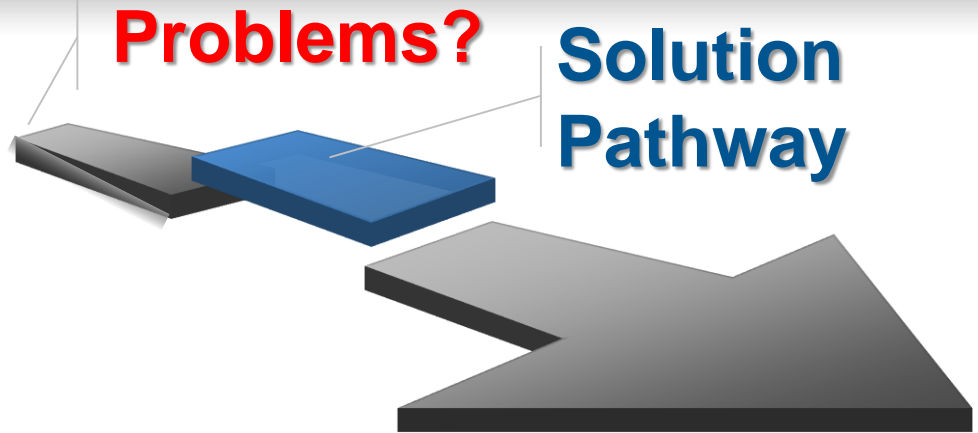
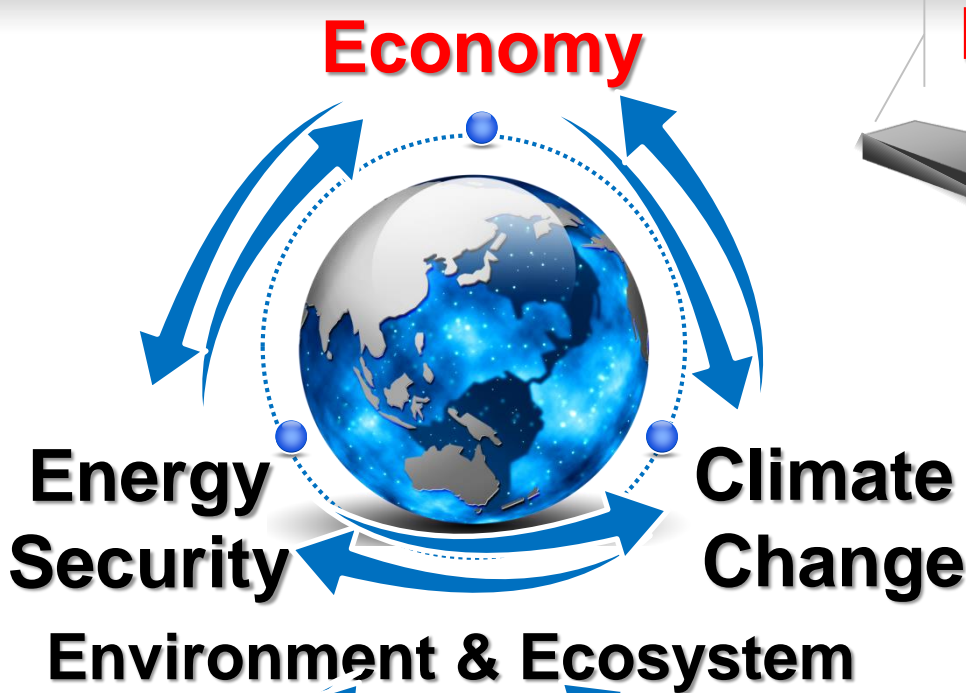


# The Core of Arguments ?



**Resources (Water)**

# Methodology Problems!



## Econometrics Model

- time series
- fitting method
- coefficient of elasticity
- Sector analysis method
- I-O analysis
- grey system theory
- etc.

### There are two kinds of traditional methods

- econometric method based on trend extrapolation and curve fitting.
- optimal method based on objectives and constraints.



## Optimizing Model

- CGE
- MARKAL
- ANSWER-TIMES
- MESSAGE
- EPPA
- AIM -IPAC
- End-Use
- etc.

## Econometrics Model

- Advantage** : Suitable for short-term forecast analysis , The precision of projection is easy to be controlled.
- Disadvantage**: When the configuration is changing, the result of projection will have great deviation , thus the limitations in long-term forecasting is very obvious.

## Optimizing Model

- Advantage** : Suitable for regional planning of energy supply, cost minimum;
- Disadvantage**: Need too many exogenous variables, such as the rate of economic growth , the coefficient of production, and demand elasticity, that greatly increased the uncertainty of the model , and the model is closed, like “a black box”. Other staff is very difficult to understand its internal structure but the model builder. The model results is difficult to verify. Therefore the biggest limitation is not open enough.

# Methodology of China 2050 Pathway



Department of Energy & Climate Change

The UK 2050 Calculator



U.S. Energy Information Administration

STEO, AEO, IEO  
**NEMS** system

SPF中英繁荣基金

中国2050能源经济发展路径分析系统  
China 2050 Pathway



International Energy Agency

Working



ETSAP

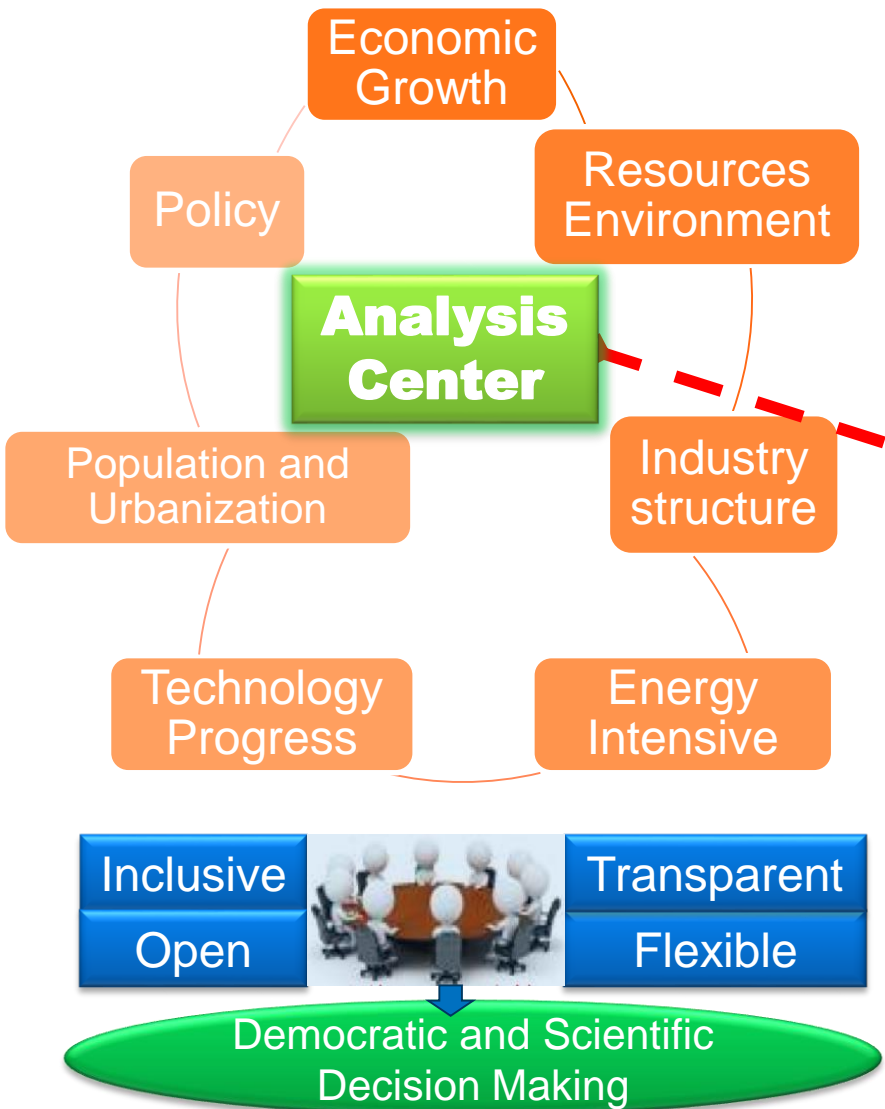
Energy and clean energy

ENERGY TECHNOLOGY SYSTEMS ANALYSIS PROGRAM

# Methodology of China 2050 Pathway



# Methodology of China 2050 Pathway



Forum See implications China 2050 Pathways (switch to Chinese version) Example Pathways Share

**Final energy demand**  
Million tons of coal equivalent

**Primary energy supply**  
Million tons of coal equivalent

**China greenhouse gas emission**  
Giga tons of CO2e

Category	Option 1	Option 2	Option 3	Option 4
<b>Industry</b>				
(i) Heavy industry output growth	A	B	C	
(ii) Rate of energy consumption decline	1	2	3	
(iii) Proportion of CCS usage	1	2	3	
(i) Strategic industry output growth	A	B	C	
(ii) Rate of energy consumption decline	1	2	3	
(i) Light industry output growth	A	B	C	
(ii) Rate of energy consumption decline	1	2	3	
<b>Transport</b>				
(i) Inner city transport demand	1	2	3	4
(ii) Travelling methods	A	B	C	D
(iii) Usage of green vehicles	1	2	3	4
(i) Inter city transport demand	1	2	3	4
<b>Renewable energy</b>				
Onshore wind energy	1	2	3	4
Offshore wind energy	1	2	3	4
Hydroelectricity	1	2	3	4
Geothermal energy	1	2	3	4
Ocean energy	1	2	3	4
PV solar energy	1	2	3	4
Solar thermal energy	1	2	3	4
Solar water heaters	1	2	3	4
<b>Nuclear</b>				
Nuclear power	1	2	3	4
<b>Thermal power</b>				
(i) Natural gas electricity generation	1	2	3	4
(ii) Greening of coal power	A	B	C	D
(iii) Rate of CCS usage	1	2	3	4
<b>Bioenergy</b>				
Geological sequestration	1	2	3	4
Power storage plants	1	2	3	4
Forestry carbon credits	1	2	3	4

## 2050 Calculator China 2050 Energy Pathway Simulator

# China's economic and political situations are undergoing periodical transition

The demand structure are changing

- Resident : The transition from survival to the pursuit of quality life.(standard)
- Pay attention to **environmental protection** and public services ( Education, medical, pension etc. )
- Pay attention to social fairness and justice and other social order.

## ***Economic Growth Quality***

The driving force of economic growth and mechanism of supply is changing

- In the past **30** years: by the cheap environmental resources, "labour force from rural to urban" , "agriculture to industry" , "domestic to international"
- technology innovation, optimize industrial structure, enhance the vitality of enterprises.

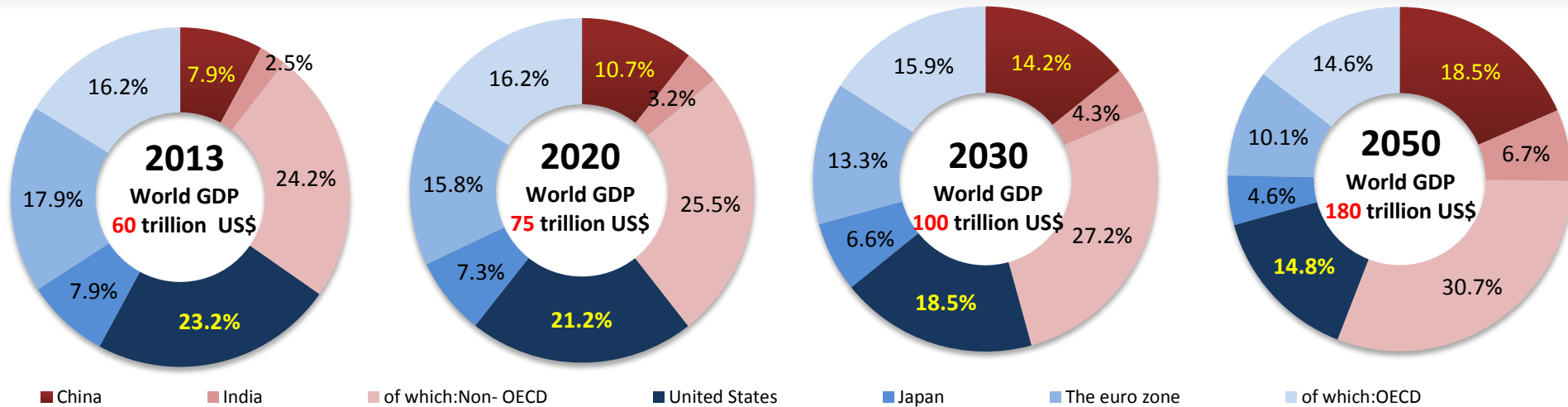
## ***Environment and Ecosystem***

Began to pay more attention to global governance and global energy governance

- From the international market bystander and user become the international market maker.
- Begin to participate in the international affairs more widely and deeply.

New Normal  
New Era

# The position of China in the world economy



## Conservative Estimation and Prediction

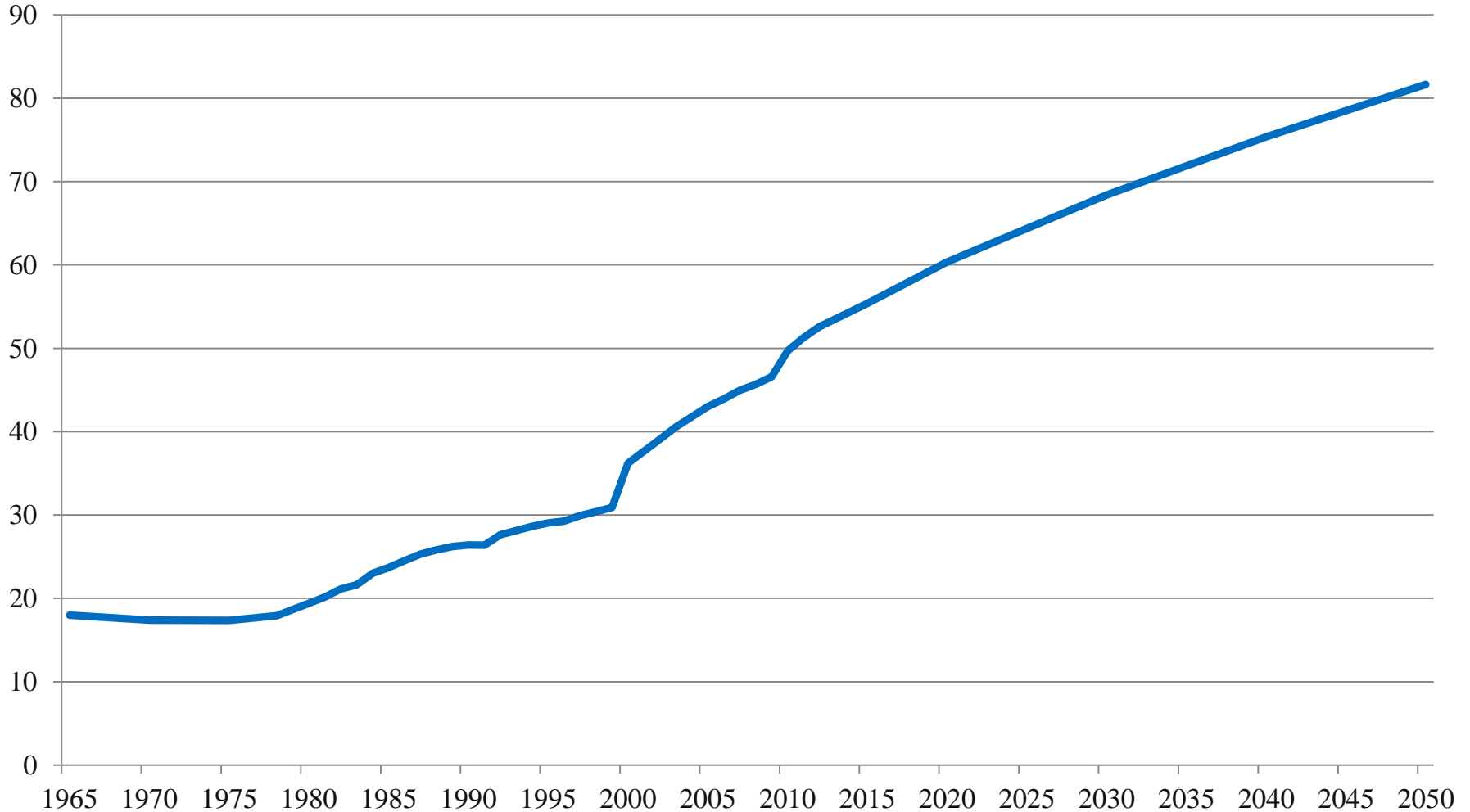
The average annual growth rate of GDP	2008-2020	2013-2020	2020-2030	2030-2050	2020-2050
China	8.0%	7.3%	6.0%	4.5%	4.2%
India	7.0%	6.5%	6.1%	5.7%	5.5%
Russia	3.5%	4.0%	4.5%	3.5%	4.0%
Brazil	3.5%	3.5%	3.2%	2.5%	2.8%
Japan	1.2%	1.5%	2.0%	1.0%	1.3%
United States	1.5%	2.0%	2.5%	2.0%	2.5%
The world average	2.6%	3.0%	3.5%	3.5%	3.0%

- In 2020, China GDP will be half of US GDP
- In 2030, China GDP will outstrip the world average;
- In 2040, China GDP will outstrip US GDP ;
- In 2050, per capita GDP will exceed the OECD average level.

Source: China Energy Outlook 2015(draft)

# The national urbanization rate

The Urbanization Rate (%)

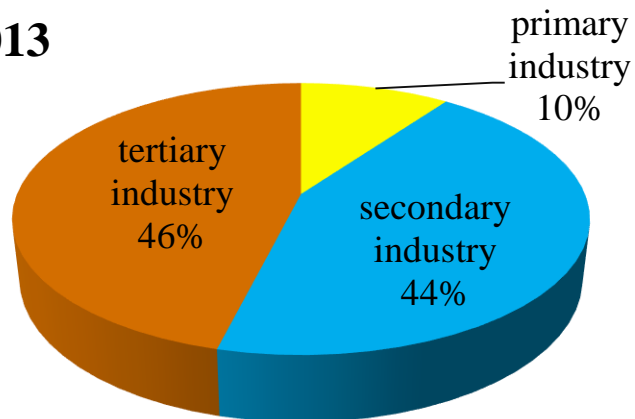




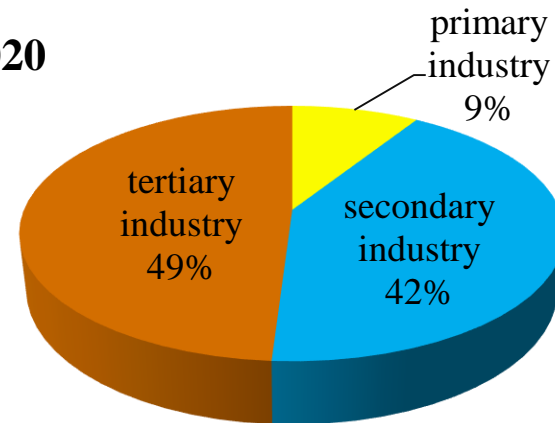
# Industrial Structure(Industrialization)



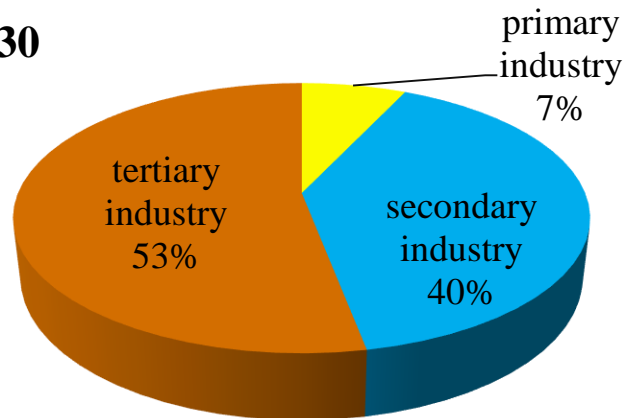
**2013**



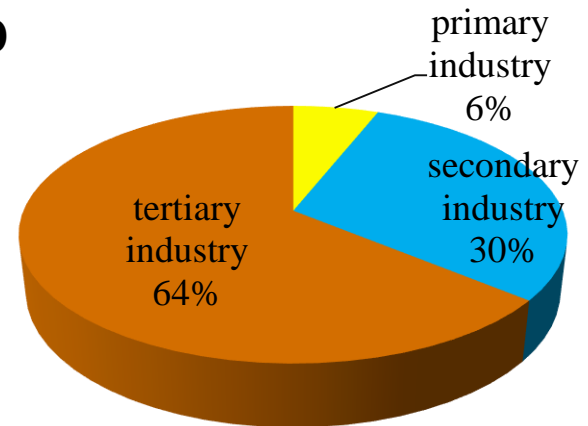
**2020**



**2030**



**2050**



# Trends of Global Energy Demand Pattern

