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Scoping Study:
Terrestrial Carbon Accounting - Academic Baselines

INDONESIA CASE

Prepared by CCROM-SEAP IPB

国家林业局调查规划设计院

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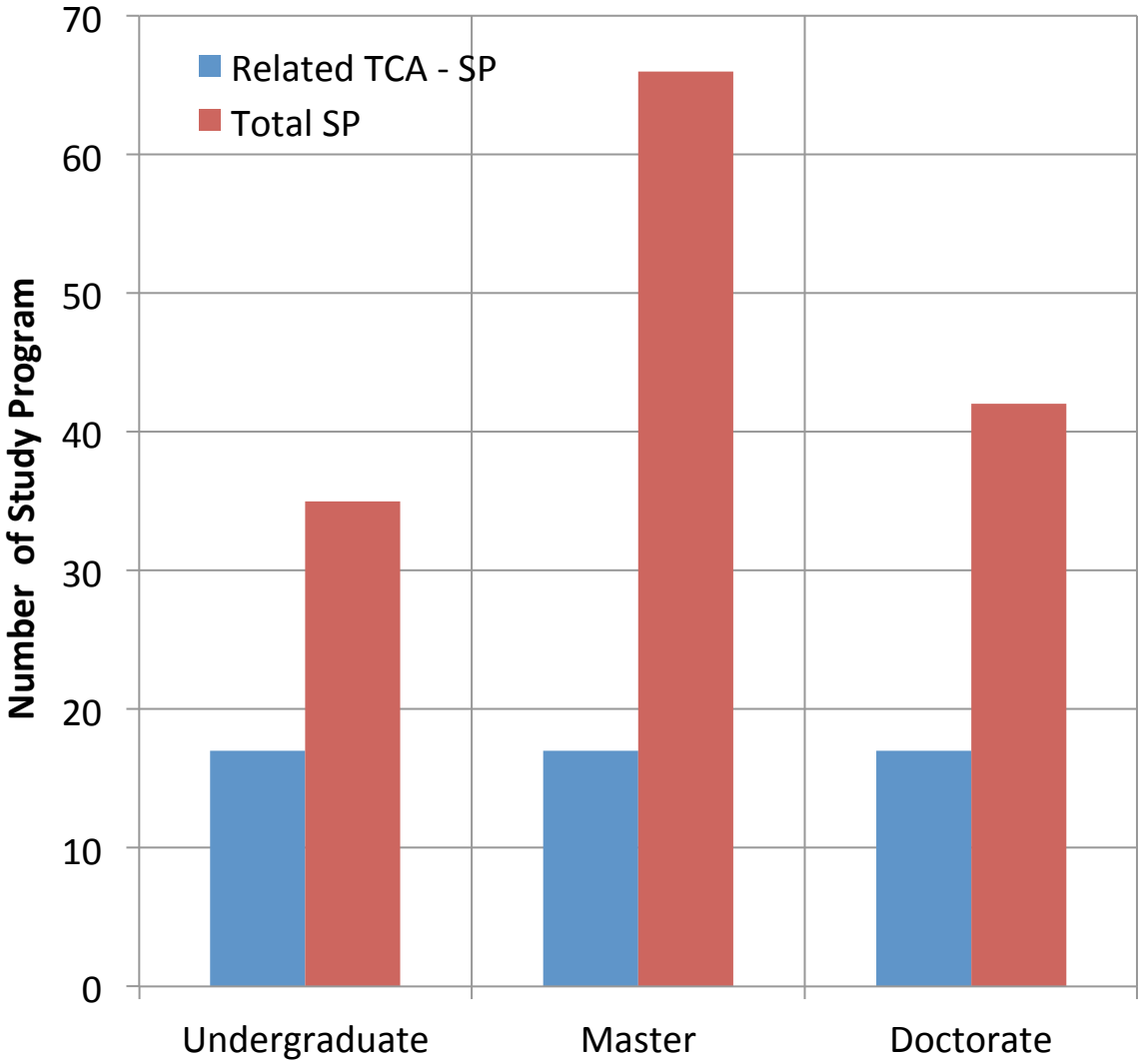
Existing In-Country Academic TCA Instruction

Bogor Agricultural University

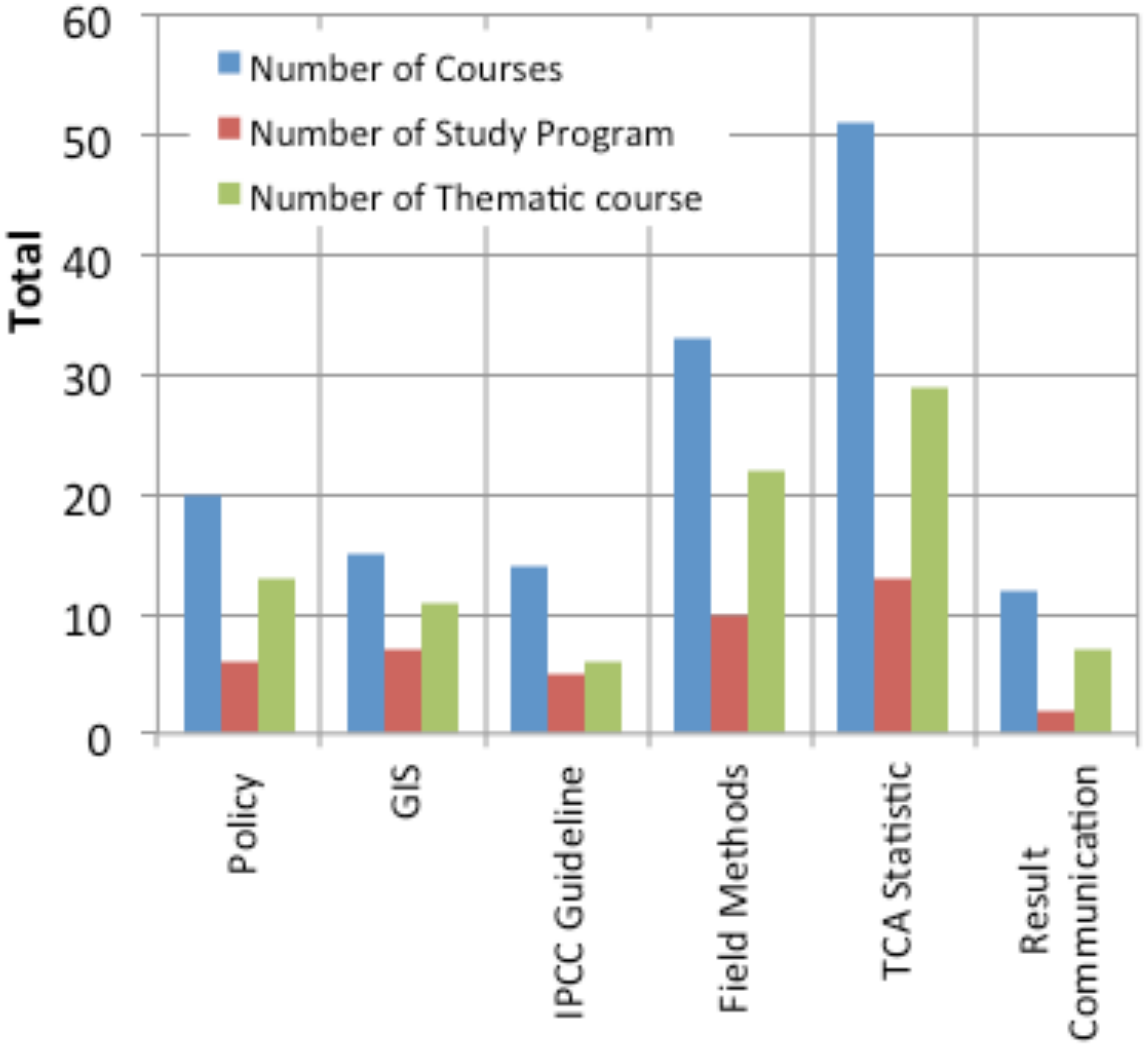
NO	UNDER GRADUATE/DEPT	MASTER PROGRAM	DOCTORAL
1	Soil Science and Land Resources.	Architecture Landscape	Architecture Landscape
2	Agronomy and Horticulture.	Mitigation Land disaster and damage	Mitigation Land disaster and damage
3	Plant protection.	Regional Planning	Regional Planning
4	Landscape Architecture.	Coastal resources and Oceanic Management	Coastal resources and Oceanic Management
5	Forest Management.	Forest Management Science	Forest Management Science
6	Forest Products.	Management of Ecotourism and Environmental Services	Management of Ecotourism and Environmental Services
7	Nature and Forest Resource Conservation.	Tropical Silviculture	Tropical Silviculture
8	Silviculture.	Statistics	Statistics
9	Machinery Technique and Bio-system	Applied Climatology	Applied Climatology
10	Civil Engineering and Environment	Plant Biology	Plant Biology
11	Statistics	Applied Mathematics	Applied Mathematics
12	Applied Meteorology (GFM)	Computer Science	Computer Science
13	Biology	Information Technology for Natural Resource Management	Information Technology for Natural Resource Management
14	Mathematic	Economy of Resources and Environment	Economy of Resources and Environment
15	Computer Science	Science of Development Extensions	Science of Development Extensions
16	Resource Economic and Environment	Communication of Agriculture and Rural Development	Communication of Agriculture and Rural Development
17	Communication Science and Community Development.	Resources and Environmental Management	Resources and Environmental Management
SP-TCA	17	17	17
Total SP	35	66	42

Number of Study Programs/Department at IPB Offering Courses contain TCA Instruction



- Most of the courses offered in each study program may include only one to three TCA Instructions (particularly GIS/RS, TCA Statistics, and Field Method, Policy Context)
- Almost none related to communication of results (except course related to method and technique of communication, awareness rising – not really connected with the communication results of climate mitigation actions

Number of Course offered by the Study Programs related to TCA Instruction (S1)



- Most of the courses offered in each study program may contains only between 5% and 30% of the TCA instructions, except for several courses related to GIS, and Forest Inventory, Forest Biometric, and Climate Policy

TAC Instructions

1. **Policy context**
   - UNFCCC (INDCs, national GHG inventories, REDD+, REDD+ reference levels)
   - Other guidance (World Bank, voluntary markets, sub-regional markets, relevant standards, including for verifiers)
   - Social landscape and safeguards (land ownership, indigenous people rights, shifting cultivation)
2. **GIS:**
   - GIS software use Remote sensing and
   - Generating activity data Software tools (e.g., ERDAS Imagine, ENVI, Google Earth Engine, CLASLite, IMGTools)
3. **IPCC Guidelines/land classification**
   - Applying the 2006 IPCC Guidelines
   - National forest classification maps
   - Forest types and classes
   - National forest inventory
   - Time series maps with land classifications
1. **Field methods**
   - Forest Measurement
   - Allometric equations
   - Forest carbon inventories
   - Generating emission factors
   - Evaluating data quality and methodological appropriateness
2. **TCA Statistics**
   - Error propagation
   - Uncertainty analysis (i.e., bootstrap, Monte Carlo methods)
   - Regression Use of software (including R code)
   - Statistics applied to forests/forest carbon
3. **Communication of results**
   - Faculty experience with UNFCCC reporting (e.g., national communications, INDC)
   - Study of previous national communications
   - Reporting requirements to government entities within Indonesia (e.g., PEP reporting)
   - REDD+ reporting (e.g., ICA, FCPF, FIP, bilateral)
   - Formatting analysis of results for reporting requirements

Courses related to TCA Instructions

No.	Thematic Areas	Is this area required by the program?	Course Titles (most relevant)	Credits/Hours	TCA Content %
1	Policy context	No	Climate Policy	3 (2-3)/48	70
		No	Political Economy and Natural Resource Policy	3 (3-0)/42	40
		Yes	Agraria	3 (2-3)/48	20
		Yes	Politics of natural Resources	3 (2-3)/48	20
		No	Forestry Policy and Regulation	2 SKS / 28	30
		Yes	Collaborative Management of Natural Resources	3 SKS / 42	20
		No	Analysis of Forestry Ploicy	2 SKS / 28	40
2	GIS	Yes	Geodetic and Cartography	2 SKS / 28	50
		Yes	Technique of Forest Resource Inventory	2 SKS / 28	50
		Yes	Remote Sensing and Image Interpretation	3 SKS / 42	75
		Yes	Geographic Information Systems and Cartography	3 SKS / 42	75
		Yes	Geomatic and forestry remote sensing	2 SKS / 28	75
3	IPCC Guidelines/ land classification	Yes	Forest Ecology	2 SKS / 28	20
		Yes	Spatial Environmental Analysis	2 SKS / 28	40
		Yes	Management of Environmental services and impact	2 SKS / 28	20
		Yes	Morphology and Soil Classification	3 SKS / 42	20
		Yes	Spatial Planning and Land Use	3 SKS / 42	40
		Yes	Introduction of Landscape Ecology	2 SKS / 28	20
		No	Climate change mitigation	3 (3-2)/42	40
		No	Analysis of global climate change	3(3-2)/42	50

Courses related to TCA Instructions

No.	Thematic Areas	Is this area required by the program?	Course Titles (most relevant)	Credits/Hours	TCA Content %
4	Fieldwork	Yes	General Forestry Practical work	3 SKS / 180	30
		Yes	Field work	3 SKS / 180	20
		Yes	Forest harvesting	2 SKS / 28	20
		Yes	Environmental Biology	3 (2-3)/42	10
		Yes	Morphology and Soil Classification	3 SKS / 42	20
		Yes	Survey and Evaluation of Land Resources	3 SKS / 42	20
		Yes	Fundamentals of Soil Science	3 SKS / 42	20
		Yes	Soil Fertility	3 SKS / 42	20
		Yes	Analysis and Design Survey	3 (2-2)/42	20
5	TCA Statistics	Yes	Statistical Methods	2 SKS / 28	60
		Yes	Sampling Method	3 (2-2)/42	20
		Yes	Statistics Simulation	3 (2-2)/42	40
		Yes	Regression Analysis	3 (2-2)/42	60
		Yes	Statistics Quality Control	3 (2-2)/42	40
		Yes	Forest Biometrics	2 SKS / 28	60
6	Communication of results	Yes	Database Management	3 (2-2)/42	20
		No	Broadcasting Media	2 SKS / 28	5
		No	Group communication	2 SKS / 28	5
		No	Participatory techniques	2 SKS / 28	5
		No	Comunication basic	2 SKS / 28	5
		No	Mass communication	2 SKS / 28	5

Other Universities

No.	Thematic Areas	Is this area required by the program?	Courses	UNMUL	USU	UNTAN
1	Policy contexs	No	Introduction to Forestry Science and Environmental Ethics (PIKEL)		✓	✓
		No	Forestry Policy and Regulation	✓		✓
2	GIS	Yes	Geodetic and Cartography	✓		✓
			Remote Sensing	✓		✓
			Data Base System	✓		
			Geographical Information System	✓	✓	✓
3	IPCC Guidelines/Land Classification	Yes	Forest Ecology	✓	✓	✓
			Tree Measurement	✓		
			Biology		✓	
			Management of Environmental Services		✓	✓
			Dendrology	✓		✓
			Spatial Land Management	✓		
			Agroforestry and Sosial Forestry	✓	✓	
			Bioenergy and biomas convertion	✓		
4	Field Methods	Yes	Forest resource Inventory	✓	✓	✓
			Forest harvesting	✓		
			Forest Carbon Inventory			✓
			General Forestry Practical work		✓	
			Field Work	✓	✓	✓
5	TCA Statistics	Yes	Matematics	✓	✓	
			Statistics Non Parametric	✓		
			Statistic	✓	✓	
			Forest Biometric	✓	✓	
6	Communication					

Other Organizations

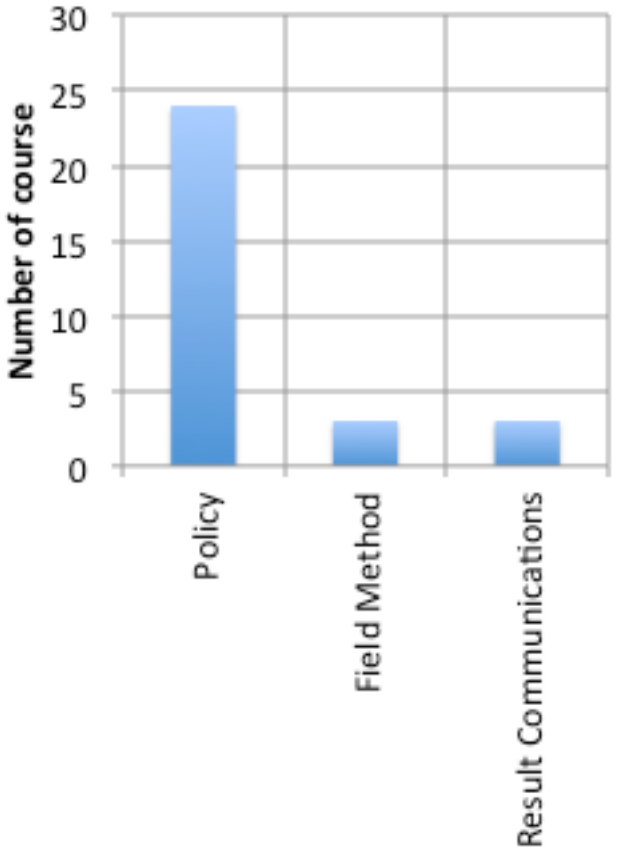
- There are so many training programs related to forest carbon have been implemented in Indonesia, particularly the ones related to REDD+
- Designed of the training programs depend on target participants
- Method are mostly combination of classes, practical and field work
- For local government, training is provided through learning by doing process (one week training and followed with technical support during the project periods)

1. Pusat Pendidikan dan Pelatihan Kehutanan (Pusdiklat Kehutanan, Center for Forest Education and Training, Ministry of Environment and Forestry)

- Various type of Training with different target participants (policy makers, academic, NGOs, private, and communities)
- Type of trainings consists of
  - General Training
  - Technical Training
  - Carbon Accounting
  - MRV and REL
  - Safeguard
- Duration of training range from 1 (8 hours) to 8 days (74 hours)

1. General Training

Facilitation technique	FM
Land cover change measurement	FM
Participatory Method	FM
Adult learning	O
Action Plan	P
Additionility, Leakage and Permanence	P
Climate change	P
Climate change and REDD	P
Co-benefit REDD+ in conservation area	P
Community based-climate change mitigation activities	P
Community role in addressing climate change	P
Deforestation & Degradation	P
Forest and Function	P
Forest carbon program and REDD in their region	P
FPIC	P
Integration of REDD+ into local policy	P
Introduction to Climate Change	P
Introduction to REDD	P
MRV	P
Planning climate change adaptation and mitigation	P
Policy of MoEF in Climate Change	P
Proposal preparation related REDD+ program	P
REDD Action Plans	P
REDD Framework	P
REDD+ Concept	P
REDD+ development	P
Role and function of conservation area as carbon sequestration	P
Strategy for awareness rising	P
Development of facilitation materials/media	RC
Effectice communication	RC
Reporting	RC



Curriculum from Implemented Training by Pusdiklat

Policy context (80%)	UNFCCC (INDCs, national GHG inventories, REDD+, REDD+ reference levels)	Climate Change	3 hours
		Role of Forests in Climate Change	2 Hours
		Deforestation and Degradation Triggers	3 hours
		International and national schemes and strategies to implement REDD+	3 hours
		REDD+ in Concept: REDD + as a Form of Payment for Environmental Services	
		Key Concept of REDD+	2 Hours
		REDD+ Implementations	3 hours
	National and provincial forest policies	International and national schemes and strategies to implement REDD+	3 hours
	Social landscape and safeguards (land ownership, indigenous people rights, shifting cultivation)	Risk of REDD+ Development	2 Hours
		Social Safeguards in REDD+	
		Climate Change and REDD for Stakeholders in the Grassroots.	5 Hours
IPCC Guidelines/land classification (25%)	National forest classification maps	Practice for Preparation of Action Plan considering forest function	12 Hours
Field methods (40%)	Forest Measurement	Carbon Measurement, Baseline and MRV	2 Hours
	Allometric equations	Carbon Measurement, Baseline and MRV	2 Hours

2. LAMA-I: ICARF-CCROM-IPB AND GIZ

- Target of the training: member of working group of low carbon development at local governments (some academic and NGOs):
- Method of classes and practical (48 hours) and followed by technical back up for the working group to develop local action plan for low carbon
  - Policy context: 33 hours
  - Technical: 12 hours (Practical to use LUMENS software-Land Use Planning for Multiple Environmental Services): Spatial model - defining REL, and development of mitigation actions)

Curriculum LAMA-I

Policy context (75%)	UNFCCC (INDCs, national GHG inventories, REDD+, REDD+ reference levels)	1. Introduction of the Land Use Planning for Low Emission Development Strategy (LUWES).	15 minutes
		2. REL calculation is based on land use changes in the past	30 minutes
		3. Making baseline scenario using linear projection	3 hours
		4. Making baseline scenario is based on the development plan	1.5 hours
		5. Identification of potential activities for emission reduction	1.5 hours
		6. Identification of potential activities to reduce emissions into the probability matrix of land use changes.	2 hours
		7. Analysis and conclusions of each baseline scenario and emission reduction actions	2 hours
		8. Calculating the impact of emission reduction action plan	3.5 hours
		9. Extracting and presentation of data	4 hours
		10. Latest Developments in Climate Change Policy in Indonesia: BUR, INDC, FREE, RAD-GRK	1 hour
		11. Reference Emission Level: Historical and Forward Looking	2.5 hours
		12. Tagging Methods: identifying gaps and contribution of current development plan/program toward low carbon	1 hour
		13. Tagging process mitigation actions	6.5 hours
	National and provincial forest policies	1. Policy and plan for reducing emission (National and Province)	15 minutes
		2. Trade-off Analysis	1 hour
		3. Trade off Profitability Data Analysis Using Land Use	2.5 hours
	Social landscape and safeguards (land ownership, indigenous people rights, shifting cultivation)	Results of land use planning assessment ; Integration with the principles, criteria and indicators of social safeguards; Develop an implementation plan.	3 hours
GIS (10%)	Remote sensing & generating AD	Preparation of land use change activity data	15 minutes
IPCC Guidelines/ land classification (60%)	Forest types and classes	Building a planning unit	15 minutes
	National forest inventory	C-Stock and C-stock difference	15 minutes
	Time series maps with land classifications	1. Identification of local land use systems.	1 hour
		2. Inventory of land use change types and the history of land use changes.	2 hours
		3. Identification of the factors triggering changes in land use	2 hours
		4. Estimated land use for the future.	2 hours
		5. Formulation of Unit Planning and Analysis of Land Use Change.	1.5 hours
		6. Identify drivers of LUC and Relationship Between factors	3 hours

3. CER-Indonesia

- Target of the training: Private sector
- Method of classes and practical (4 days/32 hours)
- Contents:
  - Policy context: 10 hours
  - IPCC Guideline: 6 hours
  - Field Methods: 16 hours
- Cost for 20 participants: 200 million IDR
- Instructors: from Universities and Research Agencies

CER-Indonesia: Curriculum

Policy context (75%)	UNFCCC (INDCs, national GHG inventories, REDD+, REDD+ reference levels)	1. Greenhouse Gas Inventory in Forest Sector	2 hours
		2. Opportunities, Challenges and Implementation Phase A / R CDM and REDD in Indonesia	2Hours
		3. Project Design Document (PDD) Preparation	2 Hours
	Other guidance (World Bank, voluntary markets, sub-regional markets, relevant standards, including for verifiers)	Institutional A / R CDM and REDD: Challenges and Agenda	2 Hours
	National and provincial forest policies	Policy, Funding Opportunities and Indonesia Forest Carbon Markets	2 hours
IPCC Guidelines/ land classification (60%)	Forest types and classes	Carbon Accounting and Forest Data	2 hours
	National forest inventory	Greenhouse Gas Inventory in Forest Sector	2 hours
	Time series maps with land classifications	Carbon Accounting and Forest Data	2 hours
Field methods (80%)	Forest measurements	Carbon Accounting and Forest Data	2 hours
	Allometric equations	Forest Biomass and Carbon calculations and Field Work	10 hours
	Forest carbon inventories	Measurement of Carbon Stock in Peatlands Area	2 hours
	Generating emission factors	Greenhouse Gas Inventory in Forest Sector	2 hours

4. REDD Academy: Collaboration BP REDD and UNEP

- Target of the training: Local Governments, Private sectors, NGOs
- Method of mostly classes and sharing lesson learnt between participants (4 days/32 hours)
- Contents in relation to TCA Instructions:
  - Policy context: 75%
  - IPCC Guideline: 20%
  - Field Methods: 20%
- Instructors: from Experts from UNEP, Multilateral Development Agencies and National Experts

Curriculum of REDD Academy

Policy context (75%)	UNFCCC (INDCs, national GHG inventories, REDD+, REDD+ reference levels)	Forests, Carbon Sequestration & Climate Change
		Introduction to REDD+ and the UNFCCC
		Drivers of Deforestation and Forest Degradation
		Economics and Finance of REDD+
		Approaches for Allocation of Incentives
	National and provincial forest policies	REDD+ National Strategies and Action Plans (NS/AP)
		Policies and Measures for REDD+ Implementation
	Social landscape and safeguards (land ownership, indigenous people rights, shifting cultivation)	Country approaches to REDD+ Safeguards
		Public awareness and stakeholder engagement
IPCC Guidelines/ land classification (20%)	National forest inventory	National Forest Monitoring Systems
Field methods (20%)	Evaluating data quality and methodological appropriateness	Forest Reference (Emission) Levels (FREL/FRLs)

RCCC-University of Indonesia

- Target of the training: Professional
- Method of mostly classes and a few practical (4 days/32 hours)
- Contents in relation to TCA Instructions:
- Modules:
  - Policy context (50%)
    - Introduction to climate change
    - Environmental economic and natural resources
    - Socio-economic aspect of management of conservation forest
    - Legal aspect on Management of conservation forest
    - Business on Forest Conservation Management (Ecotourism)
  - GIS (25%)
    - Remote sensing for forest and estimation of carbon stock
    - GIS
  - IPCC Guideline (25%)
    - Monitoring biodiversity and forest
- Cost for each module is 5 million per module per participant, thus if all modules being taken it will cost about 40 million IDR (3.5 k USD)
- Instructors: National experts from Government and Universities

Gaps, Challenges and Opportunities

- None of the existing programs provide complete coverage of TCA Instructions
  - None of training program include TCA statistics
  - Very minimum on result communications
- Training program are mostly project case (from donor) – sustainability issue
- Paying too much cost for training without clear benefit
- No evaluation system how the alumni contribute to the process of low carbon development
- Aligning the TCA curriculum to country's need (hot to design the modules for the six themes
- Need more professionals for supporting government for verifications
- Integration into existing curriculum vs competency based training (provide additional competency for graduates)
- National and International-Recognize TCA program
- Expanding the program nationally (to other national university)
- ….etc (discuss)

THANK YOU

Statistics

- Where the information and where is the noise
- Accredited by the university on the statistics on carbon accounting
- What information is needed and how to teach statistics
  - We do not need to know everything about statistics
  - Where is signal and where is noise
  - How they communicate the data and errors
  - To come up with errors needs some skill
  - Basic understanding working on data in term of signal and noise (very targeted)
- Who would take the course
  - Need to have background on statistics
  - Experience in programming, especially freeware R (free curse material and can be download freely – can be distributed prior to training so they can learnt their own)

Statistics in support of data-enabled TCA

- Core subject areas:
  - Description of signal and noise
  - Overview of descriptive statistics and their interpretation
  - Central limit theorem and the normal distribution
  - Defining and describing statistical power
  - Error propagation and Monte Carlo approach

Previous TCA

- Professional spent for 4 week, and spent 6 k USD
- Advance certificate, the most challenges certificate we need at least 160 hours (20 weeks) and have to be 3 credits or 4 credits
- University need advisory panel to inform what the course should be
- PCPF, FIP so need policy guidance from the world bank. Different policies on carbon accounting from different development agencies, multilateral development bank but all are based on the IPCC.
- IPCC and **land classification** (how many strata are you using)
- GIS and remote sensing: what type of knowledge that you need on GIS and remote sensing, how to use that for carbon accounting, do quick forest classification, how activity data from time series analysis, how to get EF, convert forest biomass into carbon (how to come up with activity data and emission factors).
- Using riel data for the GIS and remote sensing, rather than classes
- Field work: allometric equation, how you used different equations.
- TCA statistics: (really working with their data and making them suffer meaning get real experiences and gain skill in dealing with real problem
- Communication results: the one who do the carbon accounting but they do not communicate clearly, how to communicate math and statistics to general public, and also format in communicating to UN and World Bank, how you do good presentation

- How we can do better, advisory asked to talk
- How the Carbon Institute is international standard for TCA curriculum.
- Knowledge management
- The TCA is designed for serving Government
  - Why certificate program of TCA is needed.
  - Who are acquiring the certificates.
- Rizaldi Presentation on the Bring TCA as international standard for carbon accounting.
  - Why TCA is important
  - Paris Agreement
  - What are challenges, and opportunity (take from scoping study is non comphehensif coverage of the topics in TCA.
- Scopying 2 (gap, challenges and opportunities:
  - What the student want to carry from the course (training)
  - 2013