The Forest Carbon Accounting on Demonstration models of APFNet Project, Southern China

Prof. JIANG Chunqian

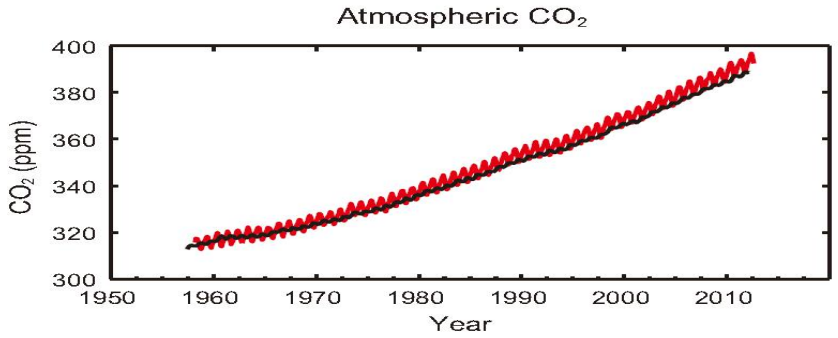
Research Institute of Forestry, Chinese Academy of Forestry

Dec. 8th, 2021

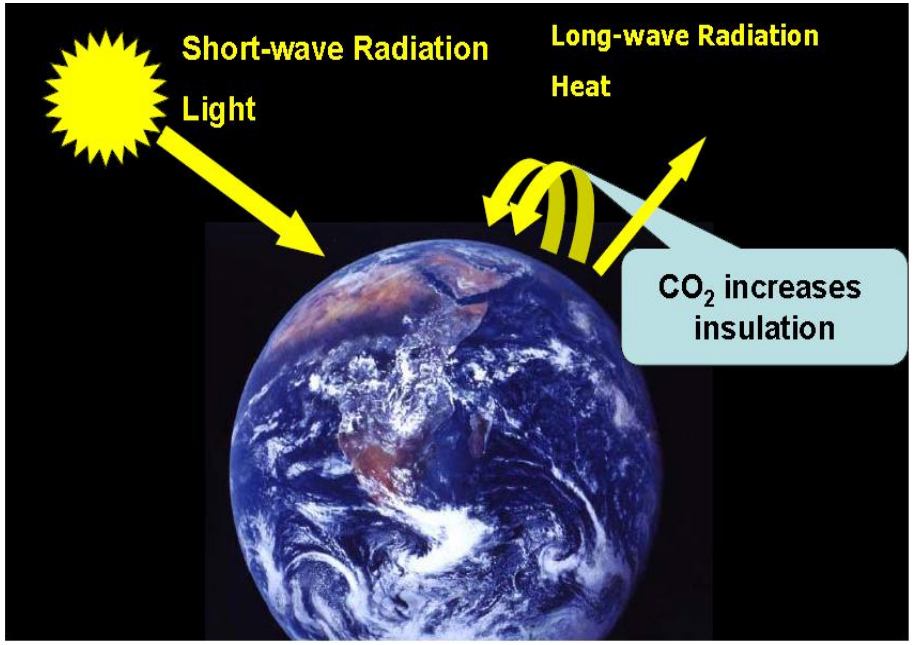
Contents

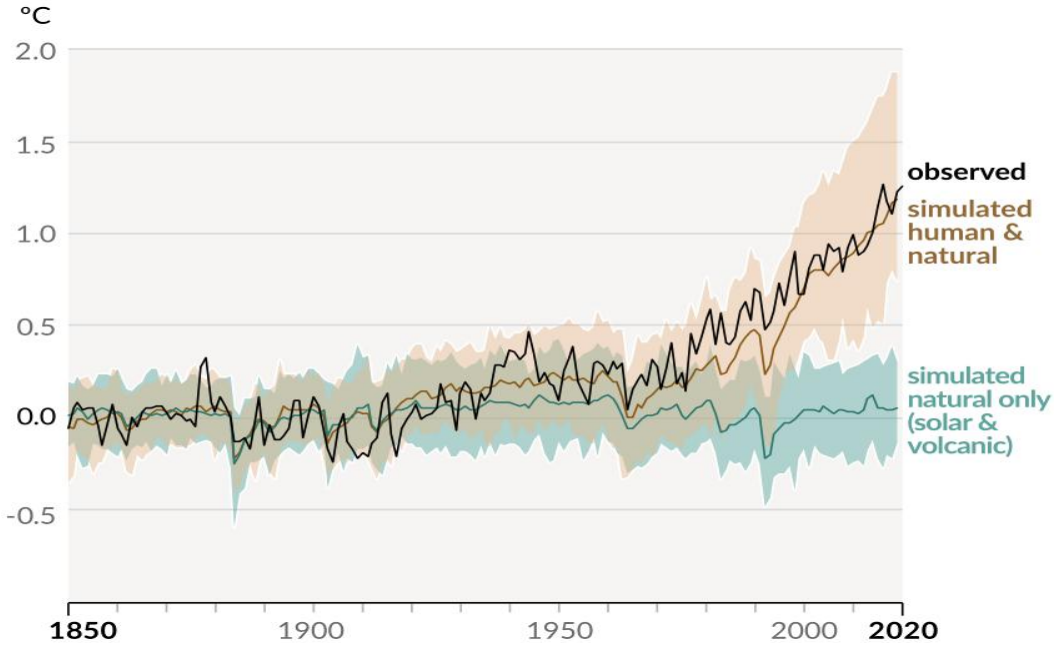
- Background
- Forest and climate change
- Carbon accounting method
- A case of Zhejiang-Anhui Project

Background



- Climate change concerns human survival and development.
- Human activities (fossil fuel, deforestation) cause massive emissions of carbon dioxide and contribute to global warming .

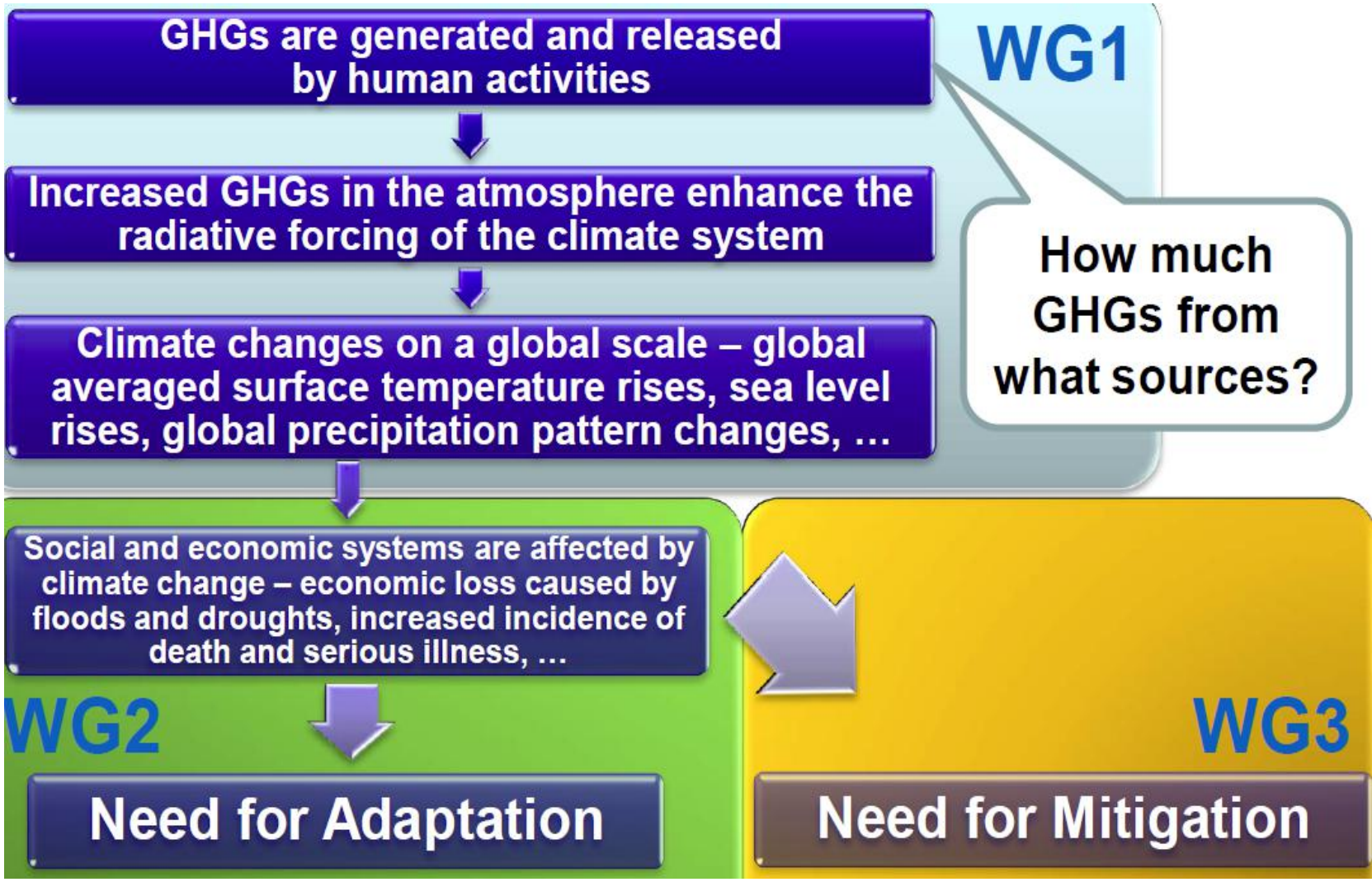




Change in global surface temperature (annual average) as observed and simulated using human & natural and only natural factors (both 1850–2020) （IPCC 2021）

Background

- Global scientists are also actively to address the global warming.
- IPCC



UNFCCC and Agreements

- UNFCCC adopted in 1992.
- Kyoto Protocol was adopted at COP 3 in 1997
- Bali Road Map at COP 13 in 2007
- Copenhagen Accord at COP 15 in 2009
- Cancun Agreements at COP 16 in 2010
- Durban Platform at COP 17 in 2011
- Doha packages at COP 18 in 2012
- Paris 2015, Climate change Agreement for post 2020

- LULUCF
- REDD+,
- CDM-A/R
- FM,
- HWP

Paris Agreement

- Holding the increase in the global average temperature to well below 2 ° C above pre-industrial levels
- Pursuing efforts to limit the temperature increase to 1.5 ° C above pre-industrial levels;
- REDD+
- Intended Nationally Determined Contributions (INDC);
- At COP26, the Parties reached consensus on the implementation rules of the Paris Agreement.

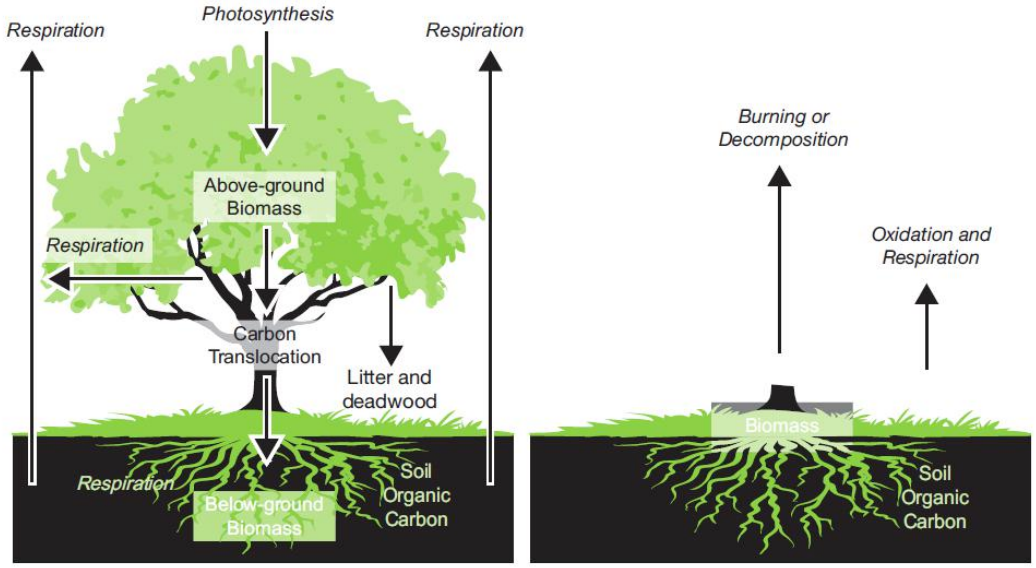
Forest and climate change

- Currently, deforestation and forest degradation have become the second largest source of greenhouse gas emissions after fossil fuels (IPCC, 2014).
- Forests play an important role in addressing the global warming.
- Forest carbon is the cheapest approach to deal with climate change.

Forestry's role in global carbon

- **Reservoirs** — **1650 GtC**
- **Sinks** — **2.6 GtC/yr**
- **Sources** — **1.6 GtC/yr**
- (from FAO)

Effect of forest on the carbon cycle



a) Undisturbed forest carbon store

b) Disturbed forest carbon transfer

Approach to increase forest C storage

- Expand forest area through restoration, planting forest.
- Forest conservation to increase C storage in the forest;
- Sustainable management of forest and improve forest quality and ability to sequestrate C;
- Strengthen the use of harvested wood products instead of energy intensive products ,such as cement and steel.

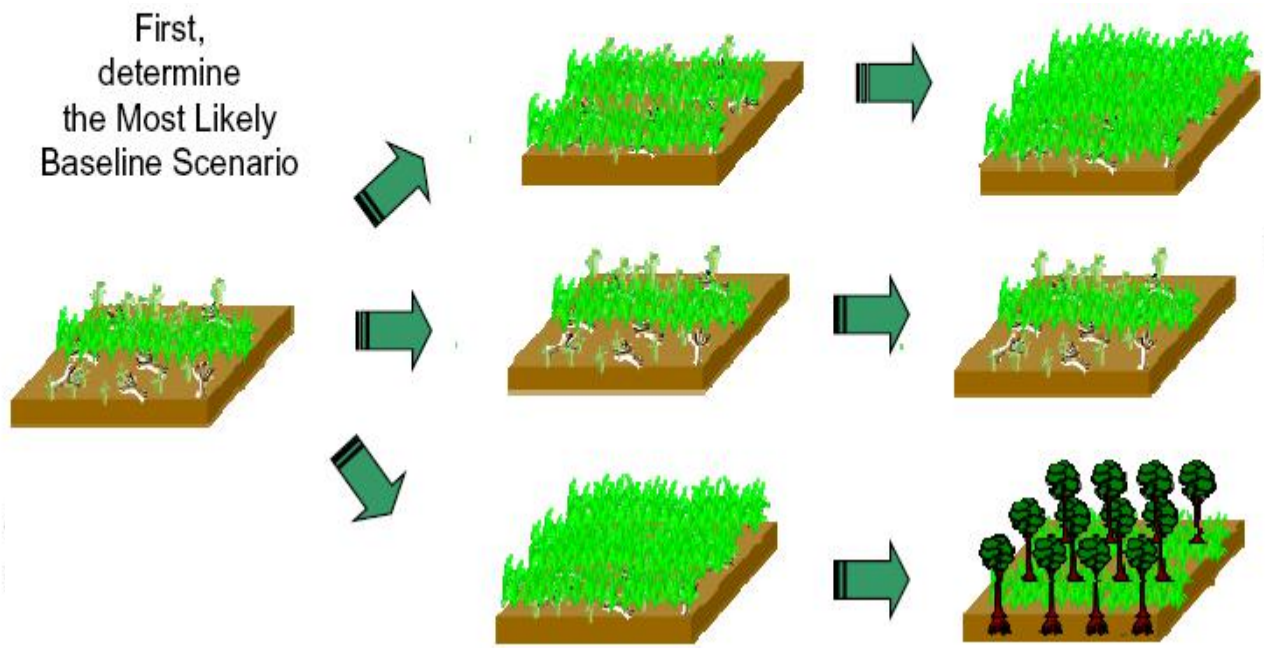
Carbon accounting

- Carbon accounting methodology is the basis for carbon neutrality.
- IPCC is the primary source of guidance for forest carbon measurement.
  - GPG-LULUCF
  - VCS and other methodologies for Carbon trade
- How to estimate the carbon sinks ?
  - To establish the baseline / reference (emission) level ,
  - To choose the carbon pools,
  - To calculate the carbon stock-change based on the method .

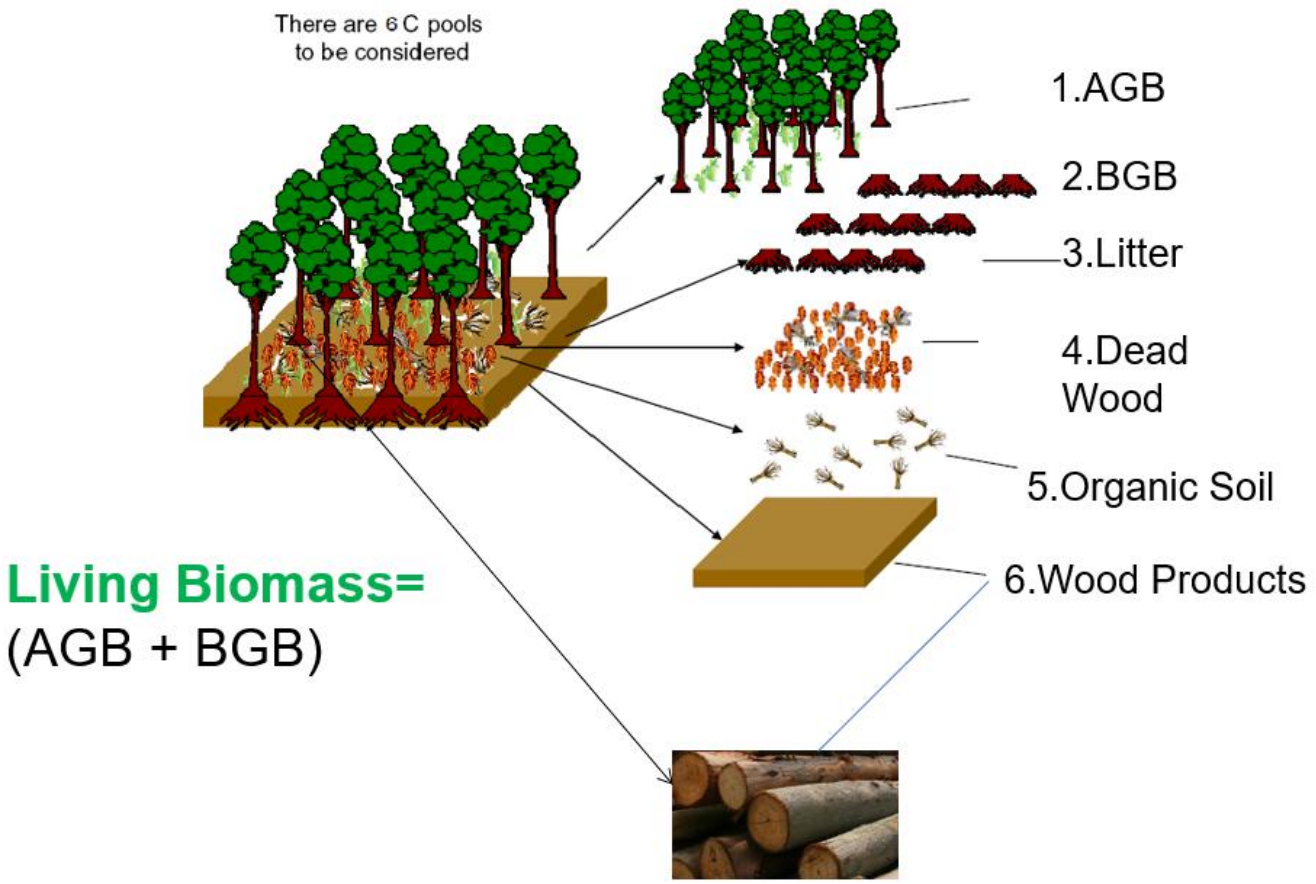
Attention to carbon leakage and additionality

Baseline / Reference Level

What would occur without the Carbon Project?



Choose carbon pools



Caculation

Net Anthropogenic GHG Removals by Sinks (or just Amount of Carbon Offsets)

$$Cn = Cp - LB - L$$

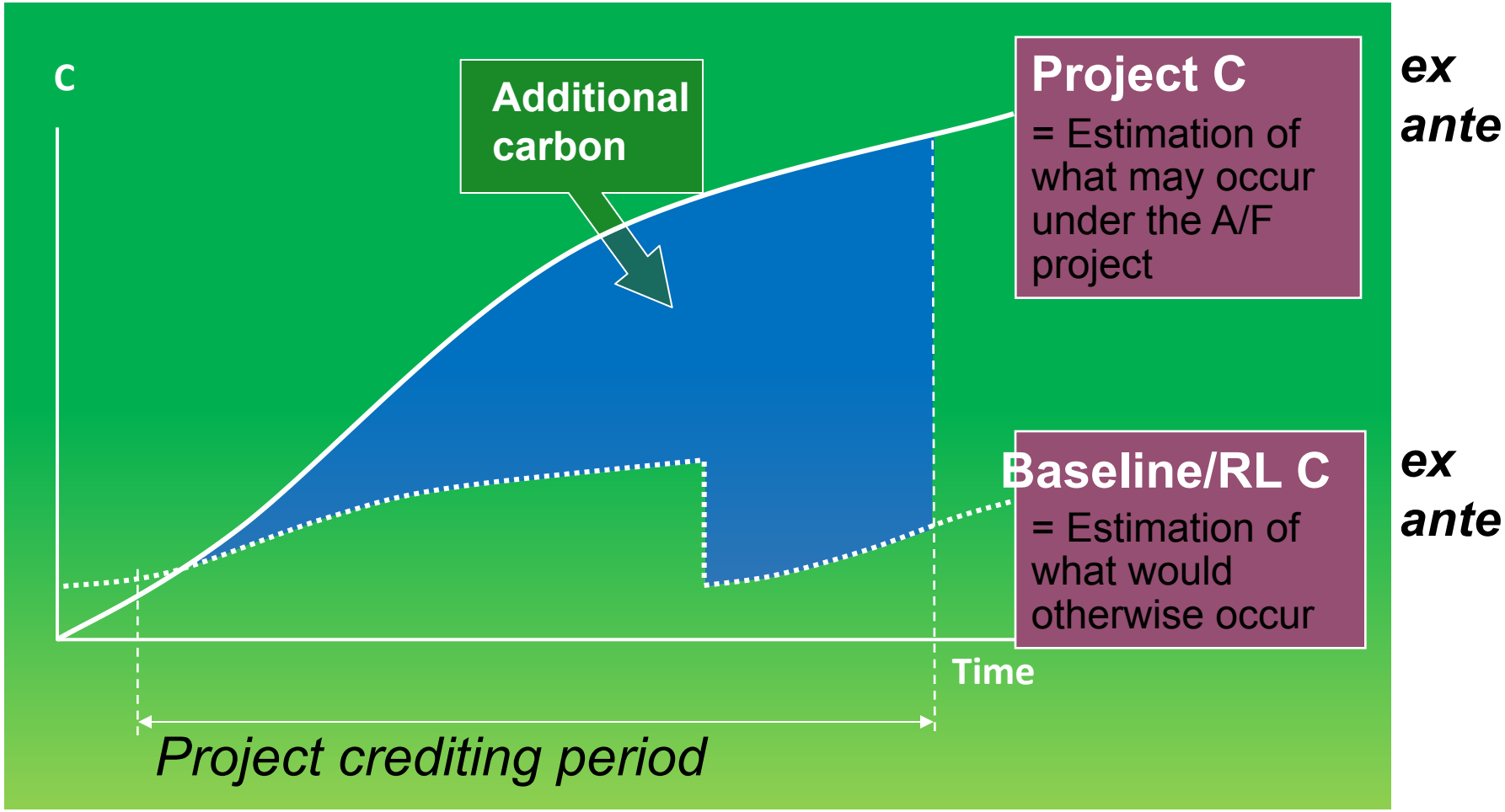
Cn = Net anthropogenic greenhouse gas removals by sinks

Cp = Actual net greenhouse gas removals by sinks (PROJECT)

LB = Baseline net greenhouse gas removals by sinks

L = Total GHG emissions due to leakage

Additionality



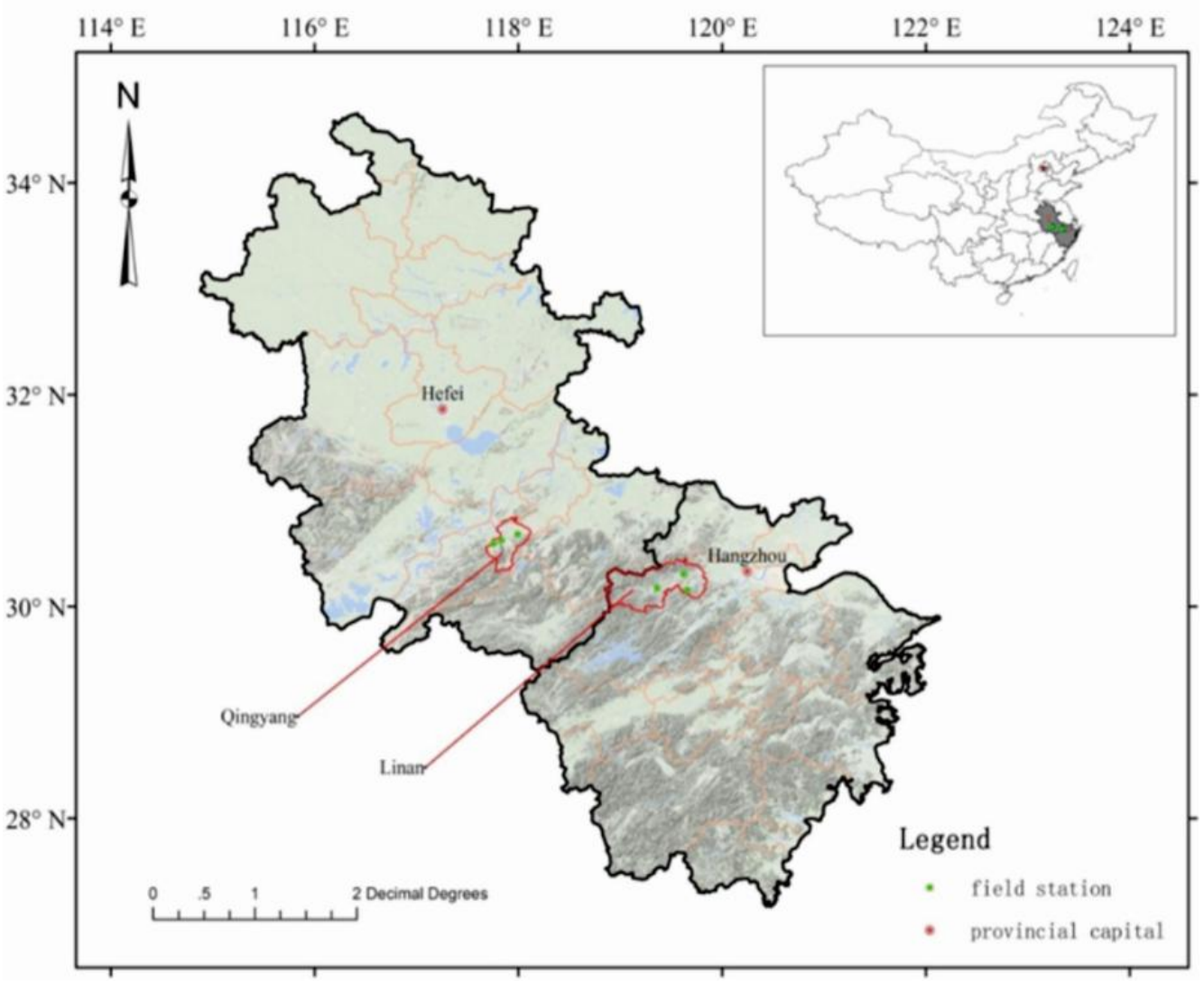
Only the “additional carbon” has a potential market value.

PEDRONI (2005)

Zhejiang-Anhui Project

Project area

- Lin’an County, Zhejiang Province
- Qingyang County, Anhui Province



Zhejiang-Anhui Project

- Objectives of the Project

◆Developing and demonstrating effective technological methods and strategies on sustainable management and restoration of forest at landscape level;

◆Establishing the carbon accounting methodology for SFM and restoration at the project level; and

◆Promoting knowledge and experience exchange in SFM and restoration among Asian-Pacific region

Output 2 of the project

Output 2 Accounted Forest Carbon Storage and Sinks in Target Areas

- Activity 2.1 Analyzing baseline data of carbon pools of project sites
- Activity 2.2 Making dynamic study on forest carbon storage in target areas
- Activity 2.3 Establishing FRLs and accounting of carbon sinks at project sites
- Activity 2.4 Developing the carbon accounting methodology at project level which could be applied in the subtropical forest area of Southeast Asia.

Methods

1. Baseline scenario:

Traditional forest management approaches

2. Choose carbon pools

Carbon pools	Yes or No
AGB	Yes
BGB	Yes
Litter	Yes
Dead wood	It was assumed as 0.
SOC	Yes
Wood product	No

3. Leakage =0

DBH , Tree height

Shrubs and herbs

Green weight

Dry weight of vegetation

SOC

Litter

（1）Demonstration of Degraded Forest Restoration in Stony Mountainous Area

- Located in Youhua Forest Farm, Qiangyang
- *Platycladus orientalis* (L.) Franco - *Pteroceltis tatarinowii* Maxim.- *Zanthoxylum ailanthoides* Sieb. et. Zucc. (5:3:2) 侧柏 –青檀-椿叶花椒
- Mean DBH7.0 cm and Height 5.6 m

Project activities: (Rice paper, Xuan Paper) Pulp forest

(1)Removing weeding and some shrubs twice a year from 2018 to 2020;

(2)Enrichment Planting *P. tatarinowii* Maxim. to 750 seedlings / ha, blank space

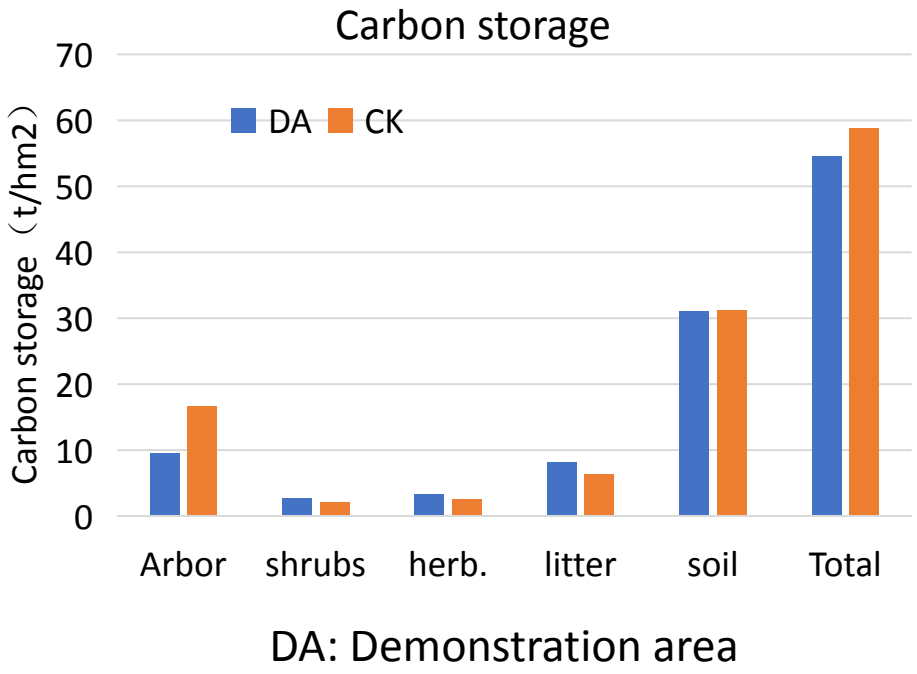
Baseline scenario: natural restoration

Project scenario: Project activities.

（1）Demonstration of Degraded Forest Restoration in Stony Mountainous Area

Results:

- The total carbon storage of forest ecosystem was as follows: CK (58.76 t/ha) > DA (54.48 t/ha).
- The carbon sink from demonstration activities was 1.84t CO_2/ ha/a.



DA: Demonstration area

(2)Management of Chinese fir Plantation

Located in Yaoxi forest farm， Qingyang

Chinese fir plantation (*Cunninghamia lanceolata* (lamb.) hook.)

Forest age 18a

Mean DBH14.1 cm and Height 12.3 m

Project activities: Transformed into conifer-broadleaved mixed forest

(1) Thinning intensity 20%
(2) Shrub cutting and weeding twice a year from 2018 to 2020;
(3) Planting *Phoebe chekiangensis C. B. Shang*.（浙江楠） and *Sassafras tzumu*（Hemsl.） Hemsl （*檫木*）450 seedlings / ha, respectively. blank space

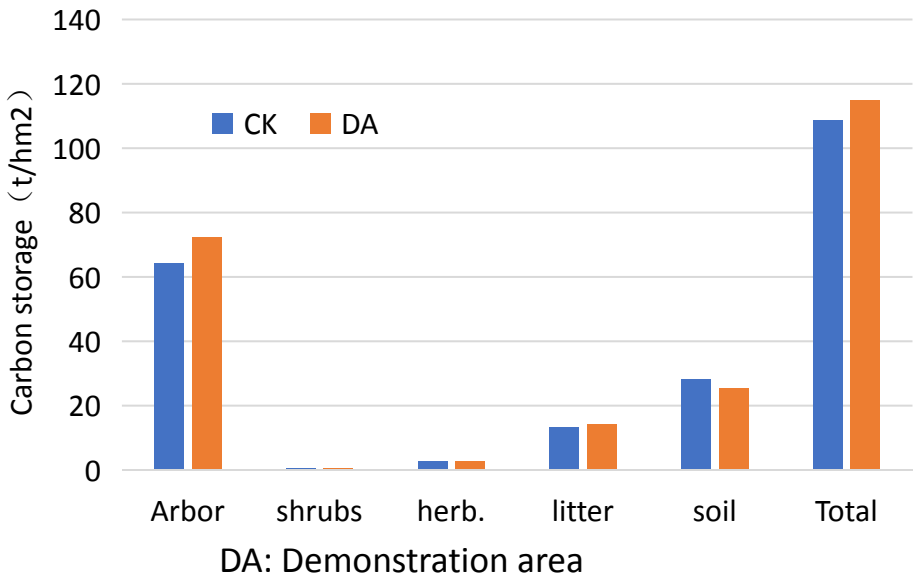
Baseline scenario: Chinese fir plantation

Project scenario: Project activities

(2) Management of Chinese fir Plantation

Results:

- The total carbon storage of Chinese fir forest ecosystem was 114.925tC/ha > 108.54 tC/ha.
- The carbon sink of *Cunninghamia lanceolata* forest demonstration activities increased by 6.91 t CO_2/ha/a.



Uncertainty

- Short duration of the project
- Planted seedlings (*Pteroceltis tatarinowii* Maxim; *Phoebe chekiangensis* C. B. Shang. and *Sassafras tzumu* (Hemsl.) Hemsl.) were still relatively young and the growth models of P. *chekiangensis* and P. *tatarinowii* were unclear. Therefore, their carbon sequestration capacity could not be predicted more accurately in the long term.
- We need to continue to observe their contribution to the carbon sequestration of forest ecosystem.

Thanks!