# Potential Impacts of China's Forests on the Atmospheric Carbon and Uncertainty Analysis

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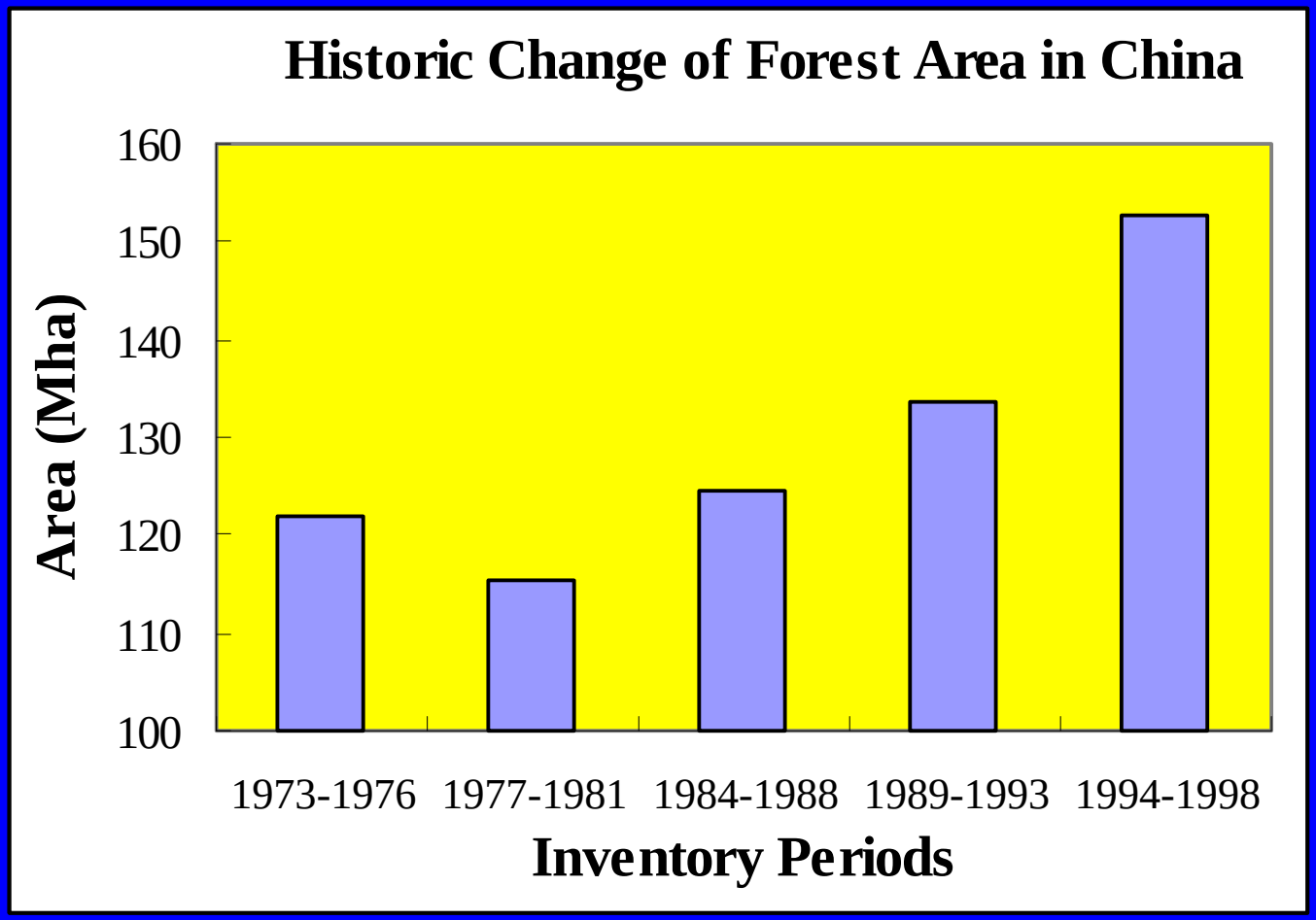
# OBJECTIVES

- To describe F-CARBON Model
- To Estimate Carbon Sequestration by Forestry Activities, 1990 - 2050, with Both F-CARBON and COMAP Model
- To Compare F-CARBON and COMAP model

# Historic Changes of Forest



# Long-term Forestry Plan

| | 1999~2010 | 2011~2030 | 2030~2050 |
|---|---|---|---|
| • Forest Area Increase(Mha) | 27.32 | 46.00 | 17.28 |
| • Forest Coverage to the End of the Periods | 19.4% | 24.2% | 26% |
| • Nature Reserve Area Increase | 18.88 | 35.00 | (Mha) |
| • New Forest Parks | 11.80 | 9.00 | (Mha) |
| • Timber Output Reduction | 16 $Mm^3$ | (1998-2003) | |

# Methodology

| | F-CARBON | COMAP |
|---|---|---|
| • **Calculated based on:** | carbon uptakes and emissions | carbon stock changes |
| • **Age classes** | considered | No |
| • **Soil carbon changes: caused by cutting** | considered | No |
| • **Emissions from different timber uses** | considered | No |
| • **Emission from burning** | considered | No |
| • **decomposition emissions** | considered | No |
| • **Different activities** | No | Considered |
| • **Cost-effectiveness** | No | Considered |

# Potential Carbon Sequestration Through Forestry Activities in the Eastern and Southern Part of China with COMAP3 Model

# Land Use Scenarios

- **Baseline (BSL):** forested area keeps unchanged, i.e., no afforestation on wasteland, and harvested area keeps on the level of the base year, but slash land would be reforested within 3 years after harvest.
- **Mitigation Scenario:** 60% of the goals of the governmental long-term forestry plan

# Carbon Sequestration by Forestry Activities in the East and South Part of China

- The total land area needed for the mitigation activities is 22.9 Mha.
- The total carbon sequestered by the mitigation scenario between 2000 and 2030 for the three study regions in China is 2093 Mt C, and 280.6 MtC between 2008 and 2012.

- The largest potential for carbon mitigation lies in the forest regeneration and forest protection options.

- The short-rotation plantation shows considerably smaller potential.

- The total additional biomass growth in the mitigation scenario in the three regions of China from 2000 to 2030 is 991 Mt B, and from 2008 to 2012 it is 117 Mt B.

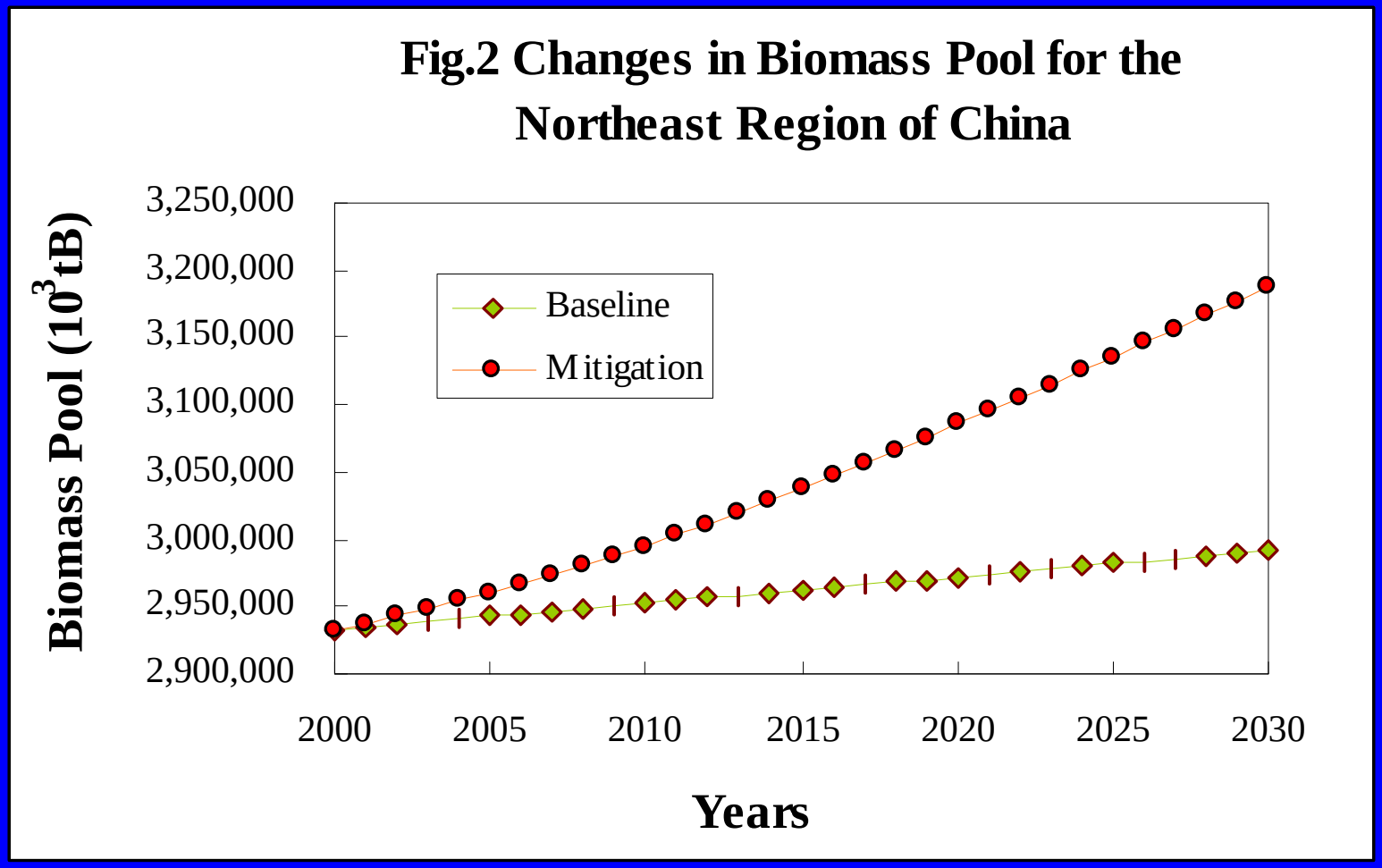


Fig.2 Changes in Biomass Pool for the Northeast Region of China
Biomass Pool ($10^3$tB)
3,250,000
3,200,000
3,150,000
3,100,000
3,050,000
3,000,000
2,950,000
2,900,000
Baseline
Mitigation
2000
2005
2010
2015
2020
2025
2030
Years

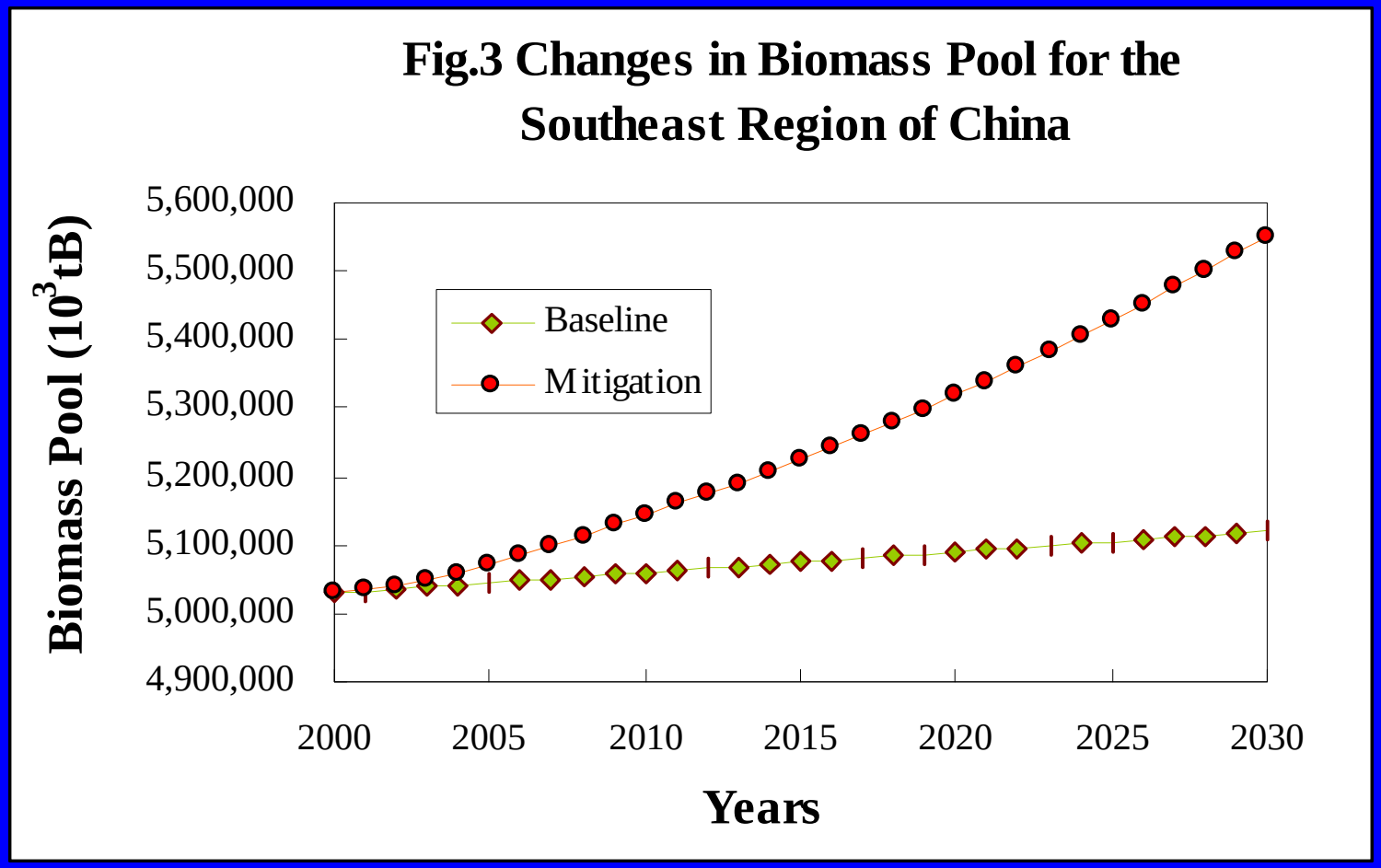
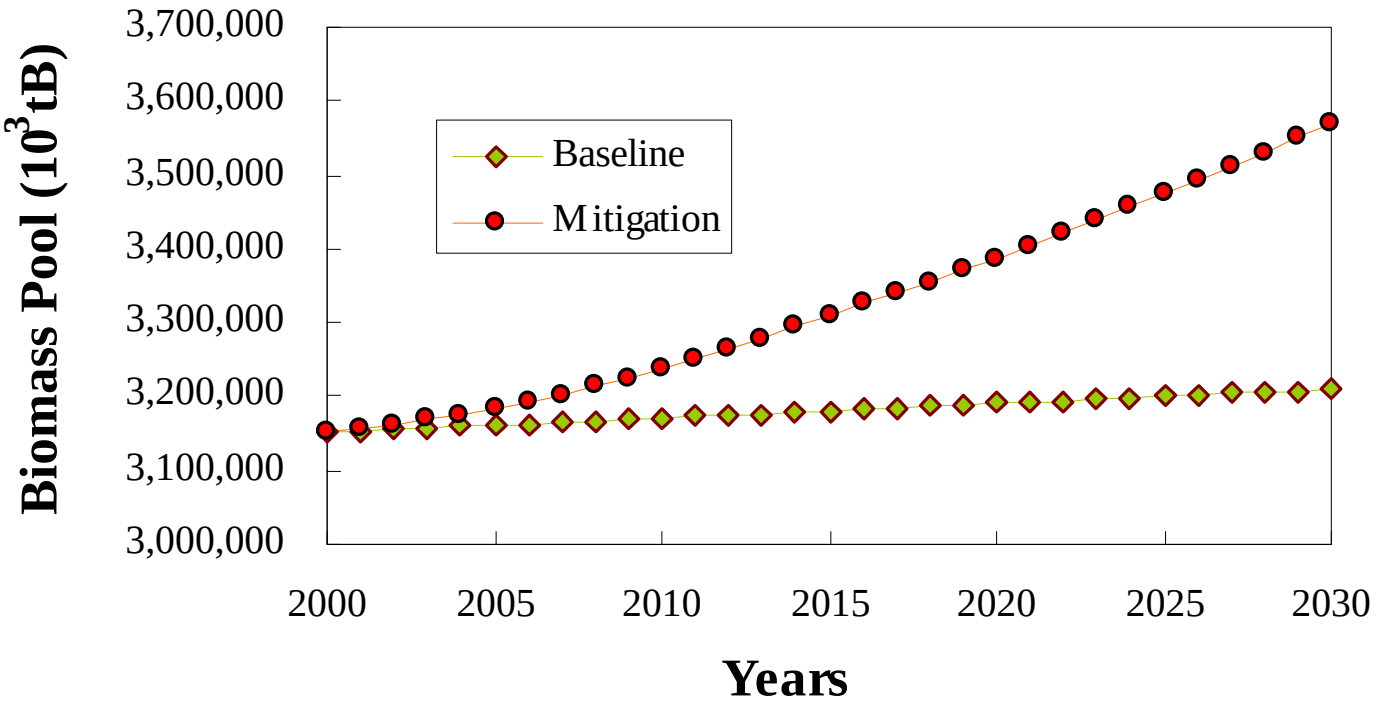


Fig.3 Changes in Biomass Pool for the Southeast Region of China
Biomass Pool ($10^3$tB)
5,600,000
5,500,000
5,400,000
5,300,000
5,200,000
5,100,000
5,000,000
4,900,000
2000
2005
2010
2015
2020
2025
2030
Years
Baseline
Mitigation

**Fig.4 Changes in Biomass Pool for the Southwest Region of China**



**The cumulative investment from 2000 to 2030 for the mitigation activities is**

**US$ 12.7 billion**

**The activity with least investment cost per one ton of carbon is forest regeneration, followed by long-rotation plantation and forest protection. The most expensive activity is Bioenergy.**

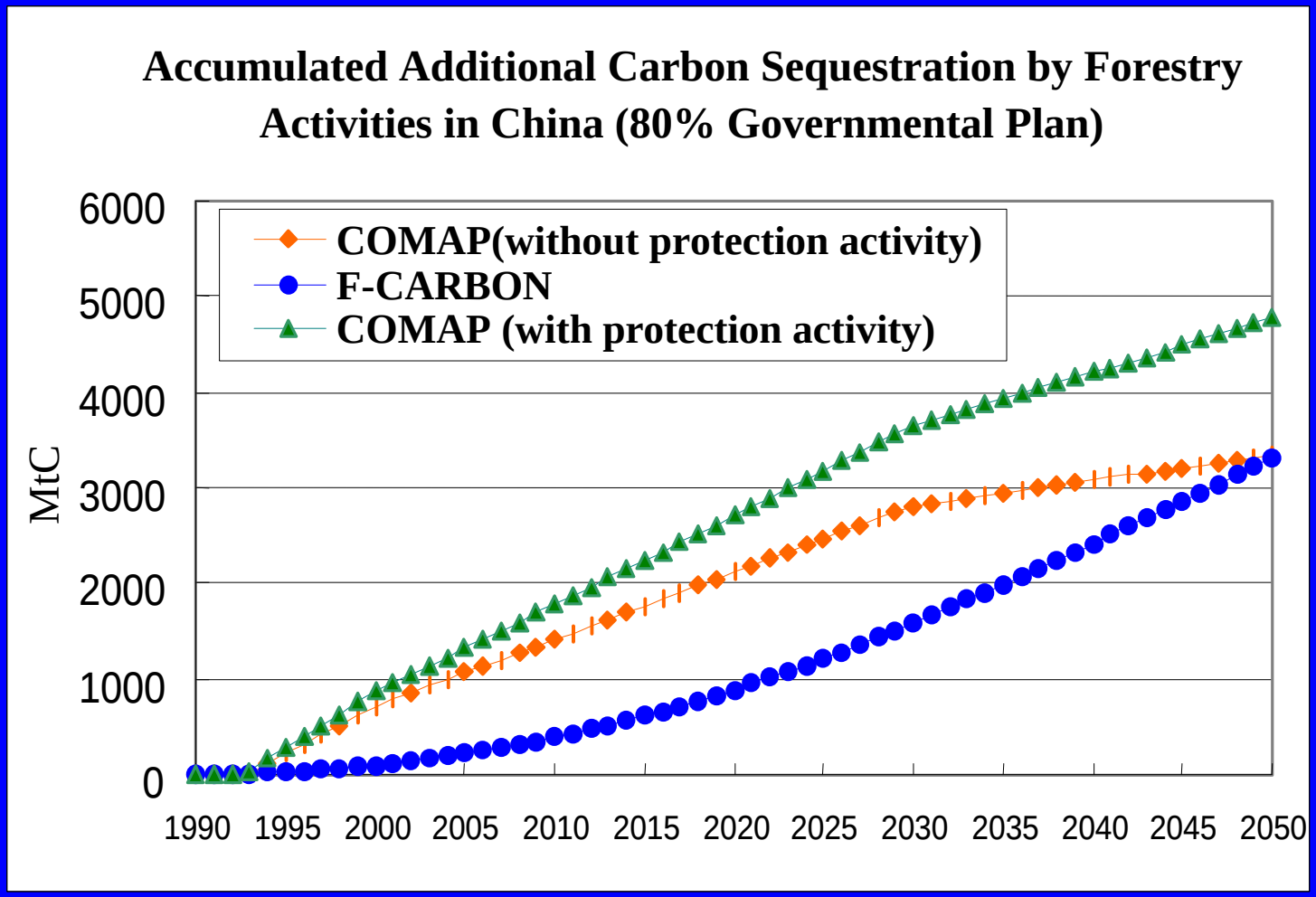
# Comparison of F-CARBON and COMAP model

- **Carbon sequestration estimated by COMAP model is larger than F-CARBON model, probably because:**

**(1) forest protection activity is not considered by F-CARBON Model, or**

**(2) Carbon emission is not fully considered by COMAP model**

- **Additional annual carbon sequestration estimated by COMAP is directly related to annual afforestation area. And The sequestration by F-Carbon increased more gradually, because its consideration of different growth rate of age classes**


Accumulated Additional Carbon Sequestration by Forestry Activities in China (80% Governmental Plan)
COMAP(without protection activity)
F-CARBON
COMAP (with protection activity)
MtC
6000
5000
4000
3000
2000
1000
0
1990
1995
2000
2005
2010
2015
2020
2025
2030
2035
2040
2045
2050

- **The advantage of COMAP model is its describe sequestration by specific activities and its cost-effectiveness**
- **The advantage of F-CARBON model is its consideration of different growth rate for age class and carbon uptake and emission**

THANKS