

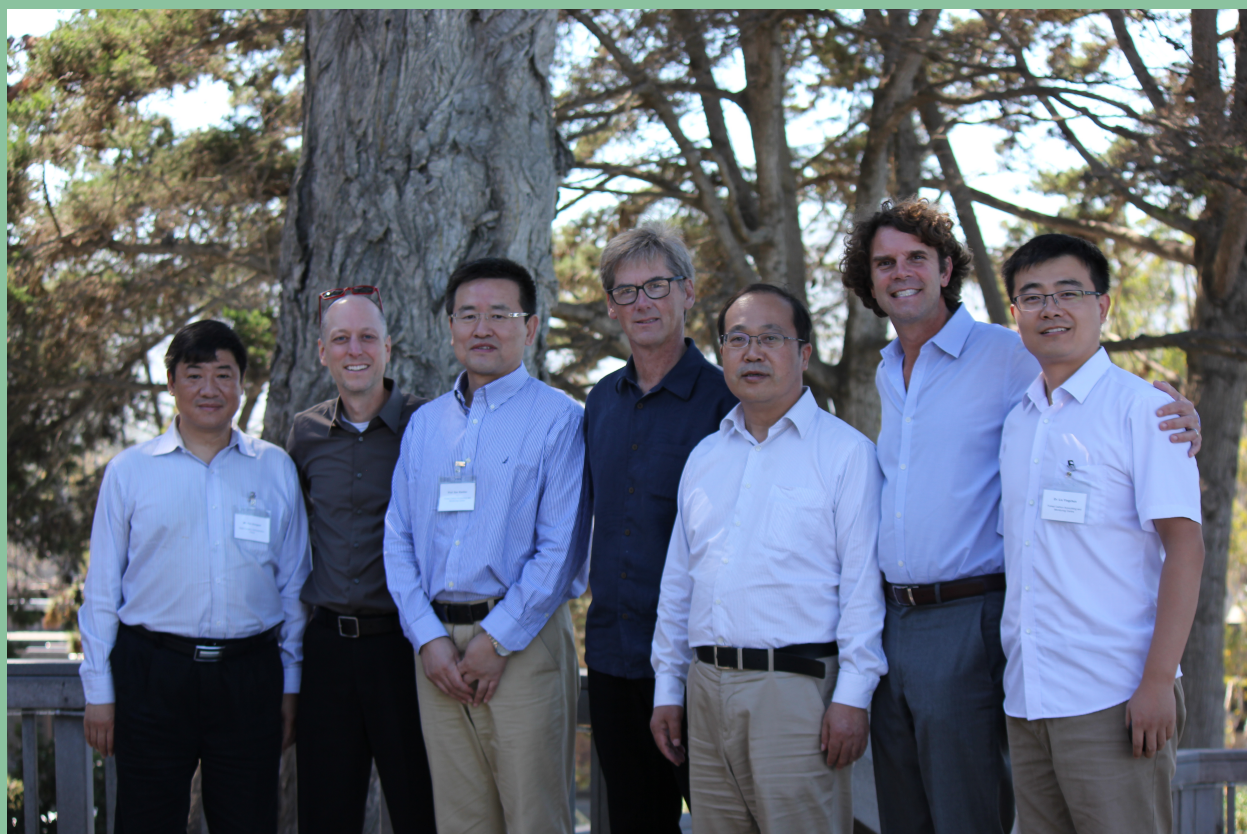


国家林业局调查规划设计院
Academy of Forest Inventory and Planning, State Forestry Administration



TCA Program Proposal:

A Certificate Program in Advanced Terrestrial Carbon Accounting
at the State Forestry Administration, China



(Left to right, Mr. Yan Hongwei, Dr. Michael Gillenwater, Dr. Gao Xianlian, Dr. Ralph Keeling, Dr. Xu Zehong, Mr. John Niles, Dr. Liu Yingchun at The Carbon Institute International Advisory Panel meeting, University of California San Diego, September 2016.)

Supported by:



Federal Ministry for the
Environment, Nature Conservation,
Building and Nuclear Safety

August 2017

based on a decision of the German Bundestag

Executive Summary:

The Carbon Institute is an international academic partnership to train the next generation of carbon workers, comprised of the Forest Carbon Accounting and Monitoring Center (FCAMC) in China, the GHG Management Institute (GHGMI) in the United States, and other partners. Together, we propose a new Terrestrial Carbon Accounting (TCA) Certificate program to be run by FCAMC in conjunction with national and international partners.

The primary goal of the TCA Certificate program is to train Chinese professionals in forest carbon accounting so that they may implement policies, projects, and market-based programs to reduce greenhouse gas (GHG) emissions and increase carbon sequestration. A second and equally important goal is to enhance the teaching faculties for advanced TCA in China.

Partnership Background (Chapter 1): TCA Certificate programs are under development by The Carbon Institute. TCA Certificate programs focus on developing comprehensive competencies, aligning curriculum with government priorities, and using real data to address government needs.

Research and Stakeholder Consultations (Chapter 2): Two studies form the basis of this program proposal. First, FCAMC conducted a scoping study on existing academic capacity for TCA instruction in China. Then, to build certificates tailored to government needs, FCAMC conducted comprehensive consultations and interviews with stakeholders.

Our Proposal (Chapter 3): As a result of our research and interviews, The Carbon Institute partners propose a Certificate that meets the following parameters:

- **Schedule:** *The program will occur 1-2 times per year, beginning in 2018. Each session will be 2 weeks of length between the Spring Festival and May.*
- **Trainees:** *The target audience for the training are provincial forestry professionals from provincial forestry departments across China. The program will train about 60 people per year.*
- **Registration Fees and Payment:** *Training will be financed by the provincial government forest agencies and forest management companies that send staff to the course. The program will cost about 6,000 Yuan per student.*
- **Management:** *The program will be organized and managed by FCAMC.*
- **Location:** *The program will be hosted and run at STAFA (the State Academy of Forestry Administration) in Beijing.*
- **Certification:** *We anticipate certificates will be jointly accredited by the Chinese Forestry Engineering Association (CFEA), the GHG Management Institute, and The Carbon Institute partnership accreditation panel.*

Table of Contents:

Executive Summary:	2
The Carbon Institute Partners	4
Chapter 1: Overview of The Carbon Institute Partnership	5
TCA Applications under the Paris Agreement.....	5
Building Comprehensive TCA Competencies.....	6
Work completed thus far	6
Chapter 2: Summary of Research and Stakeholder Consultations for the TCA Certificate Program	7
Scoping Study 1: Understanding Current TCA Instruction in China	7
Scoping Study 2: Stakeholder Consultations with Agencies and Experts	9
Chapter 3: A New Opportunity: The Terrestrial Carbon Accounting Certificate Run by FCAMC	12
A Clear and Present Opportunity	12
Principles	12
Proposed Program Details	13

The Carbon Institute Partners



The **Greenhouse Gas Management Institute (GHGMI)** was founded in response to the current and future needs for qualified professionals to actively engage in reversing the causes of climate change. GHGMI develops technically rigorous GHG training curricula authored and instructed by leading experts. These curricula are delivered globally via a low carbon e-learning portal, combined with onsite workshops and other special programs such as The Carbon Institute.



The **Centre for Climate Risk and Opportunity Management in Southeast Asia and the Pacific (CCROM-SEAP)** has been an important academic asset for Indonesia, providing support for national GHG inventories, REDD+ reference levels, training programs, and other areas on the policy-science interface. As a center within Bogor Agricultural University (IPB), CCROM has experience integrating academic programs with national and sub-national REDD+ priorities.



国家林业局调查规划设计院
Academy of Forest Inventory and Planning, State Forestry Administration

The **Forest Carbon Accounting and Monitoring Center of the State Forestry Administration (SFA)** develops personnel and products to assist the People's Republic of China (PRC) to implement forest greenhouse gas inventories and the technical components of REDD+. FCAMC conducts REDD+-related training programs on subjects including forest ecosystem inventory methods and the IPCC Guidelines for National Greenhouse Gas Inventories, among many other subjects.



The **Regional Center for Special Training in Agriculture, Forestry and Wood (CRESA Forêt-Bois)** is a Central African regional institute for masters-level education in environmental fields, including natural resource management and climate change. CRESA is the focal partner for The Carbon Institute's pioneering regional hub model for excellence in terrestrial carbon accounting in Africa. CRESA is housed in the Faculty of Agronomy and Agricultural Sciences, of the University of Dschang, Cameroon.

Chapter 1: Overview of The Carbon Institute Partnership

The Carbon Institute is a global partnership created to build strong and sustainable terrestrial carbon accounting (TCA) academic certificate programs that are of the highest academic and professional standards. Founding members of The Carbon Institute ran the first accredited Advanced TCA Certificate at University of California San Diego in 2013. Over 150 applicants competed for 24 course positions, and the evaluations from the first advanced certificate in TCA were extremely positive.

The Carbon Institute partner in China, the Forest Carbon Accounting and Monitoring Center (FCAMC), is the leading institution for national forest carbon accounting in China. Founded in 2008, FCAMC has extensive experience compiling greenhouse gas inventories for the forest sector and developing other REDD+ technical components. FCAMC has conducted numerous training programs in forest carbon related-subjects, such as national forest inventories, carbon modeling, and estimating forest carbon stocks and fluxes.

FCAMC and other Carbon Institute partners have completed the work of convening an international advisory panel for best practice TCA recommendations, developing and sharing curriculum, developing an administrative support toolbox, and organizing and preparing two initial scoping studies, summarized in chapter 2.

This program proposal is the final scoping study in the three-part series. This proposal provides an overview of the program, summarizes stakeholder consultations and programmatic assessment efforts, highlights the opportunity to increase China's forest carbon workforce by developing a TCA program, and proposes the specific details for such a program.

TCA Applications under the Paris Agreement

Terrestrial carbon accounting is the measurement and monitoring of terrestrial (land-based) carbon stocks and carbon stock changes (fluxes, or emissions and removals). TCA is carbon accounting for the land use, land use, change and forestry (LULUCF) sector. TCA is a technical discipline intended to support policy outcomes and enhance the efforts of forest and climate change decision makers.

What is TCA useful for?

- Developing and assessing Forest Reference Emission Levels
- Accounting for emissions/removals to access results-based REDD+ finance
- Providing increasingly accurate land area data, including land use changes
- Evidence-based policymaking, including low-emission land-use planning
- Developing, implementing, and tracking land-use mitigation actions
- Tracking Nationally Determined Contributions

- GHG Inventories of Emissions by Sources and Removals by Sinks
- National Communications and Biennial Update Reports to the UNFCCC (as well as Transparency of Action under the Enhanced Transparency Framework)
- Preparedness for the Global Stocktake
- Providing accurate carbon stock/change data for carbon markets

Building Comprehensive TCA Competencies

The Carbon Institute partners have identified 6 common-core skill areas needed for advanced policy applications of TCA. These are:

1. International and domestic policy contexts and climate science
2. Carbon modeling through GIS and remote sensing (developing geospatially-referenced activity data)
3. IPCC guidelines and land classification
4. Forestry field methods and data collection (developing country-specific emission factors)
5. Statistics and uncertainty analysis
6. Analysis of results and the communication of these analyses to decision makers

These six areas correspond to the six courses taught in the TCA Certificate program. The exact content and specifications of these six areas vary by national circumstances and government priorities.

Work completed thus far

As of August 2017, substantial groundwork to develop a Chinese TCA Certificate program has already been completed by the partnership.

Scoping study conducted on academic capacity and caps for TCA instruction in China: FCAMC conducted research to understand the existing academic capacities for TCA in each of the 6 core skill areas. For more information about the status of TCA instruction in China, consult “Scoping Study 1” in chapter 2.

Stakeholder consultations conducted about government capacity needs and priorities for TCA: To develop a rigorous understanding of government TCA needs and priorities, FCAMC conducted interviews with 16 stakeholders. Key outcomes include determining the ideal candidates for the course (future and current provincial forestry technicians), weighting the course content, and answering key logistical questions about the course. For more information, consult “Scoping Study 2” in chapter 2.

International Advisory Panel provides best practice recommendations for TCA instruction: In September 2016, The Carbon Institute partners from China, Indonesia, and the United States convened an advisory panel of 12 advisors from 6 countries, including two advisors from

China's State Forestry Administration, Mr. Yan Hongwei and Mr. Xu Zehong. This panel provided best practice recommendations for building the TCA Certificates. These recommendations have been published in a report and made available online at: <http://carboninstitute.org/the-carbon-institute-international-advisory-report-published/>

Curriculum refined, shared, and undergoing the process of national customization:

The Carbon Institute has developed a core template curriculum for the Terrestrial Carbon Accounting Certificate programs. This curriculum comprehensively covers the skills needed for advanced TCA. This includes 6 fundamental courses: science and policy context, field methods and data collection, the 2006 IPCC Guidelines and land classification, GIS/remote sensing, TCA statistics, and analysis and communication of results. These courses are now being customized for the Chinese context.

Toolbook to support TCA Certificates program in China:

A TCA Toolbook is under development that will provide institutional support and guidance to efficiently build sustainable TCA Certificate programs. The toolbook will establish systems for continuous course improvement. The toolbook contains lessons learned based on the 2013 course. This toolbook is really an online "toolbox," a collection of resources and guidance to be directly applied by the TCA Certificate program hosts.

Online portal and TCA Help Desk launched:

The Carbon Institute has launched an online portal at <http://carboninstitute.org/tcahelpdesk/> to share the successes of The Carbon Institute partners, to host curriculum, and to provide information about the courses as they are developed. The website includes a TCA Help Desk, where learners can ask a technical question about TCA and receive a response within 48 hours.

Chapter 2: Summary of Research and Stakeholder Consultations for the TCA Certificate Program

FCAMC conducted a scoping study to determine academic baselines for terrestrial carbon accounting instruction in China and stakeholder consultations to determine current government needs and priorities for TCA instruction. The results of these studies are summarized below and full copies of the studies are available online at: <http://carboninstitute.org/resources-and-media/country-context/>.

Scoping Study 1: Understanding Current TCA Instruction in China

The first scoping study was conducted to determine current baselines for TCA instruction in China. This scoping study was done to help FCAMC understand:

1. Existing courses in TCA at universities
2. Existing capacity building at SFA

3. What similar TCA capacity building initiatives, if any, have been done or are on-going outside of SFA and universities (e.g., under other capacity building grants, through civil society, run by government, etc.)

The high level results are summarized below. The full baselines scoping study is available online.

Existing Capacities

FCAMC surveyed 12 universities and other training institutions and programs in China, two of which are associated with the State Forestry Administration, and ranked the number of courses offered in each subject.

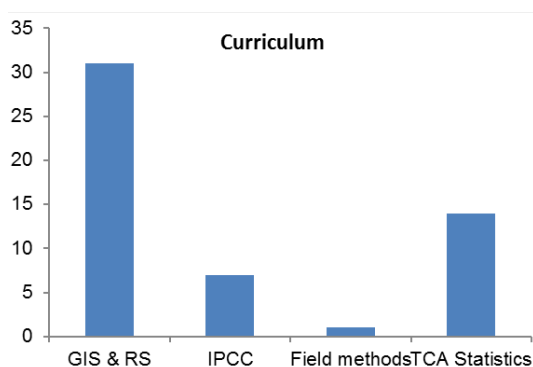


Figure 1. TCA-related curriculums at the university in China

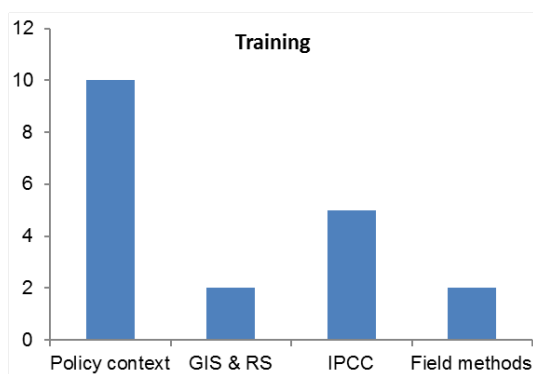


Figure 2. TCA-related trainings at the State Forestry Administration (SFA) in China

Capacity Gaps

As a synthesis of Chinese university offerings, SFA offerings, and presentations and reports, we rank each subject on where there are the fewest courses available (and greatest need) to the most courses already available. These are: (1) communication of results (no offerings), (2) field methods and data collection, (3) TCA statistics, (4) 2006 IPCC Guidelines and land classification, (5) policy context, and (6) GIS and remote sensing.

Scoping Study 2: Stakeholder Consultations with Agencies and Experts

Stakeholder consultations were conducted to determine current government TCA capacity gaps and priorities. This is essential for prioritizing the instructional and logistical elements of a TCA Certificate program in China. FCAMC interviewed 16 stakeholders including provincial technicians who work on forestry carbon accounting in provincial forestry departments (12 people), students (3 people) and young teachers (1 person) in relevant fields. The results are summarized below. The full stakeholder consultation summary (gaps scoping study) is available online.

Ideal Candidates

Respondents agreed that the key target audience are relevant professionals from China's provincial forestry departments. Respondents estimated a training need of about 3 to 5 professionals per province per year. This sums to a total training demand of 150 to 300 people from provincial forestry departments all over the country each year.

Many of those interviewed felt that, as a prerequisite, students should have or be seeking work related to TCA. Half of the respondents felt that students should be required to have prerequisite knowledge in statistics, forestry, and other subjects.

Course Content

The stakeholders identified the degree to which professional TCA work requires the skills of each course. Averaging their responses, these are ranked from most required to least required in TCA work: (1) 2006 IPCC Guidelines and land classification, (2) field methods and data collection, (3) GIS and remote sensing, (4) TCA statistics, (5) policy context, and (6) communication of results. Responses varied widely, particularly on communication of results, where some respondents use this skillset very frequently, whereas others are rarely involved in presentations or formal reporting.

The stakeholders identified the degree to which they see a training need for each course. Averaging their responses, these are ranked from greatest need to smallest need: (1) GIS and remote sensing, (2) TCA statistics, (3) policy context, (4) communication of results, (5) field methods and data collection, and (6) 2006 IPCC Guidelines. Matched against the results from scoping study 1, this can be used to indicate the respective complexity needed for each course's subject matter.

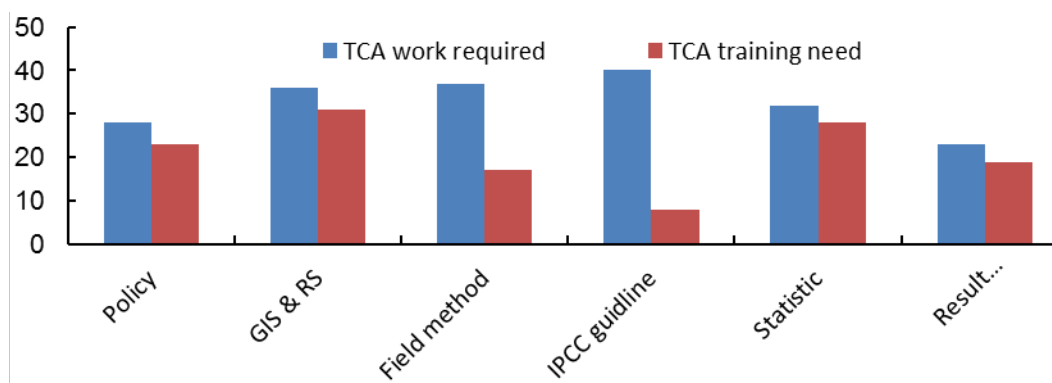
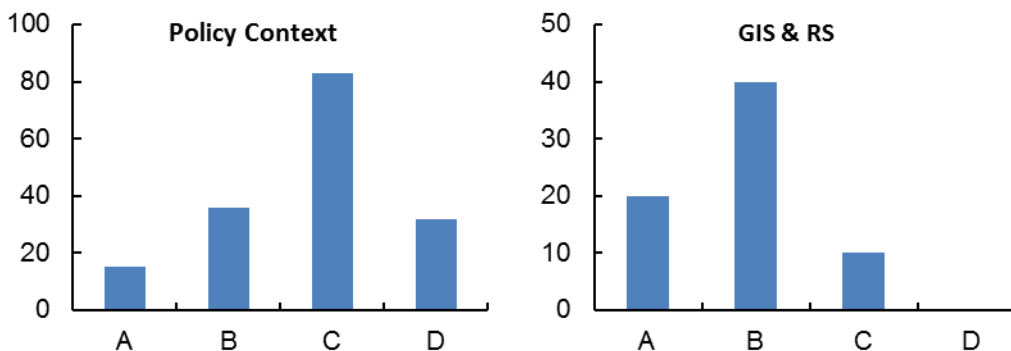


Figure 3. Respondent designation of the degree to which each of the six courses is used in TCA work and the degree to which there is an additional training need for each course area.

Based on respondent self-evaluation, the course areas with the least knowledge to the areas with the most knowledge are: (1) communication of results, (2) policy context, (3) 2006 IPCC Guidelines and land classification, (4) field methods and data collection, (5) TCA statistics, and (6) GIS and remote sensing. This can also be used to determine the relative complexity of each subject.



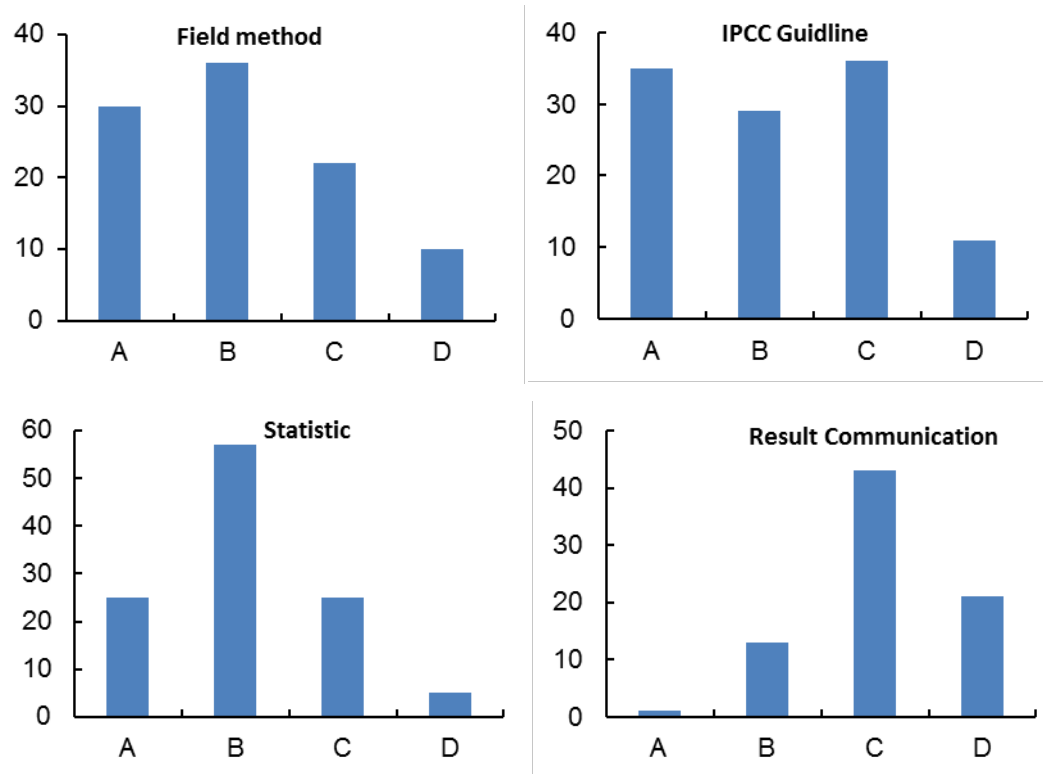


Figure 4. Each interviewee self-evaluated their understanding for subtopics under each of the six course areas. These are summed on the vertical axis. The categories are: (A) deep understanding of this area, (B) conduct occasional work related to this area, (C) know the basics for this area, and (D) very unfamiliar with this course area.

Based on their knowledge of the target audience and their employees, the respondents predicted that most learners will be able to bring real data for use in the course. These data will arrive in variety of formats, so communications will be needed prior to the course to align data formats.

Logistical Considerations

Generally, respondents preferred a two-week course duration and one course run per year. Most respondents felt that the best time to run the course is between the Spring Festival and May. Respondents perceived a strong value-add to having a government ministry brand the course.

Chapter 3: A New Opportunity: The Terrestrial Carbon Accounting Certificate Run by FCAMC

A Clear and Present Opportunity

Based on our findings to date, we conclude there is a clear need and opportunity to run a new TCA Certificate program in China under the auspices of SFA. This program will help government and other institutions understand carbon stocks and fluxes, enable government to better mitigate climate change, and support regional, national and international climate change policies. Per the recommendations of the International Advisory Panel, these programs will be nationally owned and operated, adapted to Chinese needs, iteratively updated, internationally accredited, and developed in close relationship with numerous government agencies.

Principles

Nationally owned, operated, and financed

The Carbon Institute is an international partnership. However, the TCA programs are designed to be country-owned and operated. FCAMC is developing Chinese-language curriculum in the 6 common-core skill areas for terrestrial carbon accounting. All courses are designed according to the specifications of the Chinese national forest system. The program will closely involve the CFEA, a specialized accreditation agency focused on certifying qualified individuals in forestry, forest inventories, and land-use planning. It is expected that the program will receive endorsement from China's State Forestry Administration.

World-class instruction that meets Chinese needs

The Carbon Institute and The Greenhouse Gas Management Institute have committed to ensure that the TCA Certificates issued in China are recognized as world-class, comprehensive training programs. The TCA Certificates will benefit from GHGMI's decade of experience teaching GHG management and accounting to over 3,500 professionals from more than 160 countries. The TCA Certificate programs will also benefit from the work developing, accrediting and running successful TCA Certificates at the University of California, San Diego and in Central Africa.

The core TCA curriculum has been developed by and in consultation with world experts, and addresses all the skills needed for advanced terrestrial carbon accounting. All courses are designed with rigorous pedagogy, applying active learning approaches based on the latest research to ensure strong learner outcomes. Teaching styles and curricular content are both adapted to Chinese needs and instructional culture. The level of each course is carefully honed

in for the best impact according to FCAMC's understanding of the background of candidates and the nature of China's systems for forest carbon accounting.

Close relationships with government agencies and international partners

The TCA program should be managed by FCAMC to ensure longevity, quality, and close cooperation with SFA. FCAMC will also continue to serve as the primary Chinese partner in collaborating with The Carbon Institute partners around the world. Advisers from the State Forestry Administration, Beijing Forestry University, and the Chinese Academy of Forestry are being consulted in the design and management of the program.

The International Accreditation Panel of The Carbon Institute will invite the TCA Certificate program in China to be considered for accreditation. Further, as with all partners of The Carbon Institute, China will be invited to nominate two members to this panel. This panel will ensure that all TCA Certificate programs meet the highest quality standards. Some key areas considered in the accreditation process include curricular comprehensiveness, national suitability of the curriculum, faculty development, opportunities for hybrid learning (in class combined with on-line learning), and learner support through active alumni networks and mentoring.

Proposed Program Details

As a synthesis of our stakeholder consultations, research, and discussions as a partnership, The Carbon Institute partners believe the program should be structured in the following way:

INSTITUTIONAL HOME AND MANAGEMENT TEAM:

The TCA Certificate program will be hosted at the State Academy of the Forestry Administration (STAFA). FCAMC will organize and manage the training sessions. The Chinese Forestry Engineering Association (CFEA) will play a key role in accrediting the course (described below).

PROGRAM SERVICES:

The following services will be offered to students enrolled in the TCA Certificate program:

- Two-week training session
- Instruction and examinations in the 6 core course areas and examinations (detailed below)
- Alumni support resources (e.g., professional network, career services)
- TCA Help Desk service to respond to technical questions within 48 hours
- TCA Certificate (upon successful demonstration of proficiency)

The Carbon Institute partners will offer the following services to the TCA Certificate program hosts:

- Development of student products and services above
- Nationally-specific curriculum in the 6 core course areas, iteratively updated
- Faculty recommendations, mentoring, and support resources (e.g., best practice pedagogy materials)
- Administrative toolbook and interactive “toolbox”
- Accreditation process support
- Direct and indirect marketing materials
- Systems for iterative program improvement

COURSE LENGTH AND TIMING:

The program will be run for about 2 weeks continuously, totaling approximately 80 hours. The program will typically run between the Spring Festival and May. The course will be run once per year in 2018 and 2019. The course may be run one or two times per year in 2020 and beyond.

COURSE SUBJECTS:

Six (6) courses will be taught, covering the key competencies of terrestrial carbon accounting. These courses are: (1) TCA Science and Policy Context, (2) carbon modeling through GIS and remote sensing, (3) 2006 IPCC Guidelines and land classification, (4) forestry field methods and data collection, (5) TCA statistics and uncertainty assessment, and (6) analysis and communication of results to decision makers. These courses will be tailored to national context and government needs, and provide case studies in the Chinese national context.

Drawing on the research and stakeholder consultations, these courses are being refined with respect to emphasis and complexity, with all courses teaching the context-specific skills needed to conduct TCA work:

Course	Complexity	Emphasis
Complexity and emphasis are ranked ordinally. For complexity, 1 signifies the most complex with the most instruction in advanced technique. For emphasis, 1 signifies the course most emphasized within the curriculum.		
Science and Policy Context	5	5
GIS/Remote Sensing	1	1
2006 IPCC Guidelines and Land Classification	4	3
Field Methods and Data Collection	2	4
TCA Statistics	3	2
Analysis and Communication of Results	6	6

INSTRUCTION:

FCAMC proposes the following individuals serve as instructors for each of the 6 courses for the 2018 run of the TCA Certificate program:

Course	Instructor
Science and Policy Context	Dr. Liu Yingchun
Carbon Modeling through GIS/Remote Sensing	Dr. Fu Anmin
2006 IPCC Guidelines and Land Classification	Dr. Liu Yingchun
Field Methods and Data Collection	Dr. Fu Anmin
TCA Statistics	Dr. Sun Zhongqiu
Analysis and Communication of Results	Dr. Gao Jinping

During the orientation and graduation ceremony, additional guest lecturers will focus on particular topics in policy.

For the initial years (2018 and 2019), instructors will be paid partially under the TCAIAP grant and partially by course tuition. For 2020 and beyond, instructor costs will be covered by course tuition.

EXPENSE:

We expect a price of about 6,000 Yuan per student for a two-week course that results in examinations and a certificate for qualified students. This pricing will allow for program self-sufficiency and guarantee the long-term sustainability of the program. This pricing covers: lecturer, administrative personnel and guest lecturer costs, meals and catering, costs associated with field work, literature & printing, renting meeting rooms and A/V equipment, and administrative expenses. Program tuition expenses will be paid by provincial forestry departments.

TARGET AUDIENCE AND ENROLLMENT:

The key target audience is provincial forestry professionals. We estimate an annual training demand of 3 to 5 professionals for each province. There is a total training demand of up to 150 to 300 people from provincial forestry departments across China every year. We expect to train as many as 20 to 60 forestry professionals the first year.

CERTIFICATION AND ACCREDITATION:

Students who complete the entire program and demonstrate proficiency will receive TCA Certificates. Pending accreditation, it is anticipated that the TCA Certificate may be issued by CFEA, and jointly issued by The Carbon Institute and The Greenhouse Gas Management Institute. Accreditation through The Carbon Institute will occur through The Carbon Institute's International Accreditation Panel, which involves representation by multiple international partners of The Carbon Institute.

RECRUITMENT AND MARKETING:

The Carbon Institute partners will work together to design effective marketing materials for direct marketing to potential students. Marketing will be conducted primarily through the network of CFEA, which serves about 50,000 people. Additional marketing will occur through connections to provincial training academies. The Carbon Institute partners will also develop the necessary materials to engage sponsoring government ministries and agencies (e.g., other bodies within the State Forestry Administration).

REAL DATA:

Our research shows that most learners will be able to bring real data to use in the course. Beforehand, there will be communication between the program and the students to ensure the TCA data is formatted in a way that can be used in the course.

FACULTY SUPPORT:

All faculty that are chosen to teach the TCA Certificate in China will have access to The Carbon Institute and The Greenhouse Gas Management Institute “faculty success” support. This will include access to curriculum, teaching materials, information on successful past TCA instruction, tools for how to prepare lectures and examinations based on strong pedagogy, as well as in person and remote support for modifying and delivering course materials.

STUDENT SUPPORT:

All students who take the course will be given access to “learner success” support offered by The Carbon Institute and The Greenhouse Gas Management institute. This learner success support will include supplementary materials, on-line courses as agreed by the partners, the “TCA Help Desk,” and alumni network and mentoring.

This project is part of the International Climate Initiative (IKI). The Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB) supports this initiative on the basis of a decision adopted by the German Bundestag.