

Research on Establishing Forest Carbon Market in the Chinese Context

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Structure

Potential and Opportunities of Carbon Market

- Supply & Demand

Environmental Policy Thinking on How to Support the Establishment of National Level Carbon Market

- Stimulation and regulation of supply & demand
- Avoiding leakage
- Compensation for Ecological Services

Supply Side Analysis

- Factors affect carbon supply
 - Tree planting cost
 - Transaction cost (Monitoring, Verification, etc)
 - REDD

Supply Side Analysis

- The potential Carbon Supply Curve
 - Tree planting cost based on the county-level data
 - classified into 5 categories.
 - The total un-stocked forest land since 1990 is 428,217,387 mu

Ratio	Range (Yuan/Mu)	Level
42%	100~264	1
36%	265~485	2
14%	486~859	3
5%	860~1500	4
3%	1501~4025	5

Li Nuyun 《 Forestry Carbon Sequestration in China》 ,P154,156

Supply Side Analysis

Marginal cost for forestry carbon sequestration

- Cost components : tree planting cost=timber cost+ carbon cost
- Ratio of cost=Ratio of revenue

$$MC_{carbon} = \frac{C_{plant}}{Y_{yield}} \times \frac{P_{carbon} \times Y_{ytc ar}}{P_{timber} + P_{carbon} \times Y_{ytc ar}} + TC$$

Where

C_{plant} Tree planting cost (US\$/Mu)

Carbon sequestration of mature forest, 2~3.3 ton/Mu

Average international forestry carbon price , US\$6.8/ton

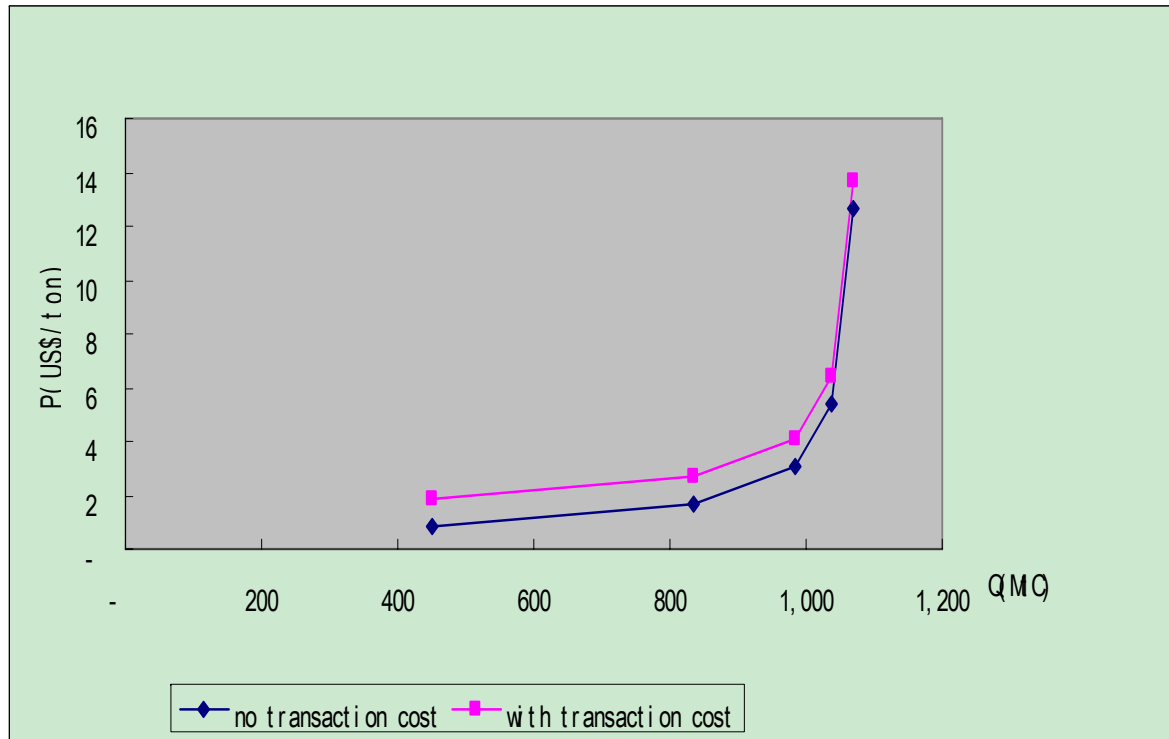
Price of timber, assume 1000 yuan/ M^3

$Y_{ytc ar}$ Carbon sequestration per unit timber, 1.83 ton/ M^3

TC

Transaction cost, differs with project scale, assume US\$ 1/ton

Supply Side Analysis

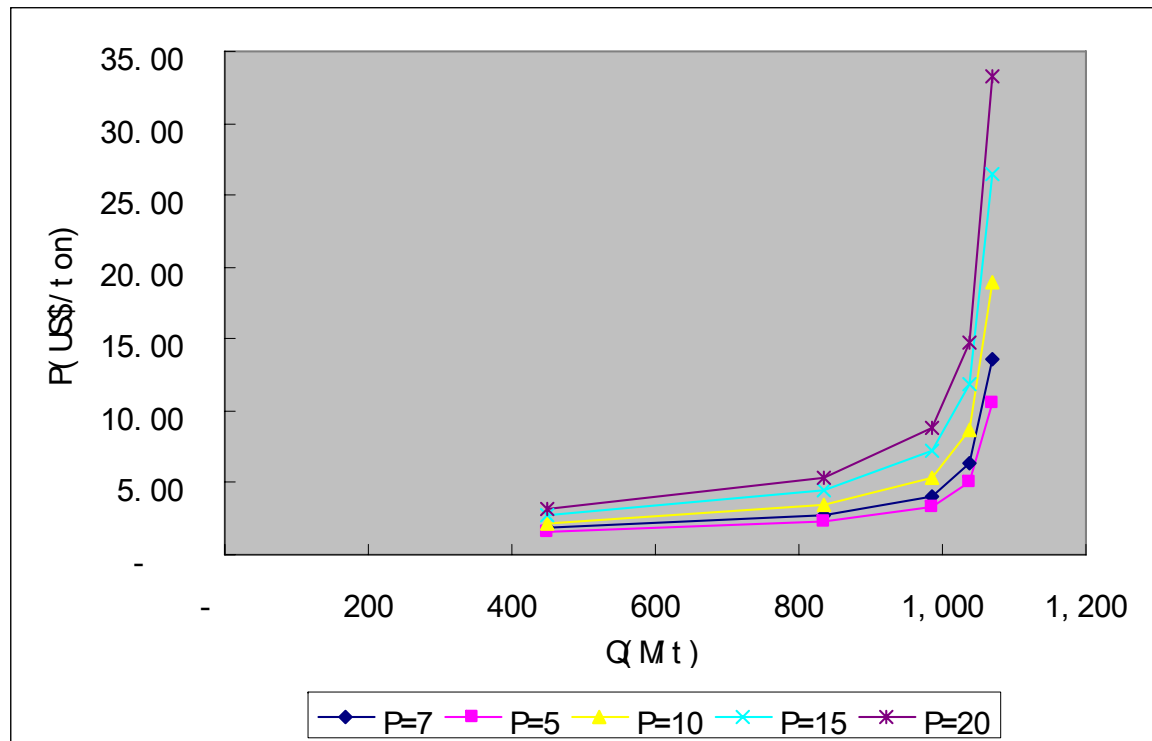


China's potential forestry carbon supply curve

Supply Side Analysis

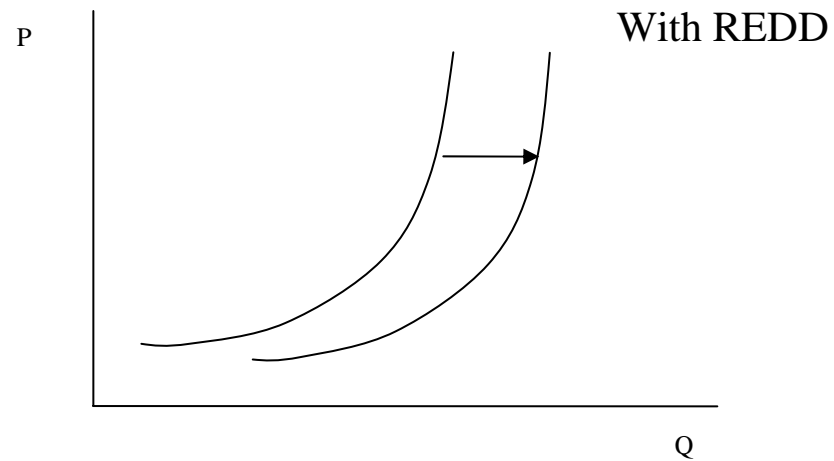
- Sensitivity analysis

price does not have a much impact on forestry carbon supply.



Supply Side Analysis

With REDD, carbon supply will increase.



Supply Side Analysis

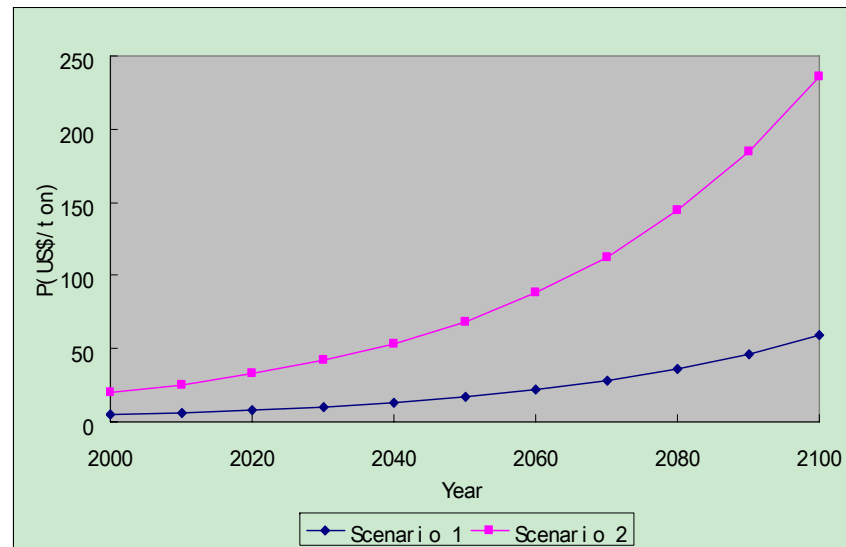
- Dynamic Model

- Global Timber Market Model (GTM)

- Baseline : when there is no carbon price

- Scenario 1 : carbon price set at \$5 in 2000 and increases 2.5% annually

- Scenario 2 : carbon price is set at \$20 for 2000 and increases 2.5% annually

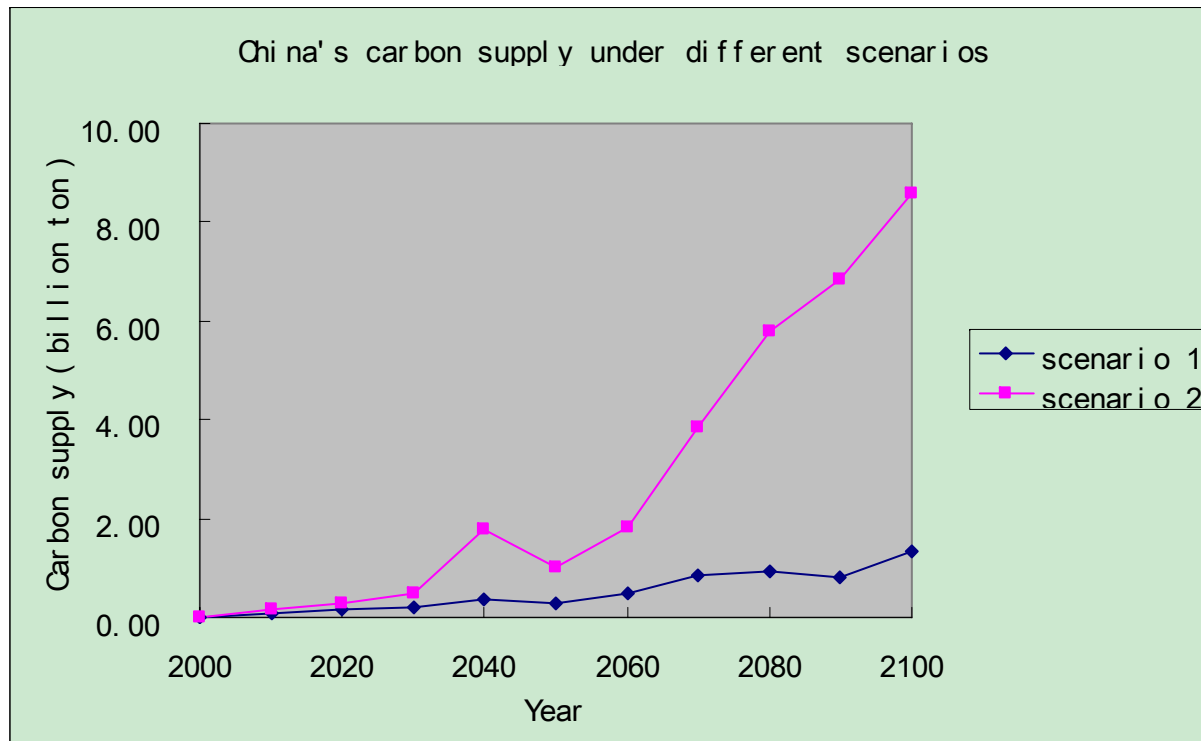


Dynamic curve of carbon price

Supply Side Analysis

- Results

$$CG_t = S_t^B - S_t^S$$



Brent Sohngen, etc., 2003

Demand Side Analysis

- Factors affect demand
 - The anticipation of compliance
 - The effectiveness of substitution between carbon credit in voluntary market and compliance market.
 - Price of substitutes
 - Preference for forestry carbon

Demand Side Analysis

- Set three scenarios for China's carbon emission reduction

- baseline :

- Baseline : energy intensity decreases annually at 3% , GDP reaching US\$ 11,290 per capita in 2050.(He JK, etc. 2006)

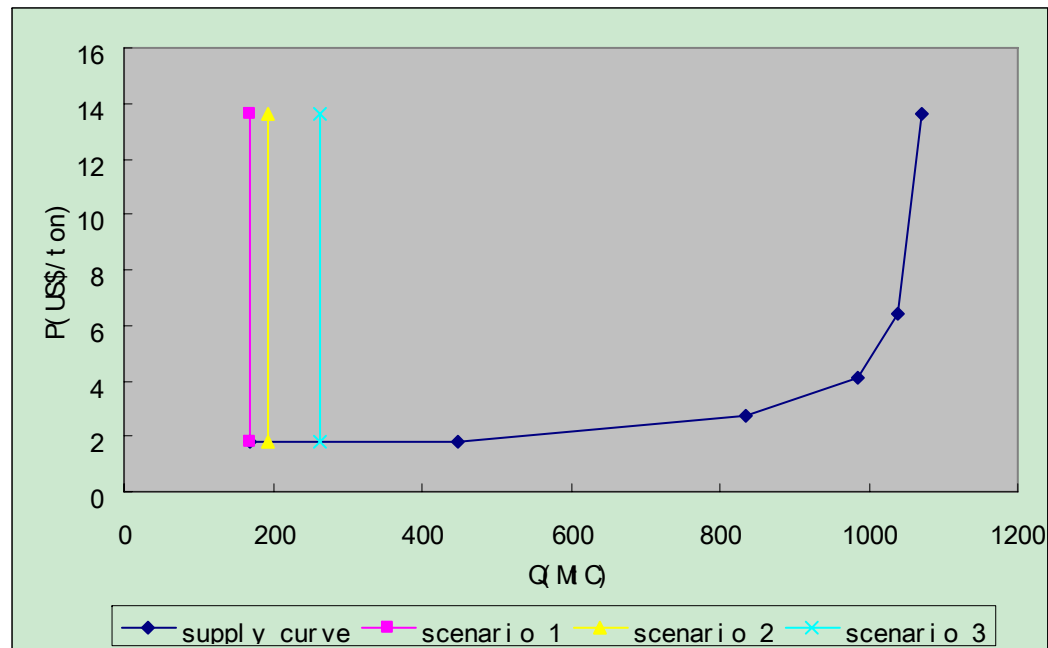
- Scenario 1 : Commitment to emission reduction at 2012, with a 5.2% reduction at the base of 1990.

- Scenario 2 : Commitment to emission reduction at 2020, with a 5.2% reduction at the base of 1990.

- Scenario 3 : Commitment to emission reduction at 2050, with a 5.2% reduction at the base of 1990.

- Assuming 5% of the emission reduction will be realized through forestry carbon sequestration.

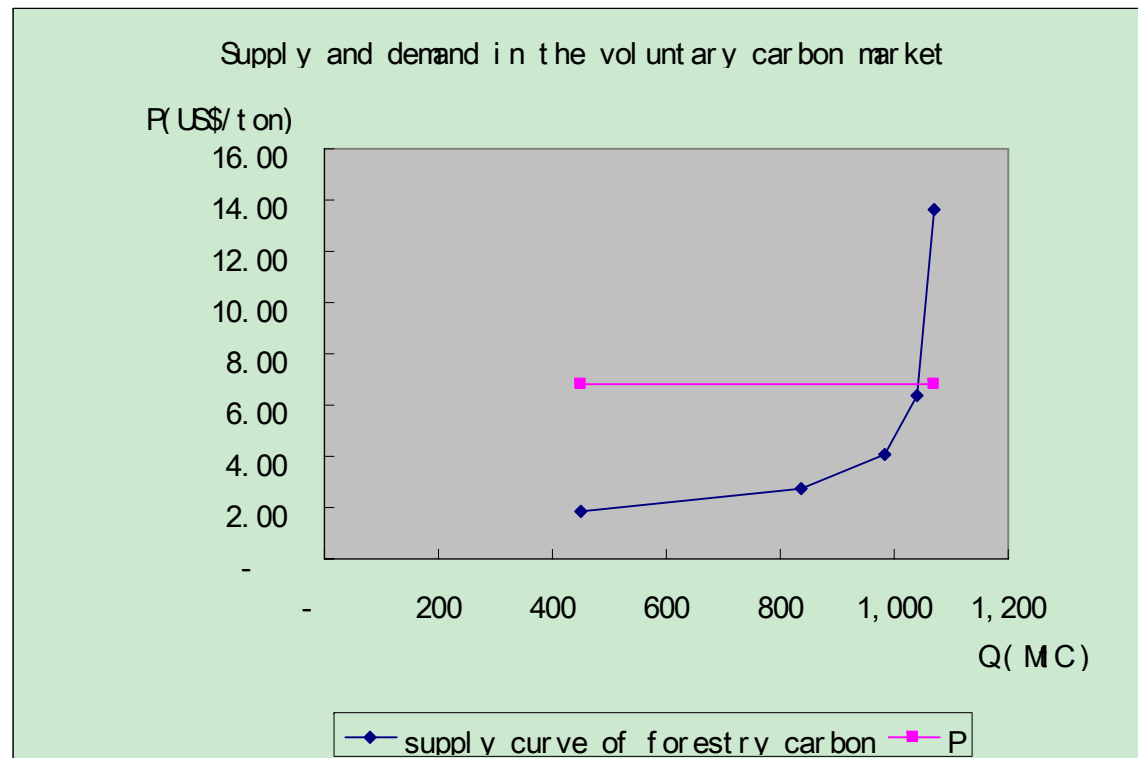
Demand Side Analysis



Demand curve under different scenarios

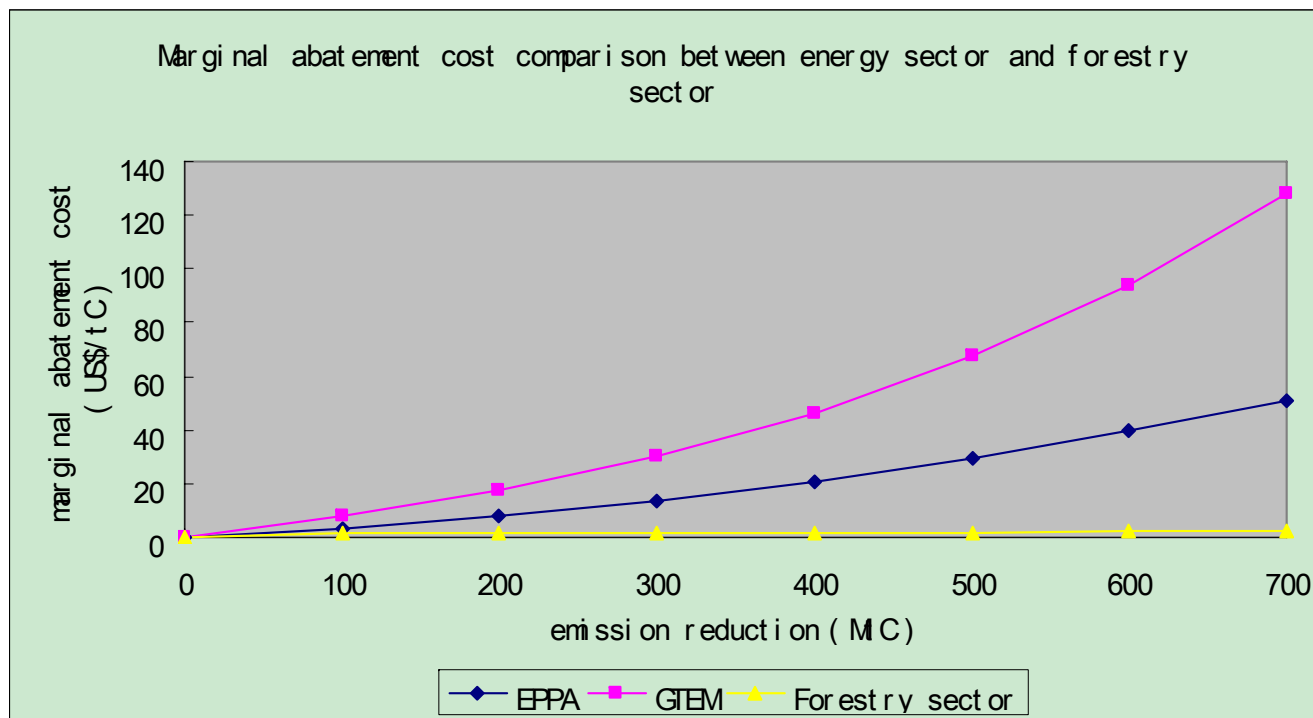
Demand Side Analysis

- Demand in voluntary carbon market
 - price taker , US\$ 6.8/ton
 - 1 billion ton carbon supply
 - market size: US\$ 6.8 billion



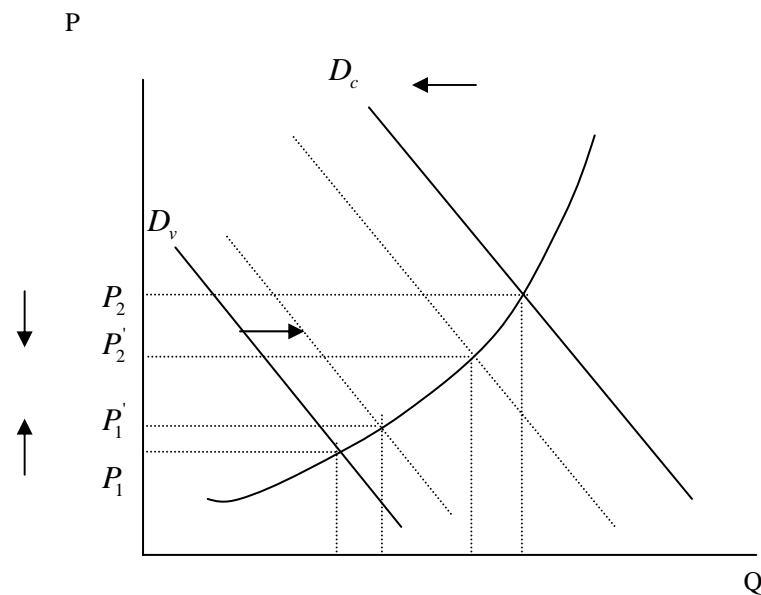
The comparison of Marginal abatement cost between energy sector and forestry sector

- EPPA : Emissions Predictions and Policy Analysis GTEM : Global Trade and Environment Model



The relationship of voluntary carbon market and compliance market

- Complement
- Precursor of compliance market



Stimulation and regulation of supply & demand

- Supply side
 - Afforestation and reforestation project
 - Institution reform
 - Low transaction cost
 - Capacity building for local staff

- Demand side

- Outcome of international climate change negotiations
- Public awareness on environmental service provided by forest
- Whether to set a rigid restriction for forest share
- Design substitution mechanism between voluntary market and compliance market
- Whether to set trade barrier against carbon offset export

Avoiding leakage

Forest : carbon sinks / carbon sources

Leakage from CDM & REDD, project-based market is not enough

- National level monitoring and evaluation system
 - Remote Sensing Technology
- Carbon Accounting System
 - Net changes of national forest carbon sinks
 - Changes of industrial emissions
 - Net changes of national carbon offset projects

Compensation for Ecological Services

- carbon titlement
 - dilemma on timber harvest quota cancellation
- compensation standard
 - value compensation
 - cost compensation : opportunity cost