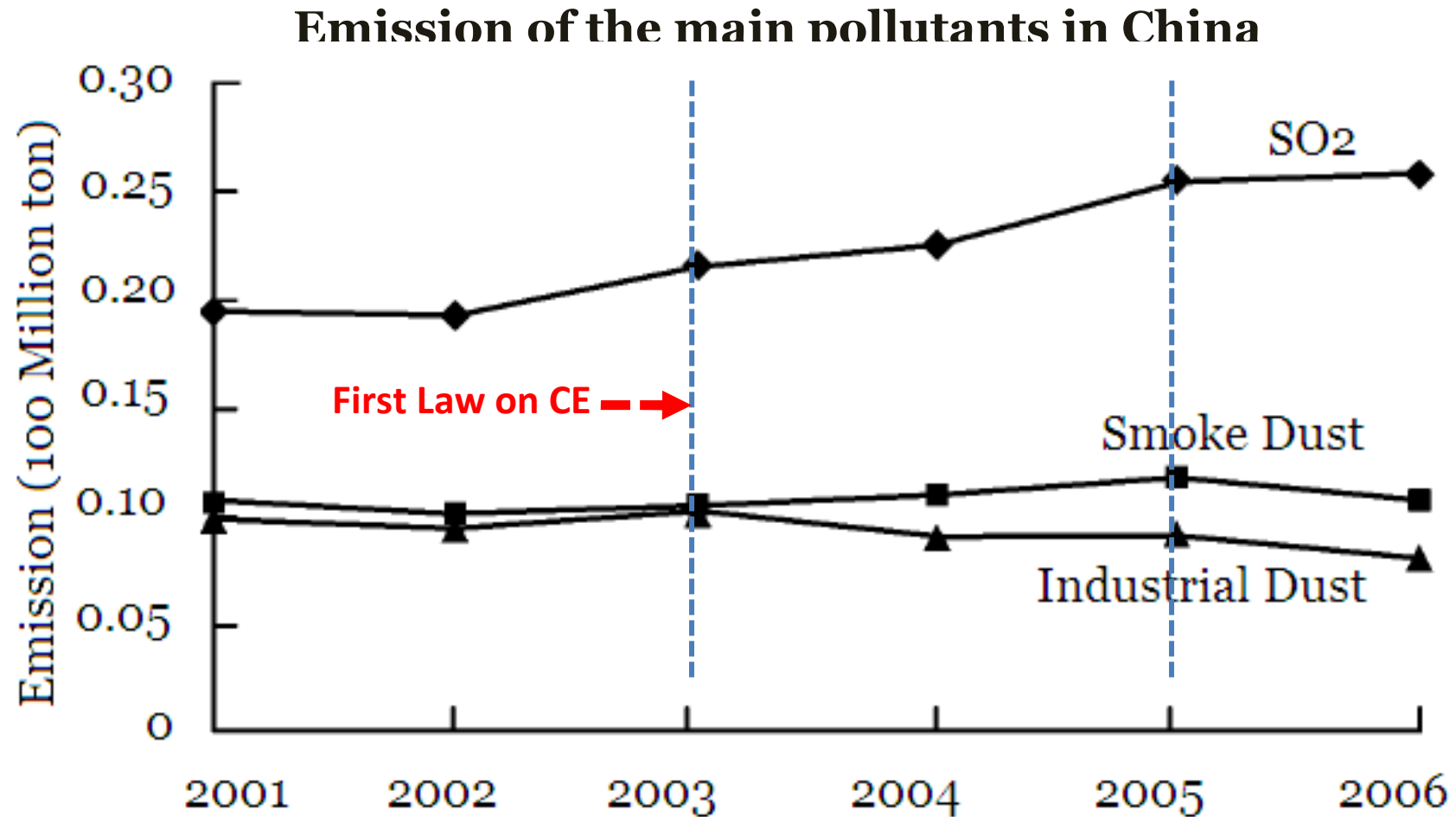
- **Major CE Laws and Regulations:**

- January 1, 2003, Law on Promotion of Cleaner Production
- September 1, 2003, Environment Impact Assessment Law
- 2004, amendment in Law on prevention and control of environmental pollution by solid wastes
- June 1, 2005, Renewable Energy Law
- October 2003, Suggestions on accelerating cleaner production
- October 1, 2004, Method for the Audit of Clean Production
- **Aug. 29, 2008 Circular Economy Promotion Law**

- **Major Initiatives in Recent Years:**

- “Small-sized circulation”: Cleaner production at 5000 enterprises nationwide
- “Medium-sized circulation”: About 20 national pilot eco-industrial parks
- “Regional-level circular economy”: 8 national pilot regions, including 2 provinces and 6 cities

4.2 Policy Effect : Still a Long Way to Go



Sources: China Statistical Yearbook 2001 -2007

4.3 Challenges for China's CE

- What is circular economy?
- CE vs. China's economic development stage: the energy bottleneck;
- The inertia in contemporary economic development mode;
- Should we still welcome certain INVESTMENTS?
- The lag-behind in laws system and the stimulation;
- The lack of Green GDP Accounting systems and shortsighted government activities;
- The CE technology R&D and extension issues;
- The public awareness.

4.3 Challenges for China's CE – Response.

- Some Holistic Point of View beyond 3R
 - *CE is beyond CP, Circular Use of Resources or Waste Management.*
 - *CE should be sustainable: both circular and **economy**.*
 - *CE itself is not the end.*
- A Chinese-way of Circular Economy needs to be explored by theorists and policy makers;
- What the government should do?

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5.1 CA & CE

CA should take an important position in national CE development policy consideration. The development of CA provides a chance for transformation to a sustainable economic development, which is one of the major initiatives in recent rural development policies.

- **Within the CE framework, Circular Agricultural Economy or Circular Agriculture has multiple meanings:**
 - Clean Production
 - Minimization of Emission
 - Waste Utilization
 - Circular Consumption

5.2 CA & Energy Issues (1)

- **As for today's energy and environmental situation, we can see that Circular Agriculture (production) has a lot to do:**
 - First, CA provide the supply-side solutions to the energy crisis;

Resource characteristics of energy carriers		
	Depletable	Non-depletable
Renewable	Biological Energy Resources	
Non-renewable	Natural gas Mineral oil Coal Uranium	Tidal power Solar energy Hydro-energy Wind energy

Source: *Deutsche Bank Research*, December 2, 2004

5.2 CA & Energy Issues (2)

- **As for today's energy and environmental situation, we can see that Circular Agriculture (production) has a lot to do:**
 - Second, CA offers the mitigation to eco-degradation effect of economic development;
 - Maximization of energy and resources efficiency;
 - Reduce chemicals and fertilizer use;
 - Minimization of waste through integrated production process;
 - Improve water and air quality;

5.3 Three Levels of CA policy Objectives (1)

- **At the Micro level:**

- Encourage farmers to seek higher efficiency through the three Rs of CP;
- Reduce consumption of resources;
- Reduce emission of pollutants and waste;
- Reuse resources;
- Recycle by-products;
- etc.

5.3 Three Levels of CA policy Objectives (1)

- **At the Meso level:**

- Encourage partnership between agricultural firms and government;
- Encourage cooperation in CA R&D and extension services;
- Reuse and recycle resources within industrial parks;
- Reuse and recycle resources and by-products within clustered or chained industries;
- etc.

5.3 Three Levels of CA policy Objectives (1)

- **At the Macro level:**

- Integrate Regional Agricultural Production and Consumption Systems
- Circulate resources among industries and rural-urban systems
- Development of municipal or regional by-product collection, storage, processing, and distribution systems.
- Stimulate regional and international cooperation;
- Ensure biodiversity using market/market-oriented instruments;
- etc.

Thank you!