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## TCA Scoping study in China: baseline, gap and opportunity

### 1. Background

Funded by the International Climate Initiative (IKI), the Carbon Institute is a collaboration of the Greenhouse Gas Management Institute (GHGMI), the Forest Carbon Accounting and Monitoring Centre (FCAMC) of the State Forestry Administration (SFA) in China and the Centre for Climate Risk and Opportunity Management (CCROM) at Bogor Agricultural University (IPB) in Indonesia. The Carbon Institute partners will develop comprehensive and world-class Terrestrial Carbon Accounting (TCA) certificates that address national needs and fulfill international standards. By developing academic courses and teaching capacities in China and Indonesia on TCA, the Carbon Institute will help create the human capacity for countries to account for, and implement, their Nationally Determined Contributions (NDCs), continue to improve national greenhouse gas inventories, and receive performance-based payments for REDD+.

One of the first work packages that must be completed by the Carbon Institute as part of the IKI grant, SFA and IPB (especially FCAMC and CCROM) will prepare three scoping studies on: 1) existing baseline in-country academic TCA instruction, 2) gaps based on country needs, and 3) opportunities for new academic TCA Certificate programs. With the support from GHGMI, FCAMC is conducting these three scoping studies to first understand what TCA courses and programs are already being taught in China; second, understand what government needs are for comprehensive TCA

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instructions, or gaps identified by government; and third, develop or proposing a new TCA academic programs and filling unmet government TCA training needs with a new TCA certificate, led by SFA. This is the first scoping study, baseline of TCA in China.

## **2. Materials and Methods**

As show in the guidelines from GHGMI, TCA training covers six thematic areas: policy context, GIS and RS, IPCC guidelines/land classification, field methods, TCA statistics, communication of results. These six topics were chosen through an extensive stakeholder process to identify what subjects were more needed for training in terrestrial carbon accounting, and that will yield a certificate course that was truly comprehensive.

We inventoried 12 universities, academies and institutions in China. (1) Four universities that are first- and second-class universities in China: Beijing Forestry University, Beijing Normal University, Peking University, Xiamen University; (2) Two academies that leaded by SFA: Academy of Forest Inventory and Planning, Personal Exchange and Development Center; (3) Six institutions that present research capacity at country and province level: Institute of Geographic Science and Natural Resources Research (CAS), Institute of Botany (CAS), South China Botanical Garden (CAS), Chinese Academy of Agricultural Sciences, Chinese Academy of forestry, Beijing Academy of Agricultural Sciences.

We collected the curriculums of the universities, the training schedules of SFA, the presentations and reports of the institutions from websites and by personal communication. Then, we divided all these information into the six thematic areas and other areas that isn't related to TCA area.

### 3 Baseline

#### 3.1 Curriculum at the university

Curriculum: The professor carries on the specialized courses to students. The purpose of students is to learn knowledge and basic skills. Evaluation of course is test and score. Curriculum usually has strong theoretical and general adaptability.

The TCA related courses focus on forestry remote sensing (31 courses), measurement (7 courses), field methods (1 courses), statistical analysis (14 courses) and other basic knowledge are taught in one term for the four universities. Generally, the course of TCA has not been set up at the university. Their courses lack policy context and Communication of results.

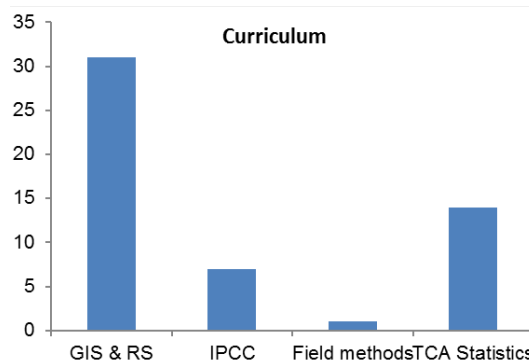


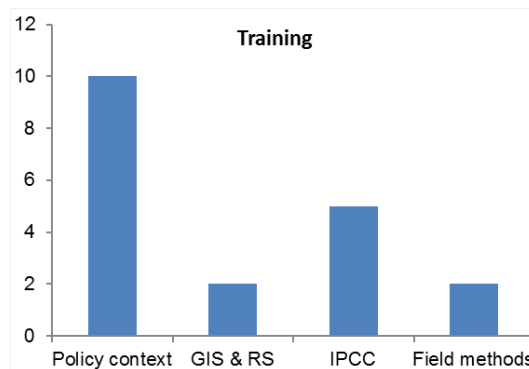
Fig 1 TCA related curriculums at the university in China

#### 3.2 Training at SFA

Trainings are short-term, specialized, systematic teaching for practitioners. The purpose of training is to obtain professional skills. Evaluation of training is professional certification or certificate. Training usually has stronger advantage of method and

operation than curriculum.

The training at SFA teaches policy context (10 courses), GIS and RS (2 courses), IPCC guidelines (5 courses), and field methods (2 courses) in recent three years (Fig. 2). And the training topics are mainly focus on forest and land use. They lack specialized statistic courses and GIS and RS for TCA. Communication of results is not mentioned in these trainings.



**Fig. 2 TCA related trainings at the State Forestry Administration (SFA) in China**

State Academy of Forestry Administration organized four programs related to forest carbon accounting during the 12<sup>th</sup> Five Year Plan period (2011-2015). A total of 360 experts and technicians from provincial Forestry Departments, Offices of Carbon Sink, Forestry Institutes of Designing and Planning, Forestry Institutes of Survey and Planning, Detection Centers for Forest Resources had been trained. The Courses are: Elaboration on Policies Related to Evaluation of the Work of Carbon Sink and Afforestation, Guideline for Monitoring Carbon Sink of Afforestation, Case Study for Monitoring Carbon Sink of Afforestation, Guideline for Monitoring Carbon Sink of Forest Management.

State Academy of Forestry Administration also organized 10 training programs of



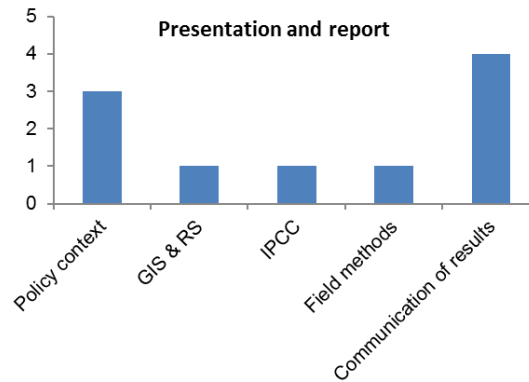
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Forest Surveying and Monitoring at provincial level during the 12<sup>th</sup> Five Year Plan period (2011-2015). A total of 1100 experts and technicians from provincial level Institutes of Forest Research and Planning, local Commissioner Offices, Forest Resources Division of Forest Bureaus, Forest Research Centers. The Courses are: An Overview of the Research; Monitoring and Management of Forest Resources and the Integrated Monitoring of Forest Resources; Sampling Survey Techniques for Forest Resources; The Application of Remote Sensing Technology in Forest Resources Management And Ecological Building; An Overview of Forest Resources Survey in Foreign Countries; Forestry Mathematical Modeling; Technical Order of Planning, Designing and Surveying Forest Resources.

### **3.3 Presentation and report**

Presentation and report: Experts understand their professional topics, and focus on the accurate and new result. The audience is covered with professional students and researchers. It is very difficult to identify the degree or knowledge context of the audience. The relationship between the speaker and the audience is more equal, have more opportunities for communication and interaction.

The topics of presentation and report cover policy context (3 times), GIS & RS (1 time), IPCC (1 time), field method (2 times) and communication of results (4 times) in a half year for the six institutions. Usually, policy context and IPCC is used for explaining why they did the works. Presentation and report reflects the basic skills about communication of results, but no special communication for TCA.



**Fig 3 TCA related presentation and report of terrestrial carbon accounting in China**

#### 4. Gap

This study has found that while many universities teach GIS and RS and statistics, there is limited or no training on GIS and RS and statistics specifically for terrestrial carbon accounting. There is no training or curriculum of communication of results. This is also an important gap, since the clear communication of carbon accounting is critical for their application and use.

**Table 4 Presentation and report in China**

	Policy context	GIS and RS	IPCC Guidelines/land classification	Field methods	TCA Statistics	Communication of results
Beijing Forestry University		√			√Statistics	
Beijing Normal University		√			√Statistics	
Peking University		√			√Statistics	
Xiamen University		√			√Statistics	



<b>IGSNRR, CAS</b>	Mainly presentation	√	√	√		
<b>Chinese Academy of Agricultural Sciences</b>	Mainly presentation	√	√		Involved in agriculture	
<b>Chinese Academy of forestry</b>		√	Mainly forest		Mainly presentation	
<b>Beijing Academy of Agricultural Sciences</b>			RS training, no curriculum			
<b>Conclusion (Curriculums)</b>	Lack	Lack of activity class data	lack of IPCC courses	Lack	There are statistical courses, there is no TCA statistical courses	Lack
<b>FCAMC, SFA</b>	√	√ forest	√ forest	√ forest		
<b>Personal Exchange and Development Center, SFA</b>	√		√ forest			
<b>Conclusion (Training)</b>	√	√ forest	√ forest	√ forest	Lack	Lack

## 5 Opportunity



## Supply materials

**Table 1 Curriculum at the university in China**

Thematic area	Curriculum
RS, GIS	1. Advanced geographic information system
	2. Progress in Geographic Information Science
	3. Digital earth and digital city
	4. Spatial Database
	5. GIS algorithm and application development
	6. Spatial data mining and knowledge discovery
	7. Measurement and Cartography
	8. Earth science data: the key to understanding the earth
	9. Photographic surveying
	10. Remote sensing physics
	11. Thermal infrared remote sensing
	12. Microwave remote sensing
	13. Advanced seminar of remote sensing and mapping
	14. Disaster remote sensing and emergency management
	15. Hyperspectral remote sensing
	16. Principles and methods of remote sensing image interpretation
	17. Remote sensing thematic information extraction and analysis
	18. Remote sensing image analysis
	19. Introduction to airborne remote sensing system
	20. Advanced remote sensing digital image processing
	21. Measurement and remote sensing





	22. Forestry remote sensing and geographic information system
	23. Remote sensing of resources and environment
	24. 3S theory and technology
	25. The principle and application of geographic information system
	26. Special topics on Vegetation Quantitative Remote Sensing Technology
	27. Spatial analysis of geographic information system and industry application
	28. Geographic information system
	29. Research progress of 3S Technology
	30. Introduction to geographic information systems
	31. Quantitative Geography
IPCC	1. Seminar on climate change
Guidelines/land	2. Meteorology
classification	3. Soil science and land resources
	4. Air pollution control engineering
	5. Soil plant atmosphere system
	6. Advanced forest soil science
	7. Forest Meteorology
Field methods	1. Experimental design and data analysis
TCA Statistics	1. Data statistical Analysis and practice using SPSS
	2. Mathematical statistics analysis and Practice
	3. Non parametric statistics
	4. Statistics
	5. Statistical principle
	6. Theory and method of statistical data analysis



	7. Statistical software
	8. Application of statistical analysis software
	9. Visualization of statistical data analysis
	10. Forestry Statistics
	11. Statistical calculation
	12. Experimental design and statistical analysis
	13. Introduction to MATLAB
	14. Method of calculation

**Table 2 Curriculum at the university in China**

<b>Thematic area</b>	<b>Curriculum</b>
Policy context	<ol style="list-style-type: none"> <li>1. China's response to climate change policy and action</li> <li>2. The system design of China's carbon market construction</li> <li>3. Policy and development of forestry carbon trade in China</li> <li>4. Progress in international negotiations on climate change and interpretation of forest related issues</li> <li>5. The situation and task of forestry in China response to climate change</li> <li>6. Policy and practice of the construction of China's carbon market</li> <li>7. The situation and task of the forestry carbon trade in China;</li> <li>8. Development trading guide of forestry carbon project;</li> <li>9. The approval and certification of forestry carbon sink project transaction;</li> <li>10. Registered trade procedure of forest carbon sink</li> </ol>
GIS and RS	<ol style="list-style-type: none"> <li>1. LULUCF Technical guide for carbon monitoring: Land classification and</li> </ol>



	<p>data processing method</p> <p>2. LULUCF Technical guide for carbon monitoring: Measurement and reporting</p>
IPCC Guidelines	<p>1. Methodology of forestry carbon sink project</p> <p>2. Forestry carbon sink project development and management</p> <p>3. Afforestation technology procedures for carbon sink</p> <p>4. Bamboo afforestation project methodology</p> <p>5. Methodology of the forest carbon sink management</p>
Field methods	<p>1. General situation and experience summary of the national forestry carbon measurement and monitoring system</p> <p>2. Technical guide for the measurement and monitoring of carbon sink</p>

**Table 3 Presentation and report in China**

<b>Thematic area</b>	<b>Presentation and report</b>
Policy context	1. Carbon sequestration effect assessment of major ecological engineering in China
	2. Perspective of ecological research hotspots in recent years
	3. Ecological big data
IPCC guidelines/land classification	4. International Symposium on the impact of forest carbon sink on Soil and water
Field methods	5. Integration of large scale ecological problems in the era of big data: Problems and approaches
	6. Canadian forestry carbon budget model (CBM-CFS3) training



GIS and RS	7. Advances in satellite ocean remote sensing of CO <sub>2</sub> in China
Communication of results	8. International Symposium on carbon cycle in tropical ecosystems
	9. Emissions and increasing carbon sink Symposium
	10. Carbon sequestration of grassland ecosystems, rate mechanism and Potential
	11. USCCC the 13th annual meeting

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