

3. 海外研修(カンボジア研修) 資料

平成 23 年度カンボジア海外研修の記録(プロシーディング)
～ 住民が参加するカーボン・プロジェクトへ向けて～

**PROCEEDING OF
TRAINING SEMINAR ON A/R CDM AND
REDD+ IN CAMBODIA
1-3 February 2012**

Forest and Wildlife Training Centre, Phnom Penh, Cambodia

Organize and Sponsored by:

**Forestry Administration of Cambodia and
Japan International Forestry Promotion &
Cooperation Center**

**Phnom Penh, Cambodia
February 2012**

CONTENT

ACKNOWLEDGEMENT	1
AGENDA	2
LIST OF ACRNYMS	3
WELCOME REMARKS	4
OPENING REMARKS	5
Opening Session of the Training Seminar	6
Presentations (Day 1: February 1st, 2012)	7
Review on A/R CDM projects: Experiences, success and recommendation	
National forestry policy on A/R CDM and REDD+ in Cambodia	
Basic concept of REDD+ and demonstration projects in Cambodia	
Basic rule of A/R CDM and current situation	
Methods for monitoring and estimating forest carbon stock	
National Forest Monitoring project by FFPRI Japan and FA in Cambodia	
Proposal: Contribution to National Forest Monitoring System to Promote REDD+ in Cambodia	
Field Practices (Day 2: February 2nd, 2012)	7
Field excursion: Interview to the local people	
Field practice: Monitoring and estimating forest carbon stock by each group	
Discussions and Evaluation (Day 3: February 3rd, 2012)	9
Carbon stock calculation based on the field measurement data by each group	
Problems and challenge for the promotion of forest carbon projects in the Philippines	
Group discussion and preparation for presentation by each group	
Presentation by each group and general discussion	
Group discussion and preparation for presentation by each group	
Presentation by each group and general discussion	
CONCLUSIONS	10
Closing remark and delivering certificate	11
QUESTIONNAIRE FOR EVALUATION AND FEEDBACK BY PARTICIPANTS	12
Annex 1: LIST OF PARTICIPANTS	15
Annex 2: PICTURES	19
Annex 3: PRESENTATIONS	

ACKNOWLEDGEMENTS

On behalf of the Training Seminar Secretariat, we would like to take this opportunity to thank H.E. Chheng Kimsun, Delegate of Royal Government in charge as Director General of Forestry Administration and its staffs, all participants who have spent their valuable time to participate in this training. The inputs and active participation in this training are very important for future development of REDD and promote sustainable forest management practice in both Cambodia and Japan.

We also would like to express our sincere appreciation to Japan International Forestry Promotion & Cooperation Center of Japan for its technical and financial support to organize this training seminar in Cambodia and especially Dr. Tokunori Mori, scientific adviser to JIFPRO, Mr. NAKAMA Eiichiro and also resource person from JIFPRO, and Dr. Edward V. Maningo from Negros Oriental State University as well as from FFPRI for sharing their valuable and useful presentations for this training seminar.

AGENDA

Training Seminar on A/R CDM and REDD+ in Cambodia Forestry Administration, Cambodia – JIFPRO, Japan

Day 0, Jan 31 2012: Meeting of lecturers and preparation		
Day 1, 1 Feb 2012		Lectures
08:00	Registration	
08:30-9:00	Opening ceremony including opening speech	Cambodian and Japanese
9:00-9:30	1. National forestry policy on A/R CDM and REDD+ in Cambodia	Dr. Keo Omaliss lecture 1
9:30-10:00	2. Review on A/R CDM projects: Experiences, success and recommendation)	Japanese
10:00-10:15	Coffee/tea break	-
10:15-11:15	2. Basic rule of A/R CDM and current situation	Mr. Nakama, JIFPRO
11:15-12:15	3. Basic concept of REDD+ and demonstration projects in Cambodia	Khun Vathana lecture 2
12:15-13:15	Lunch break	-
13:15-14:15	4. Methods for monitoring and estimating forest carbon stock	Dr. Mori, JIFPRO
14:15-15:15	5. National Forest Monitoring project by FFPRI Japan and FA in Cambodia	Dr. Toriyama, FFPRI Japan
15:15-15:30	Coffee/tea break	-
15:30-16:30	6. Proposal: Contribution to National Forest Monitoring System to Promote REDD+ in Cambodia	Mr. Lim Bunna, FA Cambodia
16:30-17:00	7. Discussion	Facilitator

Day 2, 2 Feb 2012		Lectures
Morning	8. Field excursion: Interview to the local people	Cambodian and Japanese
Afternoon	9. Field practice: Monitoring and estimating forest carbon stock by each group	Cambodian and Japanese

Day 3, 3 Feb 2012		Lectures
08:00-10:45	10. Carbon stock calculation based on the field measurement data by each group	Cambodian and Japanese
10:45-11:00	Coffee/tea break	-
11:00-12:00	11. Problems and challenge for the promotion of forest carbon projects in the Philippines	Dr. Edward V. Maningo Negros Oriental State University (NORSU)
12:00-13:00	Lunch break	-
13:00-14:30	12. Group discussion and preparation for presentation by each group	Facilitator
14:30-14:45	Coffee/tea break	-
14:45-16:30	13. Presentation by each group and general discussion	Facilitator
16:30-17:00	Closing ceremony including closing remarks	Cambodian and Japanese

LIST OF ACRONYMS

A/R	Afforestation and Reforestation
ABG	Above Ground Biomass
BBG	Below Ground Biomass
CCCA	Cambodia Climate Change Alliance
CDCF	Cambodia Development Cooperation Forum
CDM	Clean Development Mechanism of the Kyoto Protocol
CF	Community Forestry
COP	Conference of the Parties
DBH	Diameter at Breast High
EIA	Environmental Impact Assessment
ELCs	Economic Land Concessions
ESIA	Environmental and Social Impact Assessments
FCPF	Forest Carbon Partnership Facility
FPIC	Free, Prior and Informed Consent
GEF	Global Environment Facility
GHG	Greenhouse Gas
FA	Forestry Administration
FAO	Food and Agriculture Organisation of the United Nations
FLEG	Forestry, Law Enforcement and Governance
JICA	Japan International Cooperation Agency
JIFPRO	Japan International Forestry Promotion and Cooperation Center
JMI	Joint Monitoring Indicators
KP	the Kyoto Protocol
MAFF	Ministry of Agriculture, Forestry and Fisheries
MEF	Ministry of Economy and Finance
MoE	Ministry of Environment
MLMUPC	Ministry of Land Management, Urban Planning and Construction
MRV	Monitoring, Reporting and Verification for REDD+ (also called the REDD+ Monitoring System)
NCCC	National Climate Change Committee
NFP	National Forestry Programme
NGO	Non-Governmental Organisation
NRM	Natural Resource Management
NSDP	National Strategic Development Plan
PA	Protected Area
R-PP	Readiness Preparation Proposal
REL/RL	Reference Emission Level / Reference Level (also called the REDD+ Baseline or Reference Scenario)
RGC	Royal Government of Cambodia
REDD	Reduced Emissions from Deforestation and forest Degradation
REDD+	REDD, and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks
SA	Strategic Assessment
SESA	Strategic Environmental and Social Assessment
SIA	Social Impact Assessment
SFM	Sustainable Forest Management
tCO ₂ e	Tonnes of CO ₂ equivalent (a measure of greenhouse gases)
UNDP	United Nations Development Program
UNEP	United Nations Environment Program
UN-REDD	United Nations REDD Programme
WCMC	UNEP World Conservation Monitoring Centre
WA	Wildlife Alliance
WCS	Wildlife Conservation Society
WD	Wood Density

Welcome remark by Dr. Tokunori Mori, Scientific Advisor, JIFPRO

Thank you Mr. Chairman and Ladies and Gentlemen!
Good morning

First of all, thank you very much for participating in this A/R CDM and REDD seminar.

My name is Tokunori Mori, a science advisor for JIFPRO, Japan International Forestry Promotion and Cooperation Center. It's a great honor for me to make a Welcome Remark on behalf of Chairman of JIFPRO.

I am very happy to hold this workshop in good cooperation with Forestry Administration, Royal Government of Cambodia and Institute of Forest and Wildlife Research and Development, and many Cambodians and Japanese organizations interested on the mitigation of global climate change and sustainable forest management.

I appreciate hearty to Delegate of the Royal Government, H.E. Mr. Chheng Kimsun, Director General of Forestry Administration and every effort of Dr. Sokh Heng, Acting Director of Institute of Forest and Wildlife Research & Development and all the staff of the organizing team for the preparation of this workshop. I also thank to the lecturers of this seminar for their kind cooperation and preparation of the lecturing.

This seminar related to AR CDM and REDD+ activities is the first time in Cambodia. This seminar has been supported by the Japanese Forestry Agency for more than 9 years, in order to meet to the request of many developing countries that they have to need training for their participating the activities to mitigate the grovel climate changes. Now-a-day, AR CDM under Kyoto Protocol reached the final stage of the first commitment period of AR CDM activities. However, to tell the truth, the number of project activities is not so many or widely spreading because of its complicated rules and high cost performance. Under the these conditions, the Executive Board of UNFCCC has been still modifying the many rules of A/R CDM from the view point of simplification and COP17 decided that the second commitment period will be continued and also, a new treaty participated by all of the countries will be discussed from 2013.

Furthermore, as you know well, Reducing Emission from Deforestation and Degradation of the forest, so called REDD or REDD+ are now discussing as a new treaty for mitigation of climate change.

Under these conditions, the main purposes of this seminar is three; the first is to learn the current situation of A/R CDM projects and the newest situation of REDD+ discussion or activities, the second is to learn the monitoring works of the forests and estimation of carbon stocks, and the third is to offer chance to talk each other between Cambodian and Japanese participants. I hope this seminar offers useful knowledge and experiences for development and implementation of A/R CDM and REDD+ activity in Cambodia.

In this occasion, I would like to introduce briefly our Center, Japan International Forestry Promotion and Cooperation Center, JIFPRO's Activities. JIFPRO is the public-interest cooperation, or NPO organization, approved by Japanese Government. Our catch-phrase is "Green earth for the future", and the center has been founded in 1991 in order to promote Japanese private sector's activities on forestry cooperation in developing countries. Our main activities are 4 fields: namely 1) Technical and financial support to Japanese NGO group, including capacity building, 2) Study on forests and forestry in developing countries and its extension to the Japanese private sectors, 3) Cooperation to Japanese Government activities for international forestry problems, such Sustainable forest management, AR CDM and REDD+ and so on, and 4) Assistance of tree planting projects in developing countries by using the fund of Japanese private sectors. For example, the plantation area cooperated by JIFPRO are now about 7,500ha in 5 Southeastern Asia countries. Unfortunately, there is no plantation in Cambodia, presently. We are very happy if we can develop the tree plantation founded by Japanese donation fund under cooperation of Cambodian organizations in the near future.

Finally, I am confident that this seminar will help carrying out the A/R CDM and REDD+ project activities in Cambodia. I also hope all of you participated here have a good fortune in the New Year.

Thank you very much.

Opening Speech by
H.E. CHHENG KIMSUN
Delegate of the Royal Government
Director General of Forestry Administration

Dr. Tokunori Mori, scientific adviser to Japan International Forestry Promotion & Cooperation Center (JIFPRO)

Excellencies, Ladies and Gentlemen:

It is a great honour for me, on behalf of the Forestry Administration of Cambodia to welcome you at the opening session of the Training Seminar on A/R CDM and REDD+ in Cambodia which is co-organized by the Institute of Forest and Wildlife Research and Development of the Forestry Administration of Cambodia and the Japan International Forestry Promotion & Cooperation Center.

First of all, I would like to express my sincere thanks to Mr. Nakama Eiichiro for his effort in working closely with my colleagues in organising this training seminar. I would also like to thank all lecturers and participants from Japan who have spent their valuable time to travel on a very long trip to Cambodia to be with us today. I very much appreciate the excellent facilitation and arrangement of my Cambodian colleagues to make this training possible.

Excellencies, Ladies and Gentlemen,

Forests are globally recognised as one of important keys to the economic, ecological and social development of our Earth. A few billion people depend on forests and trees for their livelihood. Forests are home to people, they harbour biological diversity, they are vital to protect the soil, to ensure sustainable water supply, and to provide employment. However, forest sector development is still facing some key challenges. A great concern of today in terms of significant impact on deforestation is connected to the illegal activities in logging and land conversion are a serious threat to the future of the forest sector in many countries. As a consequence, forest resources are being destroyed, and its related economic development and local livelihoods are being seriously affected. It is of importance to know more and find a suitable alternative source of income for rural population and national economy rather than relying on non-timber forest products and timber. In this sense, environmental services and function obtained through REDD+ mechanism should be studied and explored more and more.

Excellencies, Ladies and Gentlemen

The forests of Cambodia have also suffered of over exploitation. However, the Royal Government of Cambodia is committed to the conservation and sustainable management of the country's forest resources, and is endeavouring to implement the international forest agreements including the IPF/IFF Proposals for Action and decisions of UNFF, in attaining international forest management standards.

As one of the important efforts to reverse deforestation and forest degradation and to increase forest cover from 57% in 2010 to 60% of the country's total land area by 2029, as envisioned in Cambodia's National Forest Programme, the Royal Government of Cambodia has been continuing in reforming the forest sector while working closing with different stakeholders. Our National Forest Programme focuses on strengthening forestry law enforcement and governance, speeding up the forest demarcations, enhancing the effectiveness of forests and wildlife management and conservation, building up and implementing community forestry, increasing re-forestation, human resource development, and forestry research and extension.

I would like to stress that the NFP is the overall framework agreed upon by all key stakeholders in the forest sector in Cambodia for sustainable forest management and REDD is one of key activities in the implementation programmes. It is important to improve our understanding on REDD especially the potential of methodologies for measurement of carbon change and stocks. It is one among other first steps in efforts to benefit from this mechanism.

As you all know, the purpose of this training seminar is capacity building for governmental and non-governmental staffs in Cambodia to learn basic rules and some technologies for estimating carbon stock for the promotion of A/R CDM and REDD+ in Cambodia. I was informed that there are some Japanese trainees participating in this training. I think it is our first time to organize such training. I do hope they can share and learn a lot not only about technical aspects but also cultures of our two countries.

Excellencies, Ladies and Gentlemen

On behalf of the Forestry Administration, I take this opportunity to thank again all participants who have spent their valuable time to participate in this training. Your inputs and active participation in this training are very important for future development of REDD and sustainable forest management in Japan and Cambodia.

Last but not least, I would like to express my sincere appreciation to Dr. Tokunori Mori, scientific adviser to Japan International Forestry Promotion & Cooperation Center of Japan and his colleagues and I wish you all have a successful training and an enjoyable stay in Cambodia.

I would like to declare the opening of this training from now on.

Thank you very much!

Opening Session of the Training Seminar

A three days *training seminar on A/R CDM and REDD+ in Cambodia* from 1st to 3 February 2012 were conducted in Forestry and Wildlife Training Center in Phnom Penh and include one day field practiced at the Phnom Tamao Zoological Garden and Wildlife Rescue Center in Takeo Province of Cambodia. This training seminar was jointly organize and sponsor by Forestry Administration (FA) of Cambodia and the Japan International Forestry Promotion and Cooperation Center (JIFPRO). The training seminar was co-chaired by H.E. Chheng Kimsun - Delegate of the Royal Government in charge as Director General of Forestry Administration and *Dr. Mori, Scientific Advisor for Japan International Forestry Promotion and Cooperation Center (JIFPRO)*. The complete list of local and oversea presenters and participants attending the training seminar is attached in Annex 1.

During the opening session of the training seminar on A/R CDM and REDD+ in Cambodia, Dr. Mori, Scientific Advisor for JIFPRO made a Welcome Remark on behalf of Chairman of JIFPRO as well as gave the introduction and overview of the JIFPRO overall activities to promote "Green earth for the future". H.E. Chheng Kimsun, Delegate of the Royal Government in charge as Director General of Forestry Administration of Cambodia gave an Opening Remark and stressed the vital values of forest resources for local livelihood, national economic growth and joint effort in climate change mitigation and adaptation. He also stressed that, the forest ecosystem services; functions REDD+, carbon credit mechanism, and other optional values should be studied and explored further in other to support long term sustainable financial support for sustainable forest management. It is important to improve FA's staff capacity in understanding on REDD+ especially the potential of methodologies for measurement of carbon change and stocks. It is one among other first steps in efforts to benefit from this mechanism.

Presentations (Day 1: February 1st, 2012)

The first day of the training seminar on A/R CDM and REDD+ in Cambodia were largely for presentations of theoretical and lesson learn of the concept of A/R CDM and REDD+ policy and mechanism (see detail in annex 3). Those presentations are:

- Review on A/R CDM projects: Experiences, success and recommendation
- Basic rule of A/R CDM and current situation
- National forestry policy on A/R CDM and REDD+ in Cambodia
- Basic concept of REDD+ and demonstration projects in Cambodia
- Methods for monitoring and estimating forest carbon stock
- National Forest Monitoring project by FFPRI Japan and FA in Cambodia
- Proposal: Contribution to National Forest Monitoring System to Promote REDD+ in Cambodia

Field Practices (Day 2: February 2nd, 2012)

For helping trainees to acquire real experience One day field practice were conducted in middle of the three days training seminar. The field practice were took place at the Phnom Tamao Zoological Garden and Wildlife Rescue Center in Takeo Province of Cambodia. The field practices composed of two themes: a) measuring of diameter and tree height, and b) calculation of carbon stock from data collected from sample plot.

PRACTICE 1: MEASURE OF DIAMETER AND TREE HEIGHT, it focused on

- Tools, equipments and material (for each group) for a) *establishment of sample plot and b) diameter and height measure*
- *Methods for: a) establishment of sample plot; b) measuring tree height and diameter; and c) inventory table form*

PRACTICE 2: CALCULATION OF CARBON STOCK FROM DATA COLLECTED FROM SAMPLE PLOT, this was for:

- *Biomass Calculation: a) Process 1: Calculation by using data collected and b) Process 2: Biomass calculation base on Two Factors stumpage volume table*

- Calculation of Carbon from biomass: a) calculation of above ground carbon; b) calculation of under ground carbon; and c) calculation of carbon stock for 1 hectare of in Microsoft Excel

Discussions and (Day 3: February 3rd, 2012)

With guidance and assistance from resources person, the trainees were exercised with Carbon stock calculation based on the field measurement data by each group and than their continue to have a group discussion on the lesson learn of A/R CDM, REDD+ policy, mechanism and methodologies for measurement of carbon change, carbon stocks, biomass above and below ground ...etc. Than the participants of the training seminar have learn a prospective of the problems and challenge for the promotion of forest carbon projects in the Philippines.

There is key topic for group discussion (6-7 participants per group) "How to promote and improve REDD program in Cambodia?". The responses by group presentation are summarize as following:

Response	Group Work (G)
Public awareness raising about the important of REDD, especially to government institutions, and local communities	G1, G5, G3, G6
- Specify cause of deforestation and forest degradation,	G5
- Global warming, draught, flooding and erosion,	G5
- Benefit derive from REDD programs	G4
Define potential sites for:	G5
- A/R CDM	G5
- REDD or REDD+	G5
- Promote forest plantations by public and private, especially in degraded areas, arable land	G5, G2, G3, G4
Define keys relevant stakeholders	G5
- Mobilize support	G5
- Enhance capacity for practitioners and relevant stakeholders	G5
Find-out carbon market	G1, G5,
Existing carbon market, technical and financial support and investments partners	G1, G3
Promote Sustainable natural resources and forest management practices	G1, G2, G3, G4
- Establishing Community Forestry	G1, G4
- Increase protection measures for existing natural forests, forest fire prevention and promote forest plantation	G1
- Prevent illegal forest clearance	G1
- Permanence Forest Estate boundary demarcation	G1
Commitments and involvement of relevant stakeholders, local authorities, private sector, local communities and NGOs	G1, G2, G3
Strengthen Forestry Law Enforcement and National Policy and legislation and Guidelines for REDD should be developed	G2, G4, G6
Encourage and looking for partnership to support REDD projects or programs implementations in Cambodia, especially from industrialize and high GHG emission countries	G2
Increase human resources and competency capacity building for implementing REDD programs	G1, G2, G3
Need government attention and support to promote REDD programs from national to local level	G2
Comprehensive REDD Implementation Plan in Place	G3, G6
Equity in benefit sharing for local communities and relevant stakeholders within the REDD projects areas	G1, G3
Clear compensation mechanism to local communities when its livelihood are affected by REDD project implementation	G3
Help to change the conventional usage of forest and non-forest products of local community:	G3
- shifting cultivation to permanence intensive cultivation practice	G3, G4
- using firewood for cooking to gas or bio-gas for cooking	G3
More and frequently training seminars, meeting to discuss and sharing the progress or lesson learn of REDD implementation	G1

Participatory Land use Planning for relevant stakeholders in place	G1
Encouraging and rewarding to outstanding persons or entities that success fully promote or implement REDD projects or program	G1
Consensus on REDD implementation process amongst relevant stakeholders in forest management in place	G1
Establish Multi-Stakeholders National Task Force at National and Local Level for implementing REDD programs	G6
Preparing Action Plan and Implementation Plan of REDD Programs	G6,
- Capacity Building Plan	G6
- Awareness Raising Plan	G6
- Potential Sites Identification for REDD	G6
- Forest Resource Inventory Plan	G6
- Economic, Social and Environmental Impact Assessment	G6
- Forest Plantation Development Plan	G6
- Marketing and define basic price for carbon trading	G6
- Comprehensive benefit sharing mechanism	G6
- Alternative livelihood support for local community	G6
Mobilize support for implementation REDD programs: Human resources, technical and financial support	G6

Conclusions

The Training Seminar provides a good foundation for capacity building for staffs of relevant stakeholders in Cambodia, both from, public, private and civil society on A/R CDM or REDD+ in Cambodia with keys lessons learn on problem and challenges from other country such as Japan, Indonesia, Philippines and Vietnam. There are key conclusions of this training seminar:

- There are still many barriers to implement AR CDM or REDD+. For example, no permanence of credit, expensive commission fee, complex procedures of AR CDM and probably MRV (monitoring, reporting and verification) in REDD+ and so on. We did not only learn AR CDM and REDD+ mechanism, but also it is important that we should try to be lowered these barriers in implementation of mitigation of climate changes through the sustainable forest management. The lesson learn from this seminar could give some information and knowledge to do for relevant stakeholders in Cambodia to further implementation suitable options of AR CDM and REDD+ mechanism future.
- REDD+ appears to have again wider and phenomenon acceptant compared to A/R CDM. However, both approaches are still sophisticated and requiring very strong technical linkage, continuation of capacity building, transaction supporting cost and commitment from relevant stakeholder and as well as enabling legislations tools for facilitating the management of carbon credit projects/programs.

**Closing remark by
Dr. Tokunori Mori, Scientific Advisor, JIFPRO**

Ladies and gentlemen, Good afternoon!

It is a great honor for me to address you today, on behalf of the JIFPRO, on the occasion of the Closing Ceremony of this seminar.

First of all, I would congratulate all of you upon your success in running this seminar. It surely serves as a good example of the joint efforts among the Cambodia and Japan in the spirit of cooperation to develop sustainable forest management and the mitigation of climate change.

AR CDM and REDD+ may give us a good chance to manage well the plantation and natural forests sustainably. As you know well, we need the long years for managing plantations from the time of tree planting to harvesting without any income. If we could get credits from AR CDM and/or REDD+, we could manage plantation carefully and keep the forest healthy. The credits also would help the life of local people.

However, there are many barriers to implement AR CDM or REDD+ as you learned here in this seminar. For example, no permanence of credit, expensive commission fee, complex procedures of AR CDM and probably MRV (monitoring, reporting and verification) in REDD+ and so on. We did not only learn AR CDM and REDD+ mechanism, but also it is important that we should try to be lowered these barriers in implementation of mitigation of climate changes through the sustainable forest management. I hope this seminar could give some information and knowledge to do so in future.

I would like to extend my deep appreciation to Delegate of the Royal Government, **H.E. Mr. Chheng Kimsun**, Director General of Forestry Administration and **Dr. Sokh Heng**, Acting Director of Institute of Forest and Wildlife Research & Development and all the staff of the organizing team concerned for their great contributions to the success of this seminar.

Finally I wish all of the participants can get success and happiness.

Thank you very much.

**QUESTIONNAIRE FOR EVALUATION AND FEEDBACK
BY THE PARTICIPANTS**

To improve this A/R CDM and REDD seminar, your kind cooperation is highly appreciated to answer the following questions.

Q1. Do you think, from general point of the view, this seminar will be helpful for your capacity building on A/R CDM and REDD? (Yes , No)

Yes

No

Response	Institution or belonging
Knowing general concept for developing A/R CDM and REDD in Cambodia	Local FA, FA, private company,
Build more knowledge on reducing GHG Emission	Local FA
Knowing more about A/R CDM and REDD on going initiatives both international and national	Local FA, Japanese
Getting updating document about A/R CDM and REDD both international and national	Local FA, NGO,
Provide me a clear understanding the difference of A/R CDM and REDD	Local FA
More knowledge on Calculation of Biomass and Carbon stock	Student

Q2. Which part of the seminar was most interesting / helpful for you? And why?

Response	Institution or belonging
Calculation of Biomass and Carbon stock , above and below ground, data analyses	Local FA, FA, private company
Measuring the tree at demonstration site during the practice	Local FA, student, private company
Carbon Market, local and international	Local FA, FA
Methods for data collection and carbon stock calculation, CO ₂	Local FA, FA, private company, Japanese
Calculation of carbon stock in living tree	Local FA, FA
Interview with local people by team work during field practices	Student, private company
Updating the registration of A/R CDM projects	private company
Field Practices after classroom	NGO, private company, Japanese
Basic concept of A/R CDM, applicable required conditions	Local FA
Basic concept of A/R CDM and REDD	Local FA
How to convert the biomass to carbon, if it limited info on carbon estimation	Japanese
Calculation of total carbon	Japanese

Q3. Which part of the seminar was most difficult for you to understand? And why?

Response	Institution or belonging
Equations and allometric for carbon biomass calculation and data analyses	Local FA, student
Methods for forest carbon stock calculation, because it quite new and complicated	Local FA, FA, private company, NGO
Translation technical terminology to local language not so clear, especially on the parameter for equations and allometric	Local FA, private company
Exact calculation of quantity of carbon biomass for target sites	FA
Sample plots and sub-sample plot are not shown during field practices	Local FA
A/R CDM process it quite complicate	Local FA, student
Using tools and equipment for measurements	
Carbon market mechanism	Japanese
Not understand clearly about REDD concept	Japanese
Not enough time for exercise	Japanese
First day of the training seminar, because not hear the presentation clearly	Japanese

Q4. Do you have any suggestions to improve this type of seminar more successful in the future?

Response	Institution or belonging
Need resource person to support each sub-group while doing carbon biomass calculation exercises	Local FA
Hand-out materials should be distributed to trainees before presenting the subjects	Local FA
Improving translation to local language of technical terminology	Local FA, private company
Explanation of presenters and expert seem fast, difficult to catch up	Local FA
The duration of the training seminar shall longer (1 to 3 days more)	FA, student
Should allow and support more students for such training seminar	student
Shall provide more relevant documents	student
Invited more practitioners and implementers of A/R CDM and REDD to attend the seminar as resource person	FA
Shall provide presentation hand out to translator in advance for better translation	Local FA
Explain clearly about each parameters stand for of the Equations and allometric	FA
More time for field practices and exercise on carbon biomass calculation	Local FA, FA
Field practice on data collection & exercise on carbon stock calculation shall conducted frequently	Local FA
Elaborate more easy to understand for presentation materials	Local FA
Organize training course on carbon biomass calculation and monitoring scheme	Local FA
Cut of some parts of some presentations to provide more time for trainees to do exercise/ practice	Local FA
Shall have a follow up training seminar to strengthen capacity	Local FA, NGO
Translator have limited understanding on A/R CDM and REDD terminology, and some language accent of presenters difficult to understand	
Presenters should not presents its presentation very rush and fast	Local FA
Provide reading materials or training papers in advance to trainees	Local FA
More time for exercise on calculation AGB, BGB and explain more on REDD	Japanese

Q5. What, do you think, should be done to promote the AR-CDM and REDD in your country?

Response	Institution or belonging
National Policy and legislation for REDD should be developed	Local FA, FA
Commitments and involvement of relevant stakeholders, local authorities, private sector, local communities and NGOs	Local FA
Increase human resources and capacity building for implementing A/R CDM and REDD programs for all relevant stakeholders	Local FA, FA
Need government attention and support	Local FA, FA
Improving cooperation both national and international level on sharing experiences	Local FA,
Public awareness raising about the important of REDD, especially to government institutions, and local communities	Local FA, student, NGO
Mobilizing financial support for implementing A/R CDM and REDD programs	FA, private company
A/R CDM and REDD projects or programs shall implement in Cambodia soon to have a clear example	Local FA, student
Sustainable forest management practices in place	FA
Increase protection measures for existing natural forests	FA, private company, student
Increase and promote forest plantation	private company
More training seminars, capacity building on A/R CDM and REDD for	FA, Local FA, private

relevant stakeholders and local FA	company, Japanese
Trainees shall share and spread knowledge acquired from this training seminar to relevant stakeholders as much as possible	Local FA
Strengthen Forestry Law Enforcement	Local FA, NGO
Find-out carbon market	FA
Discuss more on strategy to reduce transaction cost	Japanese
Carry out more events about A/R CDM or REDD, especially through classes for undergraduate students	Japanese
Considering	Japanese

ANNEX 1: LIST OF PARTICIPANTS

N°	Name	Position	Organization
I. Honorable and invited guests			
1	H.E. Chheng Kimsun	Director General	FA
II. Participants (08 Person)			
1. Central Forestry Administration			
2	Mr. Lao Sethaphal	Deputy Director	DLE
3	Mr. Pok Kanada	Deputy Director	IRD
4	Mrs. Kong Phallyka	Deputy of office	DWB
5	Mr. Chuon Chanvuthy	Deputy of office	DPP
6	Mr. Morn Pengkry	Deputy Chief of Forest & Wildlife Training Center	IRD
7	Mr. Keth Samkol	Deputy Chief of Forest Development and Botany Research Center	IRD
8	Mr. Pich Ket	Staff	IRD
9	Ms. Hort Ainun	Staff	DFI
2. Local Forestry Administration (15 person)			
10	Mr. Teang Davith	Chief of Odor Meanchey Containment	Odor Meanchey
11	Mr. Em Vichet	Chief of Kampong Tralach Division	Kampong Chhnang
12	Mr. Mak Panha	Chief of Cham Khsan Division	Preah Vihear
13	Mr. Suo Hay	Chief of Krakor Division	Pursat
14	Mr. Im Savrith	Deputy Chief of Samroung Division	Odor Meanchey
15	Mr. Tu Vannarin	Deputy chief of Sre Ambel Division	Koh Kong
16	Mr. Chrouk Kimveng	Deputy chief of Bantay Srey Division	Siem Reap
17	Mr. Kong Boravuth	Chief of Kvav Triage	Siem Reap
18	Mr. Chheang Mealea	Chief of Stoung Triage	Kampong Thom
19	Mr. Porm Sopheap	Deputy chief of Angkor Chey Triage	Kampot
20	Mr. Heng Kamic	Deputy chief of Kraya Triage	Kampong Thom
21	Mr. Lim Sothy	Staff of Angkor Thom Triage	Siem Reap
22	Mr. Hou Kunthea	Staff of Anglong Veng Triage	Odor Meanchey
23	Mr. Ou Vannareth	Deputy chief of Dong Tong Division	Koh Kong
24	Mr. Lonn Panha	Chief of Chong Phlas Sre Preach Triage	Monduliri
3. Japanese (06 person)			
25	Akira Sakamoto, Mr	Nippon Eco Solutions, Inc	Japan

26	Toshio Ogata, Mr	Chuo University, Graduate School of Economics (Professor)	Japan
27	Tomoya Mori, Mr	Chuo University, Graduate School of Economics (Postgraduate)	Japan
28	Ryosuke Nakamura, Mr	OKAYAMA University, Faculty of Agriculture (Undergrad)	Japan
29	Takayuki Tsuji, Mr	Action for Mangrove Reforestation (ACTMANG)	Japan
30	Kenshin Saito, Mr	NPO Asian Green Forest Network	Japan
III. NGOs (04 person)			
31	Mrs. Pong Sokha	KIP	Preah Vihear
32	Mr. Hean Bunheang	NGO Form	Preah Vihear
33	Mr. Touch Panha	Research Assistant	LI
34	Mr. Donal Yeang	Senior Cabon Programme	PACT
IV. Private sector (03 person)			
35	Mr. Chea Chantola	Assistant	Tree Planting Company
36	Mr. Hak Kosal	Assistant	Tree Planting Company
37	Mr. Ong Kimleng	Manager	Mitsui & Co., Ltd.
V. Royal University of Agriculture (02person)			
38	Mr. Tim Veasna	Student	RUA
39	Mr. Ek Dara	Student	RUA
VI. Prek Leap National School of Agriculture (02 person)			
40	Ms.Sou Samnang	Student	
41	Mr. Vann Chyvorn	Student	
VII. Lecturers (08 person)			
42	Dr. Tokunori Mori	Japan International Forestry Promotion & Cooperation Center (JIFPRO)	Japan
43	Mr. Eiichiro Nakama	Japan International Forestry Promotion & Cooperation Center (JIFPRO)	Japan
44	Dr. Jumpei Toriyama	Forestry and Forest Products Research Institute (FFPRI)	Japan
45	Ms. Hinako Mano	Japan International Forestry Promotion & Cooperation Center (JIFPRO)	Japan
46	Dr. Keo Omaliss	Deputy Chief	DWB
47	Dr. Edward Maningo	Vice Dean	NORSU University, Philippines
48	Mr. Khun Vathana	Deputy Chief of Cabon Credit Office	DFI
49	Mr. Lim Bunna	Deputy Chief	DWB

VIII. Organizing team (06 person)			
50	Dr. Sokh Heng	Acting Chief of IRD	Team leader
51	Mr. Ma Vuthy	Deputy Chief of ESIA center	Coordinator
52	Mr. Hem Chanrithy	Deputy Chief of Training Center	Facilitator
53	Mrs. Heng Borany	Deputy Chief of Admin. And Planning Office (IRD)	Assistant
54	Mr. Sreng Synceath	IRD	Assistant
55	Ms. Dy Vutheara	IRD	Assistant

Review on A/R CDM projects: Experiences, success and recommendation

Afforestation / Reforestation
Clean Development Mechanism



Eiichiro Nakama



JAPAN INTERNATIONAL FORESTRY
PROMOTION & COOPERATION CENTER

OUTLINE of This Presentation

1. Current situation of the registered CDM projects
2. The reason why only 36 A/R CDM projects are registered
 - 2-1. Land Eligibility
 - 2-2. Additionality
 - 2-3. Temporary credit
 - 2-4. Price of the Kyoto credit
 - 2-5. Risk of A/R projects
3. Success points of A/R CDM
 - 3-1. Incentive to project proponents
 - 3-2. Environmental impacts
 - 3-3. Socio economic impacts
 - 3-4. Stakeholders' comments
4. Recommendation to A/R CDM

1. Current situation of the registered CDM projects

Number of the CDM projects

Project	Validation	Requesting Registration	Registered
A/R CDM	45	0	36
Other CDM	4,375	113	3,307
Total	4,418	114	3,335



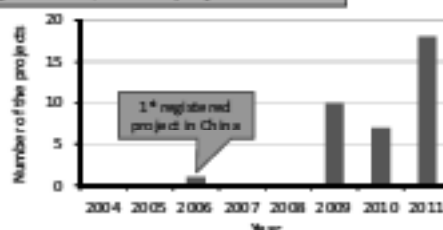
United Nations
Framework Convention on
Climate Change

As of 31st DEC 2011

→ The registered A/R CDM projects are remarkably fewer in number than the emission reduction CDM projects such as renewable energy, energy efficiency, waste-to-energy etc.

Number of the registered A/R CDM projects by year

Registered A/R CDM projects: total 36 As of 31st DEC 2011



Number of the registered A/R CDM projects is increasing because of the simplification of accounting methodologies of GHG removals by sink.

Regional distribution of registered A/R CDM projects

Registered A/R CDM projects: total 36 As of 31st DEC 2011

Africa		Europe		Latin America	
D. R. of the Congo	1	Albania	1	Argentina	1
Ethiopia	1	R. of Moldova	1	Bolivia	1
Kenya	2	Subtotal	2	Brazil	2
Uganda	6		5%	Chile	1
Subtotal	10			Colombia	4
	28%			Nicaragua	1
				Paraguay	1
				Peru	1
				Uruguay	1
				Subtotal	13
					36%

Please see the accompanying sheet for details

2. The reason why only 36 A/R CDM projects are registered

A. Land Eligibility

Eligible land for A/R CDM is very limited.

B. Additionality

Proposed A/R project would not have occurred without registered as a A/R CDM project activities.

C. Temporary credit

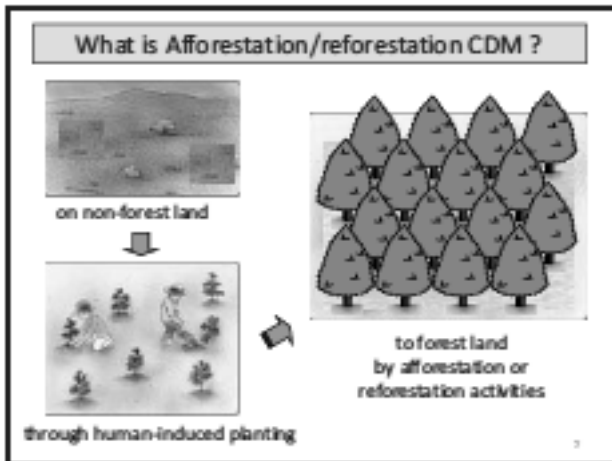
Credit of A/R CDM shall be expired at the end of the commitment / crediting period.

D. Price of the temporary credit

Price of the credit is uncertain and price of the temporary credit of A/R CDM is lower than the permanent credit of CDM.

E. Risk of A/R projects

Risk of natural disturbance; fire, typhoon etc. and human activities; illegal logging, encroachment etc.



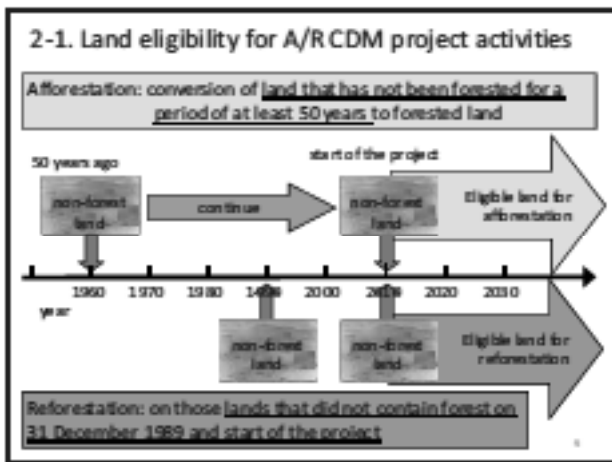
2-1. Land eligibility for A/R CDM project activities

"Forest" definition under the CDM

3 indicators

1. Minimum area of land of 0.05-1.0 ha
2. Tree crown cover (or equivalent stocking level) of more than 10 - 30%
3. Trees with the potential to reach a minimum height of 2 - 5 m at maturity in situ

A Party not included in Annex I may host an A/R CDM project activity if it has selected values of forest definition and reported to the EB through its DNA for the CDM



2-1. Land eligibility for A/R CDM project activities

Eligible land for A/R CDM is very limited.

- Non forest for 50 years !!!
- Non forest at 1989 and starting date !

Not eligible

How many land area eligible for A/R CDM in Cambodia ?

2-2. Additionality required in A/R CDM

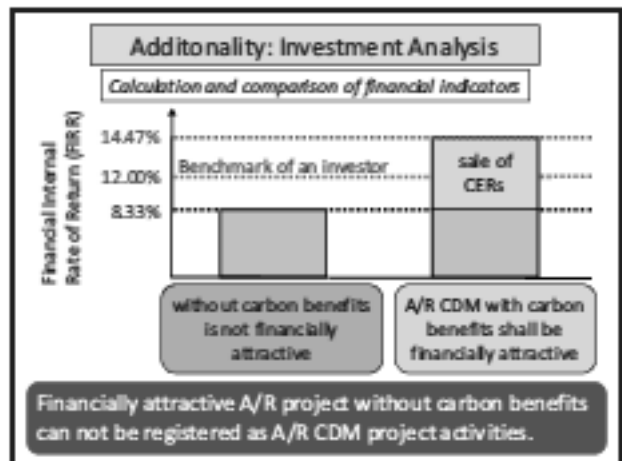
Rule: The proposed A/R project would not have occurred without registered as A/R CDM project activities.

Demonstration and Assessment of Additionality in A/R CDM Project Activities.

Comparing the project scenario to the baseline scenario (without project), will the net greenhouse gas (GHG) removals by sink be additionally increased?

= Explain why the increase would not occur without the A/R CDM project activity.

Assessing by Investment Analysis and/or Barrier Analysis.



Additionality: Barrier analysis

Project participants shall provide an explanation to show that the proposed project activity would not have occurred anyway due to at least one of the following barriers without registered as a A/R CDM project activity



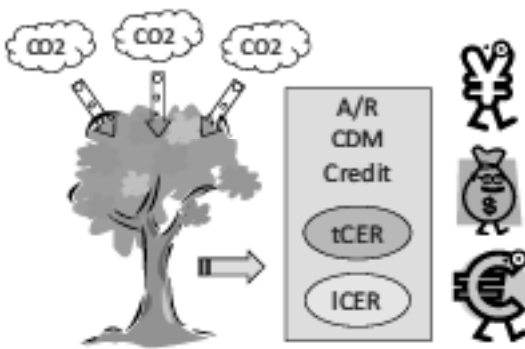
Why the proposed project activity would not have occurred ???

Barriers: example

- Investment barriers, other than the financial barriers
- Institutional barriers
- Technological barriers
- Barriers related to local tradition
- Barriers due to prevailing practice
- Barriers due to local ecological conditions
- Barriers due to social conditions
- Lack of organization of local communities
- Barriers relating to land tenure, ownership, inheritance, and property rights

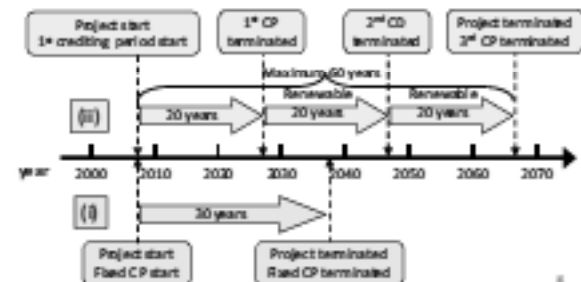
The proposed A/R project without any barrier can not be registered as A/R CDM project activities.

2-3. Temporary credits of A/R CDM



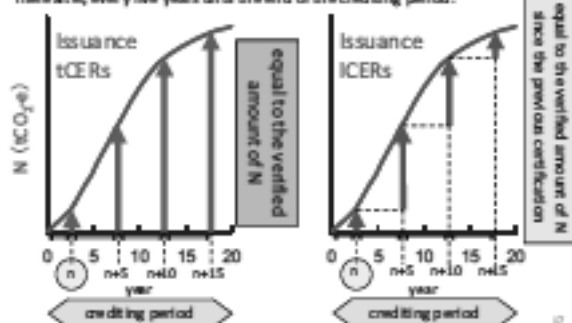
Crediting period for A/R CDM

The project participants may choose between two options for the length of a crediting period: (i) fixed crediting period or (ii) renewable crediting period



Issuance of tCERs or ICERs for A/R CDM

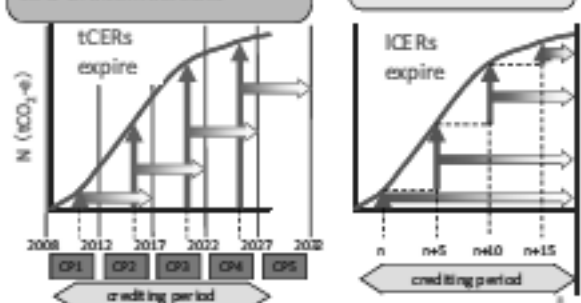
The initial verification and certification of an A/R CDM may be undertaken at a time selected by the project participants. Thereafter, every five years until the end of the crediting period.

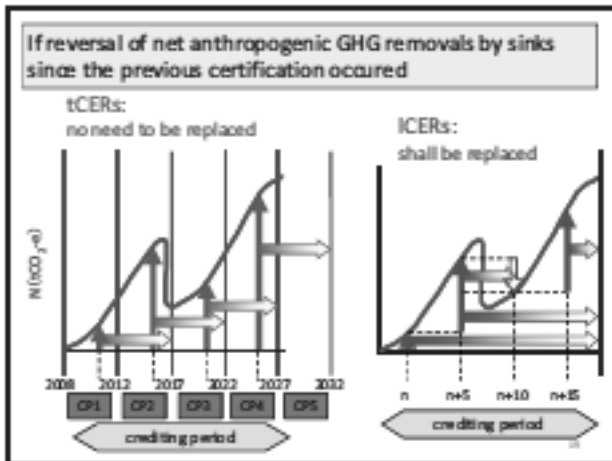


Expiration of tCERs or ICERs for A/R CDM

tCERs shall expire at the end of the Commitment Period (CP) subsequent to the CP for which it was issued

ICERs shall expire at the end of the crediting period



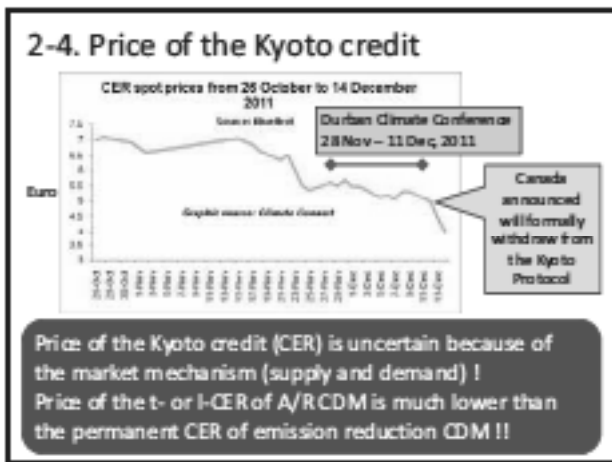


Replacement of tCERs or ICERs for A/R CDM

tCERs:
To replace an expire tCER, the concerned Party shall transfer AAU, CER, ERU, RMU or tCER.

ICERs:
To replace an expire ICER, the concerned Party shall transfer AAU, CER, ERU or RMU.
To replace a reversal ICER a Party shall transfer one AAU, CER, ERU, RMU or ICER from the same project activity

Temporary credits will be expired!
Replacement must be done !!
It is too difficult for marketing !!!



2-5. Risk of A/R projects

Risk of natural disturbance; fire, typhoon etc.
Risk of human activities; illegal logging, encroachment etc.

A/R projects originally have higher risk compared to other types of projects such as renewable energy, energy efficiency, waste-to-energy projects.

3. Success points of A/R CDM (1)

3-1. Incentive to project proponents to maintain the plantation forest

3. Success points of A/R CDM (2)

In order to pass validation of A/R CDM, project proponents shall analyze / assess and clearly state the result in Project Design Document (PDD).

3-2. Environmental impacts
3-3. Socio economic impacts
3-4. Stakeholders' comments

3-2. Environmental impacts

Analysis of Environmental Impacts on;

- ✓ Biodiversity and natural ecosystems
- ✓ Impacts outside the project boundary
- ✓ Hydrology
- ✓ Soils
- ✓ Risk of fires,
- ✓ Pests and diseases
- ...etc

→ If any negative impact is considered,

Environmental Impact Assessment
(in accordance with the procedures required by the host party)

26

3-3. Socio economic impacts

Analysis of Socio-economic Impacts on;

- ✓ Local community
- ✓ Indigenous peoples
- ✓ Land tenure
- ✓ Local employment
- ✓ Food production
- ✓ Cultural and religious site
- ✓ Access to fuelwood and other forest
- ✓ ...etc

→ If any negative impact is considered,

Environmental Impact Assessment
(in accordance with the procedures required by the host party)

27

3-4. Stakeholders' comments

For implementation of an A/R CDM project activities, various stakeholders will be involved.

e.g. Public or private entities, local community etc.

Project participants shall collect comments from local stakeholders in an open and transparent manner.

And explain how due account has been taken of comments received from stakeholders.

e.g. Whether stakeholders agree to the A/R CDM project activity or not, the impact on each stakeholder, output to be desired by the project ...etc.

28

Analysis / assessment on

- 3-1. Environmental impacts
- 3-2. Socio economic impacts
- 3-3. Stakeholders' comments

→ Counter measures

It is very useful to avoid

- negative effect on environment,
- negative effect on social economy
- conflict with stakeholders including local people surrounding the project site.

29

4. Recommendation to promote A/R CDM

A. Land Eligibility

Eligible land for forestry carbon projects (including or integrating A/R CDM and REDD+) should be expanded.

B. Additionality

Requirement of the additionality is not needed. All of the forestry carbon projects have positive impacts on climate change.

C. Temporary credit

Alternative choice is buffer system which is applied to Verified Emission Reduction (VER) in voluntary scheme.

D. Price of the temporary credit

Price of the credit should be added premium value especially for forestry carbon projects.

E. Risk of A/R projects

Reducing the risk by proper forest management considering environmental, socio economic impacts and stakeholders' comments and local people's participation.

30



Thank you for your kind attention
Oh kun = Arigatou



Reduced Emission from Deforestation and Forest Degradation (REDD) and AR-CDM

Dr. Omaliss Keo
Forestry Administration
February 01, 2012

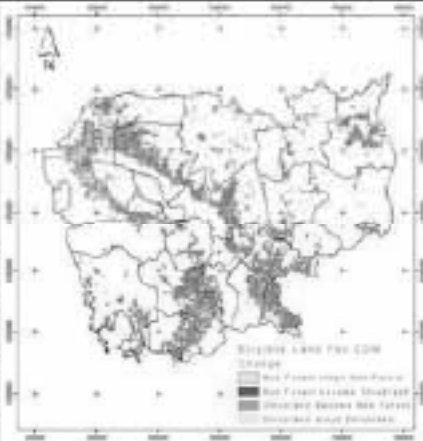
1

CAMBODIA 'S SUPPORT

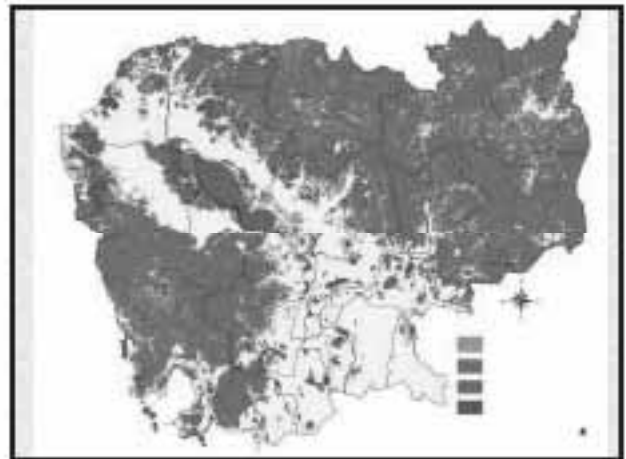
- UNFCCC : Cambodia ratified in 1995
- Kyoto Protocol: Cambodia was a member of KP in 2005 (AR CDM)
- Bali 2007, Copenhagen 2009, Cancun 2010- Cambodia supported REDD Programme

2

Eligible areas for AR/ CDM;

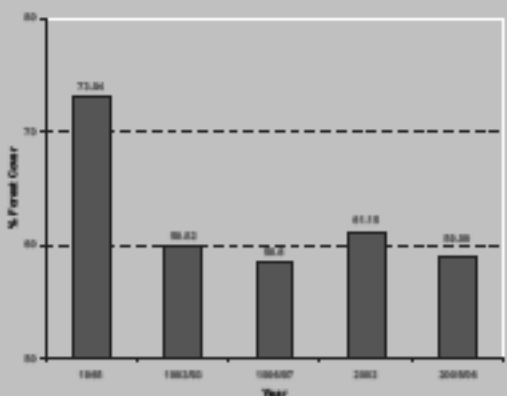


3



4

Forest cover change in Cambodia



5

Forest Land Use in Cambodia

- Protected forest
- Protected areas
- Forest concession
- Land concession
- Community forestry and Mangrove
- Wildlife conservation areas
- Biological area and RAMSA site



6

Deforestation still takes place



Reducing Emissions from Deforestation and forest Degradation (REDD)

- COP11 of UNFCCC in Montreal 2005: Papua New Guinea, Costa Rica Proposal to integrate the reduced emission through avoiding deforestation
- COP13 in Bali 2007 -accepted REDD for negotiation
- COP15 December 2009 in Copenhagen -could not reach the agreement on REDD
- COP16 December 2010 in Cancun, MEXICO -reach the agreement on REDD
- COP17 December 2009 in South Africa - negotiates about REDD on financial mechanism and not decided on methodology

Laws and Regulations

- ❖ MDGs
- ❖ National Strategic Development Plan
- ❖ National Forest Policy
- ❖ Law on Forestry, Protected area and Fisheries
- ❖ National Forest Programmes
- ❖ Government regulation to implement carbon credit in Cambodia

What is REDD

- Is the programme which provides additional revenue from forestry because the emitted countries purchase the carbon credit.
- There are five activities in REDD:
 1. Deforestation
 2. Forest degradation
 3. Conservation of forest carbon stock
 4. Sustainable forest management
 5. Increase forest carbon stock

> Why Implement REDD in Cambodia?

- Deforestation still takes place and REDD is applicable for implementation
- Follow the policy and aim of Government in Forestry.
- Decision of Government to support UNFCCC
- To improve economy, society and environment, especially forest and wildlife conservation

REDD in Cambodia

- Royal Government promotes REDD
- REDD negotiation in UNFCCC
- Dialogue among ASEAN-ARCC FCCJ
- Integrated REDD into National Strategic Development Plan (2009-2013) and National Forest Programmes (2010-2029)
- REDD member of FCPF in March 2009 and UN-REDD in October 2009
- Member of REDD+ partnership in May 2010

- Implementing REDD projects in Oddar Meanchey, Kam Spey in Mondulkiri and Southern Cardamom
- Training
- Bilateral cooperation and NGOs partner
- Develop REDD roadmap (2010)
- Organizing National REDD Taskforce

12

What is Roadmap

- Management plan and REDD readiness for 3-5 years
- Firstly, towards National Strategy on REDD in Cambodia
- A proposal for seeking the support

14

Roadmap

- Part 1 : Management procedure
- Part 2 : Dialogue and stakeholders participation
- Part 3 : Select national strategy on REDD
- Part 4 : Implementation framework
- Part 5 : Establish Reduced emission level principle
- Part 6 : Establish forest monitoring, reporting and verification system

15



Budget Supports

- Japanese grant :10 Million USD
- UN-REDD : 3 Million USD for 2 years
- FCPF : 3.6 Million USD for 3 years
- JICA 2 Million USD for 5 years
- FFI(Cardamom), RECOFTC etc.

17

Challenges

- Limit REDD awareness and technique
- Many forest management stakeholders
- Not clear about who will buy the carbon credit
- Requires many REDD project implementation and complicate
- No advanced investment budget

18



Next Steps :

- **Establish National REDD Taskforce**
- **Further research and training**
- **Continuation of REDD project**

20



Basic rule of A/R CDM and current situation



United Nations
Framework Convention on
Climate Change

Afforestation / Reforestation Clean Development Mechanism



Eiichiro Nakama



JAPAN INTERNATIONAL FORESTRY
PROMOTION & COOPERATION CENTER

OUTLINE of This Presentation

1. United Nations Framework Convention on Climate Change (UNFCCC) and Kyoto Protocol (KP)
2. Kyoto Mechanism
3. Clean Development Mechanism (CDM)
4. Basic concept of A/R CDM
5. Net anthropogenic GHG removals by sinks
6. A/R CDM Methodologies to calculate net anthropogenic GHG removals by sink
7. What should happen next ?

2

1. United Nations Framework Convention on Climate Change (UNFCCC) and Kyoto Protocol(KP)

UNFCCC

The Convention on Climate Change sets an overall framework for intergovernmental efforts to tackle the challenge posed by climate change.



3

United Nations Framework Convention on Climate Change (UNFCCC)



United Nations
Framework Convention on
Climate Change

Entry into force: 21 March 1994

Registration: 21 March 1994, No. 30822.

Status: Signatories: 165. Parties: 195.

Bali Road Map

AWG-KP

AWG-LCA

Cancun Agreements



COP17/CMP7
UNITED NATIONS
CLIMATE CHANGE CONFERENCE 2011
DURBAN, SOUTH AFRICA

Adopt a universal legal agreement on climate change as soon as possible, and no later than 2015

4

UNFCCC



United Nations
Framework Convention on
Climate Change



Kyoto Protocol (KP)



Adopted in Kyoto, Japan, on 11 December 1997
Entered into force on 16 February 2005

Registration: 16 February 2005, No. 30822.

Status: Signatories: 84. Parties: 192

5

Kyoto Protocol (KP): Commitments

- Parties with commitments under the Kyoto Protocol (Annex B Parties) have accepted targets for limiting or reducing emissions for the 5-year period of 2008 – 2012 (1st commitment period).
- E.g. : Japan (-6%), EU (-8%), Australia (+7%),
- Base-year emissions: the Party's GHG emissions in 1990.
- Assigned amounts (cap) for each Party are calculated from the base-year emissions and emission reduction targets.

6

How to meet the Kyoto target?

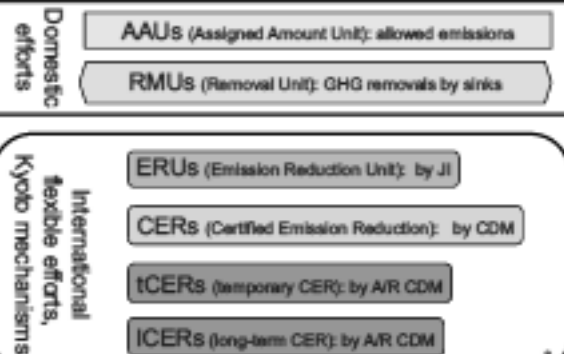
Emission reduction efforts only in each Annex B Parties (developed countries) is low cost-benefit performance

meeting the Kyoto target is difficult

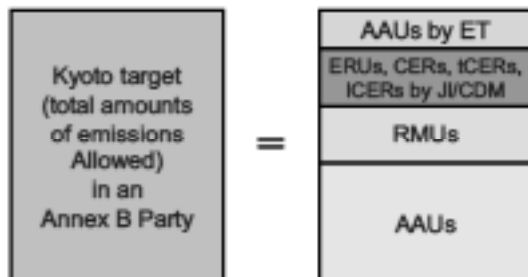
Flexibility mechanisms (Kyoto-mechanisms)

- International high cost-benefit performance
- Promoting emission reduction in non-Annex I countries (developing countries)

Types of Kyoto credits

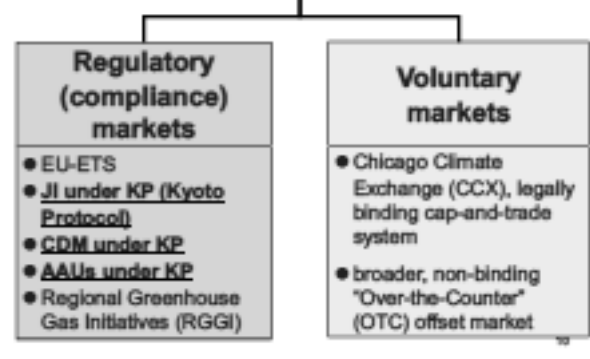


Kyoto target (total emissions allowed) in an Annex B Party



= AAUs + RMUs + JI/CDM credits (ERUs, CERs, tCERs, ICERs) + AAUs by ET *

Worldwide carbon markets



2. Kyoto Mechanism

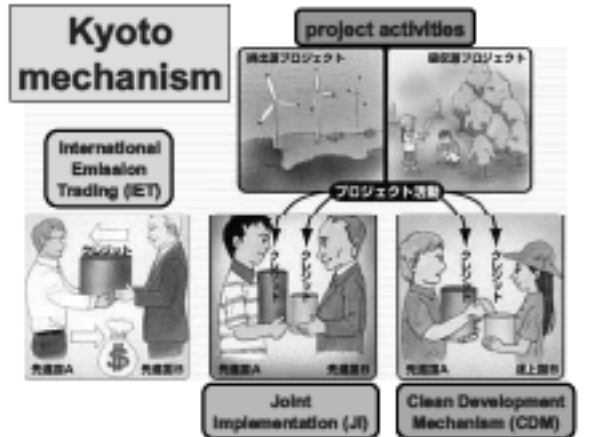
Annex B Parties can achieve their emission reduction targets in a cost-effective manner, using three Mechanisms.

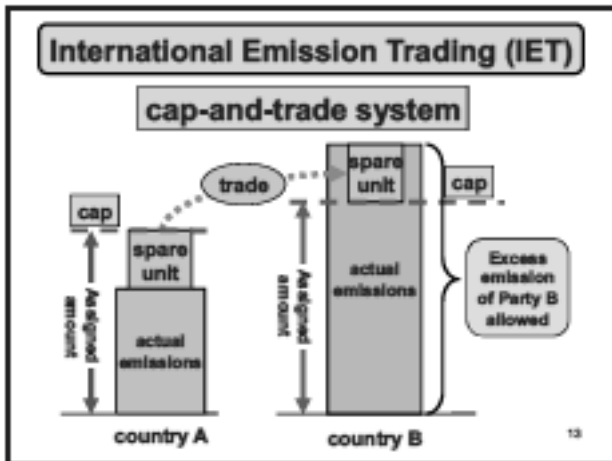
International Emission Trading (IET), article 17 of the KP

Joint Implementation (JI), article 6 of the KP

Clean Development Mechanism (CDM), article 12 of the KP

Besides Parties, private and/or public entity can participate in the Kyoto Mechanisms, provided that authorized by a Party.



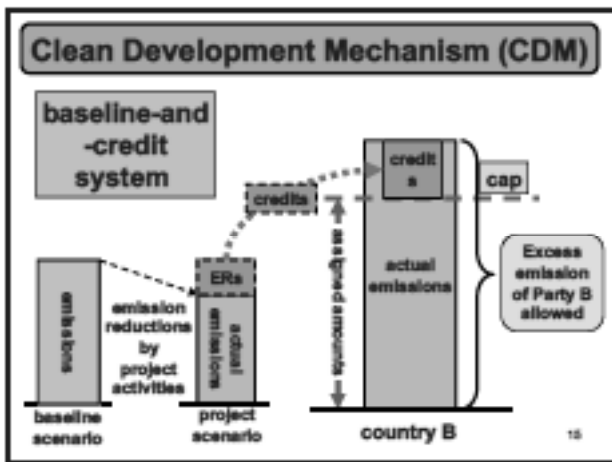


Basic rule of emission trading (ET)

Emissions trading allows countries that have emission units to spare - emissions permitted them but not "used" - to sell this excess capacity to countries that are over their targets.

Thus, a new commodity was created in the form of emission reductions or removals.

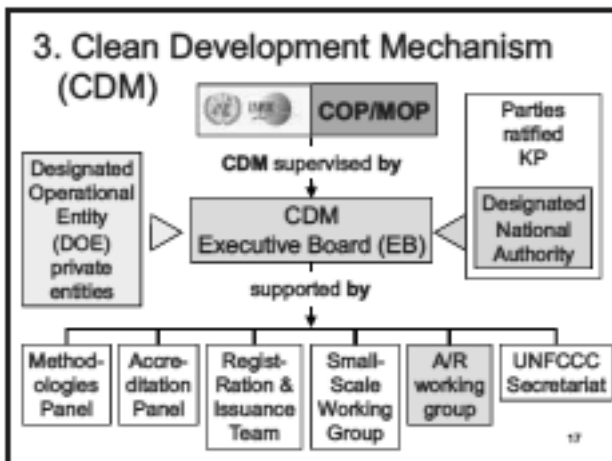
Since carbon dioxide is the principal greenhouse gas, people speak simply of trading in carbon. Carbon is now tracked and traded like any other commodity. This is known as the "carbon market."



What is the clean development Mechanism (CDM)?

The CDM allows emission-reduction projects in developing countries to earn certified emission reduction (CER) credits, each equivalent to one tonne of CO₂.

These CERs can be traded and sold, and used by industrialized countries to meet a part of their emission reduction targets under the Kyoto Protocol.



COP/MOP (or CMP)

Conference of the Parties serving as the Meeting of the Parties to the Kyoto Protocol

The Conference of the Parties refers to the Parties to the UNFCCC.
The meeting of the Parties refers to the Parties to the Kyoto Protocol.

The United Nations Climate Change Conference in Cancun, COP 16 / CMP 6, 29 November - 10 December 2010

COP/MOP (or CMP)

Conference of the Parties serving as the Meeting of the Parties to the Kyoto Protocol

The CMP:

1. has authority over and makes rules for the CDM
2. decides on the recommendations made by the Executive Board and
3. designates operational entities that are provisionally accredited by the Executive Board.



19

CDM Executive Board (EB)

Supervises the CDM activities

The CDM Executive Board supervises the Kyoto Protocol's clean development mechanism under the authority and guidance of the Conference of the Parties serving as the Meeting of the Parties to the Kyoto Protocol (CMP).

The Executive Board is fully accountable to the CMP. The Board is the ultimate point of contact for CDM project participants for the registration of projects and the issuance of certified emission reductions.



20

Afforestation and Reforestation (A/R) Working Group

Expert group

Established to prepare recommendations (in cooperation with the Methodologies Panel) on submitted proposals for new baseline and monitoring methodologies for CDM afforestation/reforestation project activities.



21

Designate National Authority (DNA)

Authorities who approve projects and facilitate participation

Parties participating in the CDM shall designate a national authority for the CDM.

The registration of a proposed CDM project activity can only take place once approval letters are obtained from the designated national authority of each Party involved, including confirmation by the host Party that the project activity assists it in achieving sustainable development.

Contact details for Japan DNA(s):

The Liaison Committee for the Utilization of the Kyoto Mechanisms

Designated Operational Entity (DOE)

Private certifiers who validate projects and verify emission reductions

A designated operational entity (DOE) under the CDM is either a domestic legal entity or an international organization accredited and designated by the CDM Executive Board. It has two key functions:

1. A DOE validates and subsequently requests registration of a proposed CDM project activity
2. A DOE verifies emission reductions of a registered CDM project activity, certifies as appropriate and requests the Board to issue certified emission reductions accordingly

23

List of DOEs

Ref. Number	Entity	Sectoral scopes for validation	Sectoral scopes for verification and certification
E-0001	Japan Quality Assurance Organisation (JQA)	1-15	1-15
E-0002	JACO CDM, LTD (JACO)	1-15	1-15
E-0003	DNV Climate Change Service AS (DNV)	1-15	1-15
E-0005	TÜV SÜD Industrie Service GmbH (TÜV SÜD)	1-15	1-15
E-0006	Deloitte Tohmatsu Evaluation and Certification Organization (Deloitte-TECO)	1-10, 12, 13, 15	1-10, 12, 13, 15
...
E-0052	Carbon Check (Pty) Ltd (Carbon Check)	1-5, 8-10, 13	1-5, 8-10, 13

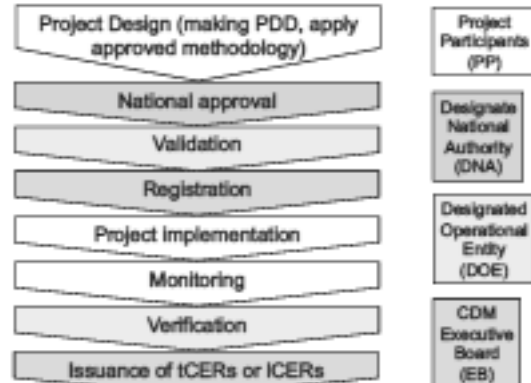
Project Participants

- (a) a Party involved,
and/or
(b) a private and/or public entity authorized by a
Party involved to participate in a CDM project
activity



25

Procedures for A/R CDM project activities



26

Sectoral scopes and registered projects of CDM

	Sectoral Scope	Registered Projects
reductions in anthropogenic emissions by sources	(01) Energy industries (renewable - / non-renewable sources)	1,925
	(02) Energy distribution	0
	(03) Energy demand	30
	(04) Manufacturing industries	145
	(05) Chemical industries	68
	(06) Construction	0
	(07) Transport	3
	(08) Mining/mineral production	33
	(09) Metal production	8
	(10) Fugitive emissions from fuels (solid, oil and gas)	148

27

Sectoral scopes and registered projects of CDM

	Sectoral Scope	Registered Projects
reductions in anthropogenic emissions by sources	(11) Fugitive emissions from production and consumption of halocarbons and sulphur hexafluoride	24
	(12) Solvent use	0
	(13) Waste handling and disposal	490
	(15) Agriculture	128
net anthropogenic GHG removals by sinks	(14) Afforestation and reforestation	17

As of November 25th, 2010

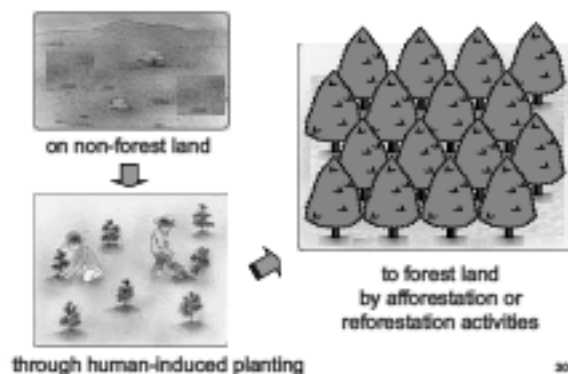
28

4. Basic concept of A/R CDM



29

What is Afforestation/reforestation CDM ?



30

"Forest" definition under the CDM

3 indicators

minimum area of land of 0.05-1.0 ha

with tree crown cover (or equivalent stocking level) of more than 10 - 30 %

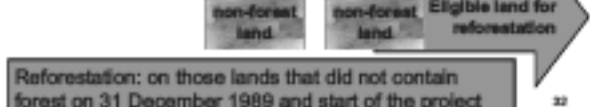
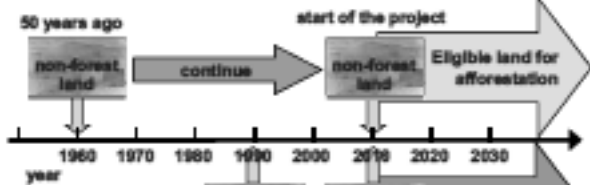
with trees with the potential to reach a minimum height of 2 - 5 m at maturity in situ

A Party not included in Annex I may host an A/R CDM project activity if it has selected values and reported to the EB through its DNA for the CDM

31

Land eligibility for A/R CDM project activities

Afforestation: conversion of land that has not been forested for a period of at least 50 years to forested land



Reforestation: on those lands that did not contain forest on 31 December 1989 and start of the project

32

Eligible land, mosaic of grassland & forest



33

Project boundaries for A/R CDM



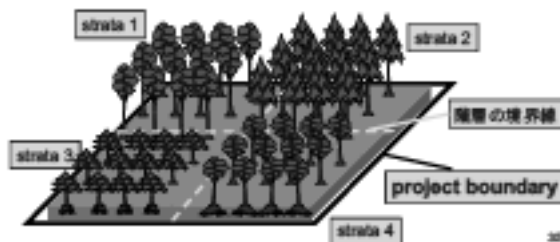
The "project boundary" geographically delineates the A/R CDM project activity under the control of the project participants.

An A/R CDM project activity may contain more than one discrete areas of land. If an A/R CDM project activity contains more than one discrete area of land

34

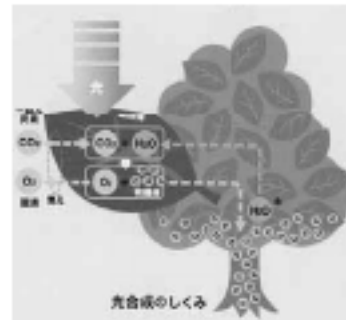
Stratification for A/R CDM

"Stratification" is for facilitating field operations and increasing the accuracy of calculation and estimation of Carbon stock

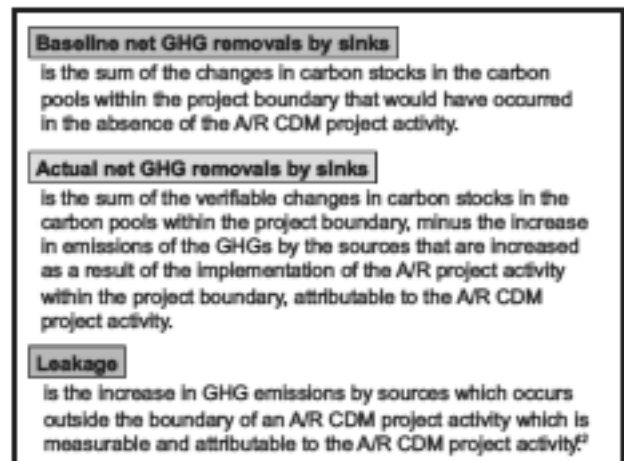
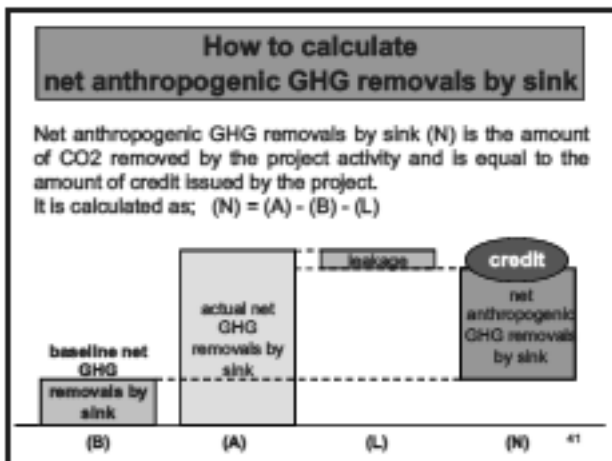
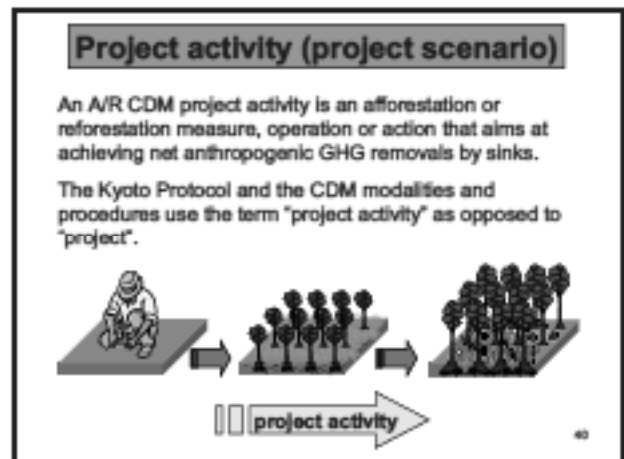
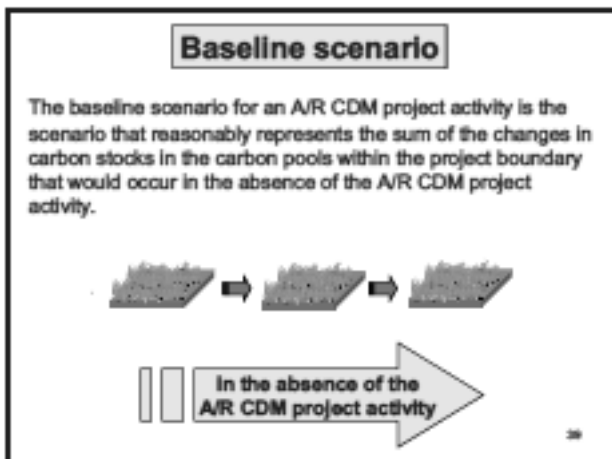
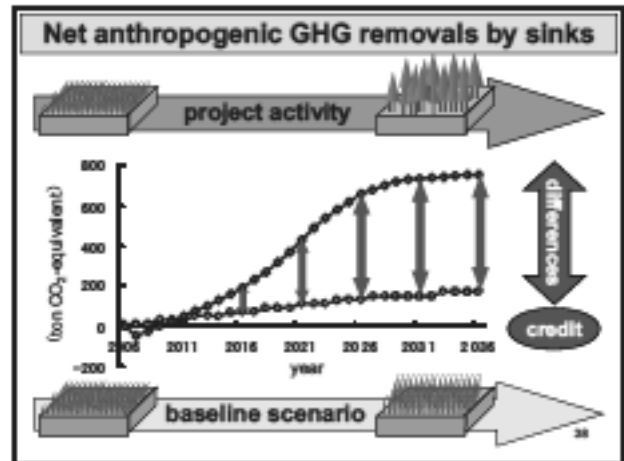
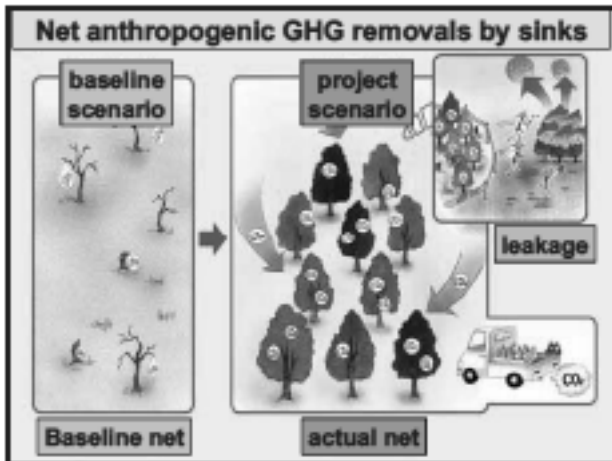


35

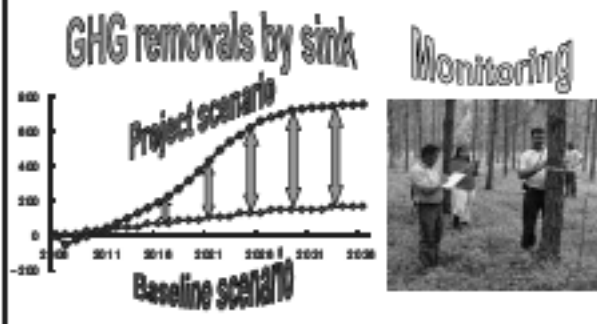
5. Net anthropogenic GHG removals by sinks



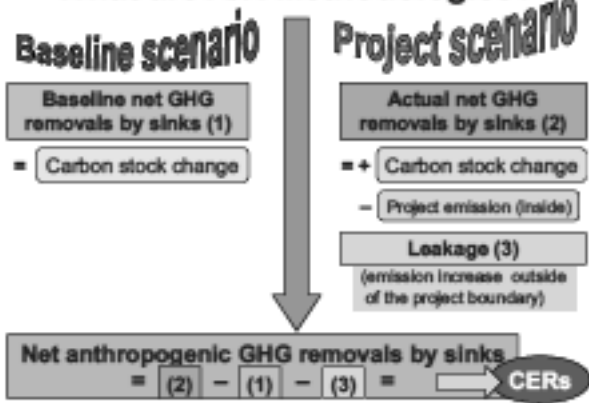
36



6. A/R CDM Methodologies to calculate GHG removals by sink



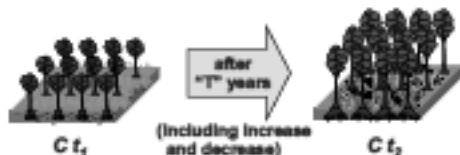
What are A/R Methodologies?



Carbon stock change method calculation formula

$$\Delta C = (C_{t_2} - C_{t_1}) / T$$

- ΔC : annual change in carbon stock
 C_{t_2} : carbon stock at time t_2
 C_{t_1} : carbon stock at time t_1
 T : number of years between times t_2 and t_1 ; years



Methodologies for A/R CDM project activities

Project participants willing to validate / register an A/R CDM project activity shall:

- use a A/R methodology previously approved by the Executive Board
- or
- propose a new A/R methodology to the Executive Board for consideration and approval

Methodology Progress Table Large Scale Methodologies

	CDM	A/R CDM
A: approved	124	14
approved by consolidation	22	-
B:	6	0
C: rejected	181	21
W: withdrawn	16	3
Pending	12	1

As of 25th JAN 2012

- Getting a methodology approved is not easy.
- Avoid submitting new methodologies - modify the existing ones.

Approved A/R CDM Methodologies & Tools to support accounting

Approved	Num.	Meth Number
Large scale A/R methodologies	11	AR-AM00xx
Consolidated large scale A/R methodologies	2	AR-ACM000xx
Small scale A/R methodologies	7	AR-AMS000xx
Tools	17	-

As of 25th JAN 2012

Please see the accompanying sheet for details

Issues already covered in the approved methodologies

Baseline scenario

- ✓ Degraded lands
- ✓ Grass lands
- ✓ Grazing lands
- ✓ Agricultural lands
- ✓ Settlements
- ✓ Wetlands
- ✓ Fuel-wood/charcoal collection
- ✓ Pre-existing A/R activities



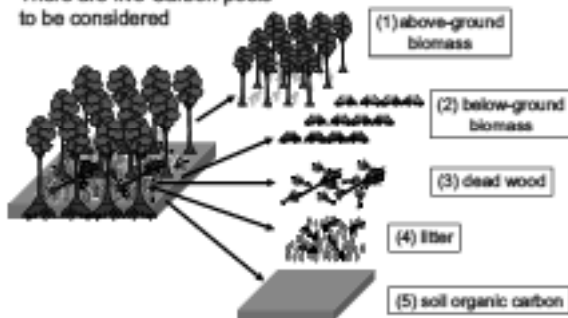
Type of project activities:

- ✓ Afforestation, Reforestation (A/R)
- ✓ Tree planting
- ✓ Agro-forestry
- ✓ Silvo-pastoral
- ✓ Natural regeneration (NR)



Carbon pools for A/R CDM

There are five Carbon pools to be considered



51

What happened until now

- Approved methodologies were partially redundant.
- Small errors and inconsistencies.
- Sometimes unnecessary "carbon purism".
- Complexity could damage project initiatives.

➔ More consolidated methodologies

➔ Simplify and still be conservative

➔ More helpful tools

➔ Focus on new "modules" to avoid redundancies and a multiplication of methods

<Reference>
Lucio Pedroni (2007) AR-CDM Methodologies. Carbon Expo 2007, Cologne

Project emissions (within the project boundary)

- ✓ Fossil fuels burning: CO_2
- ✓ Biomass loss (wood / herb): CO_2
- ✓ Biomass burning (wood / herb): CO_2 , CH_4 , N_2O
- ✓ Fertilization: N_2O
- ✓ N-fixing species: N_2O (denitrification)
- ✓ Forage-fed live stock: CH_4 , N_2O



Underline: currently negligible by simplification

Leakage emissions (1) (outside of the project boundary)

- ✓ Decrease in carbon stocks
 - Displacement of pre-project activities
 - Agriculture,
 - Grazing
 - Fuel-wood collection
 - Deforestation & land use change
 - Increase use of biomass
 - Wood posts for fencing



Underline: currently negligible by simplification

Leakage emissions (2)
(outside of the project boundary)

✓ increase in GHGs emissions

- Fossil fuels burning: CO_2
- Forage-fed live stock
 - Enteric fermentation: CH_4
 - Manure management: CH_4 , N_2O



Underline: currently negligible by simplification

7. What should happen next ?

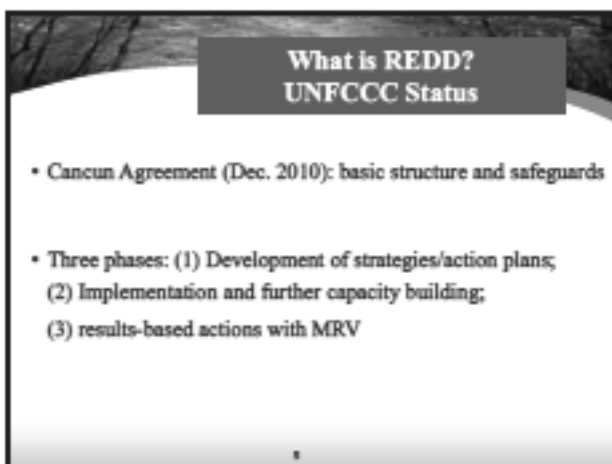
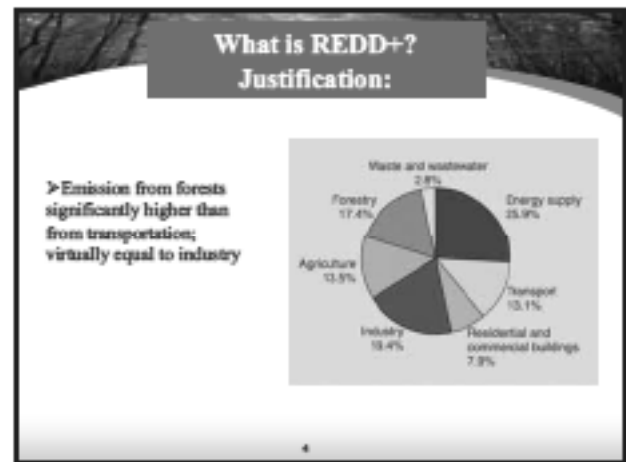
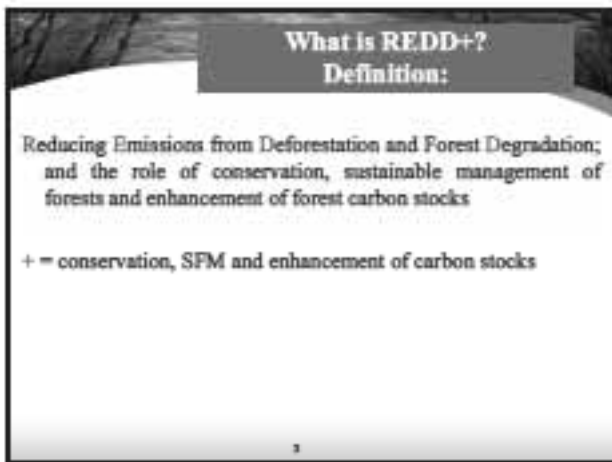
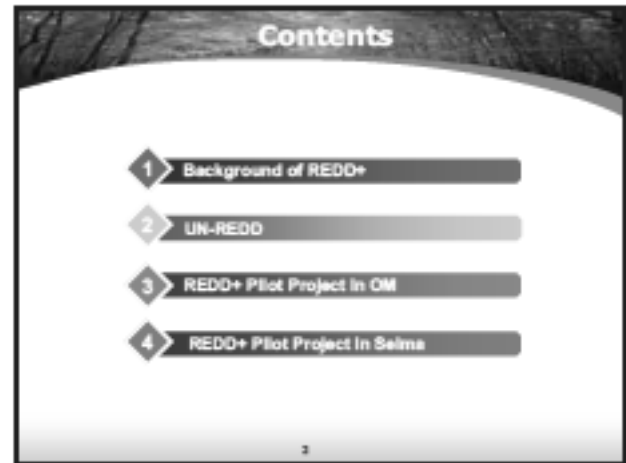
At its sixty-third meeting, the CDM Executive Board decided to launch a policy dialogue to review past CDM experience and help ensure the readiness and positioning of the mechanism to meet the challenges of the post-2012 period.

The policy dialogue should produce recommendations on "how to best position the CDM to respond to future challenges and opportunities and ensure the effectiveness of the mechanism in contributing to future global climate action, based on a wide-ranging assessment of experience, benefits and shortcomings of the CDM and engagement with civil society, policymakers and market participants."

Simplify the mechanism in a conservative manner and achieve effectiveness for global climate



Thank you for your kind attention
Oh kun = Arigatou



What is UN-REDD?

- ◆ Collaborative programme: FAO/UNDP/UNEP (One-UN)
- ◆ Launched September 2008
- ◆ To help countries and the international community gain experience with REDD
- ◆ Contribution to the UNFCCC process
- ◆ Coordinated with other initiatives, e.g., FCPF

What is UN-REDD? Quick Start: Two components:

1. National Programmes

- ◆ Capacity building for readiness
- ◆ 35 countries (currently, 13 with national programmes)
- ◆ \$4-6 million per country

2. Global Programme

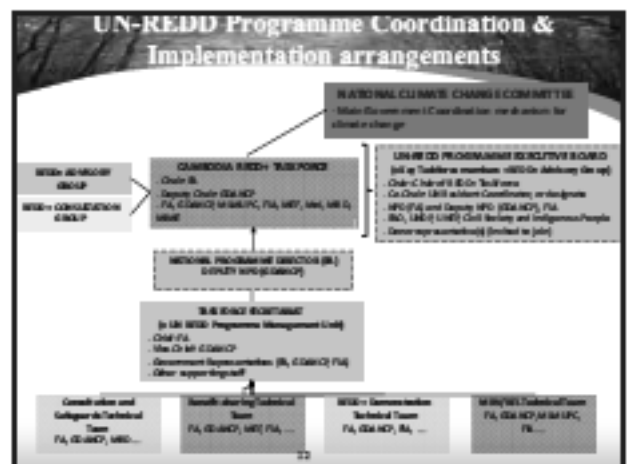
- ◆ Guidelines, advice, regional/international dialogue, analyses
- ⇒ that support country action
- ⇒ that support the UNFCCC process on a global scale

What is UN-REDD? Country programs

- ◆ **Country-driven support for demonstration activities:**
 - National REDD strategy development
 - REDD dialogue and consultations (governance, stakeholder engagement)
 - REDD assessment and monitoring (MRV)
 - REDD payment structuring and distribution options
- ◆ **Guiding principles:**
 - Country ownership and leadership
 - Delivered as joint programming (all agencies)

What is UN-REDD? Global Programme

- ◆ Build confidence in REDD, support dialogue, build consensus
- ◆ Ensure consistency in approaches
- ◆ Economies of scale in development of science, knowledge management and MRV
- ◆ Awareness raising, capacity building & technology support
- ◆ **Activities in six main areas:**
 1. Measurement, Reporting & Verification (MRV)
 2. Inclusive Governance systems
 3. Transparent and equitable payment systems
 4. Civil Society Organizations / Indigenous Peoples' engagement
 5. Capture of Multiple Benefits
 6. Supporting economic transformation



UN-REDD Programme Coordination & Implementation arrangements

CAMBODIA REDD+ TASKFORCE

Inter-ministerial coordination body at technical level responsible for:

- overall management of the UN-REDD National Programme, coordination of national REDD+ activities,
- integrating REDD+ into national development planning processes

– Chair: FA
 – Deputy Chair: GDANCP
 – FA, GDANCP, MUMUFC, FA, MEI, M-d, MRO, MME

13

UN-REDD Programme Coordination & Implementation arrangements

REDD+ ADVISORY GROUP

- Advisory group will be invited to join Taskforce meetings.
- Monthly meeting with the Taskforce Secretariat.

14

UN-REDD Programme Coordination & Implementation arrangements

REDD+ CONSULTATION GROUP

- Provides a mechanism through which civil society, indigenous peoples, NGOs, the private sector and academic institutions can review and comment on the REDD+ readiness process.
- To enhance members, Taskforce Secretariat and Advisors will meet with the Consultation Group bi-monthly to review progress.

15

UN-REDD Programme Coordination & Implementation arrangements

UN-REDD PROGRAMME EXECUTIVE BOARD

- Responsible for the effective implementation of the UN-REDD National Programme
- Meeting twice a year:
 - Chair: Chair of the Cambodia REDD+ Taskforce
 - Co-Chair: UN Resident Coordinator, or designate
 - NPD (FA) and Deputy NPD (GDANCP)
 - FAO, UNDP, UNICEF, Civil Society and Indigenous peoples
 - Donor representatives (invited to join)

16

UN-REDD Programme Coordination & Implementation arrangements

**NATIONAL PROGRAMME DIRECTOR (FA)
DEPUTY NPD (GDANCP)**

- The NPD will oversee the programme and carries overall responsibility and accountability on behalf of the RBG Chair for the programme to the Project Executive Board.

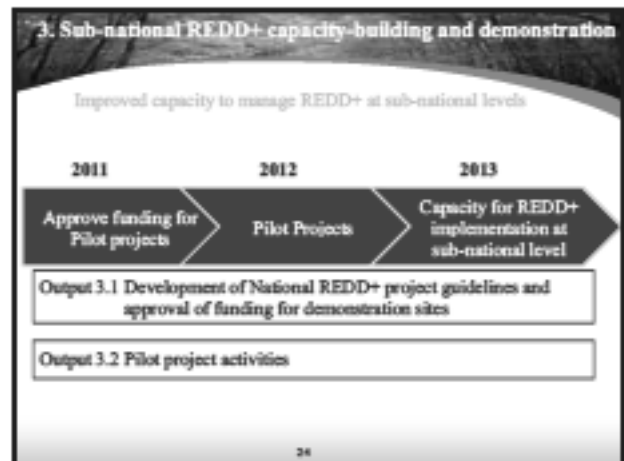
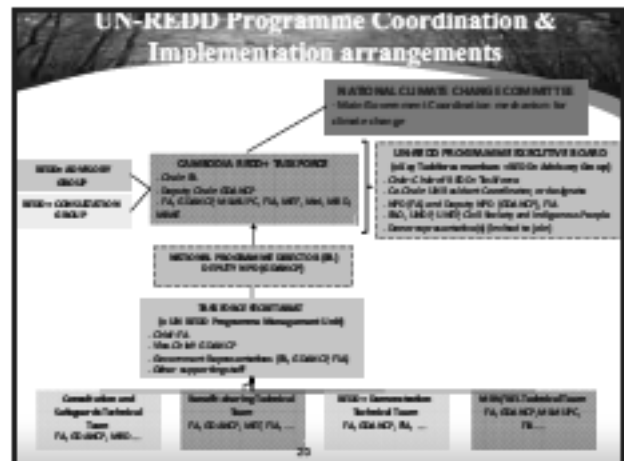
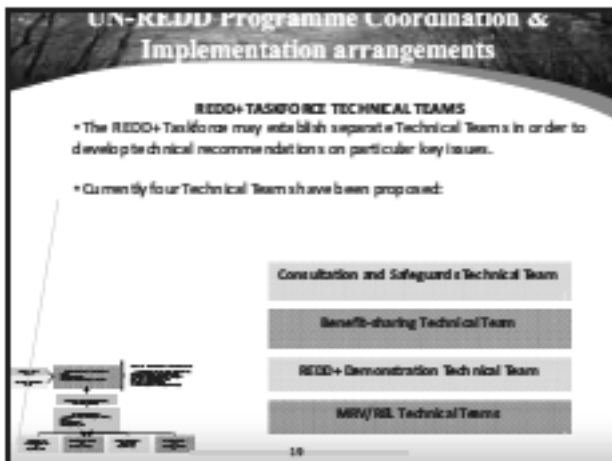
17

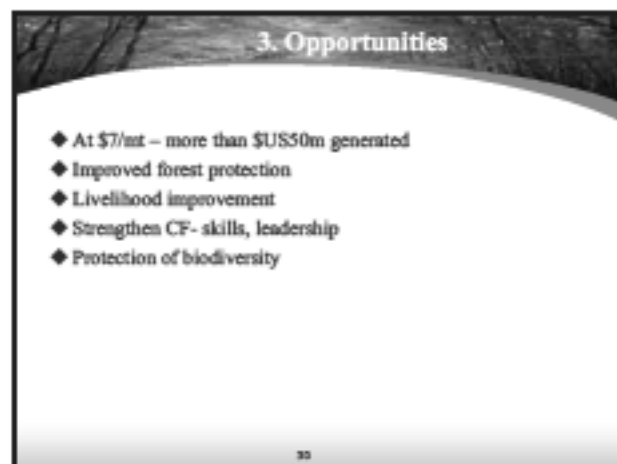
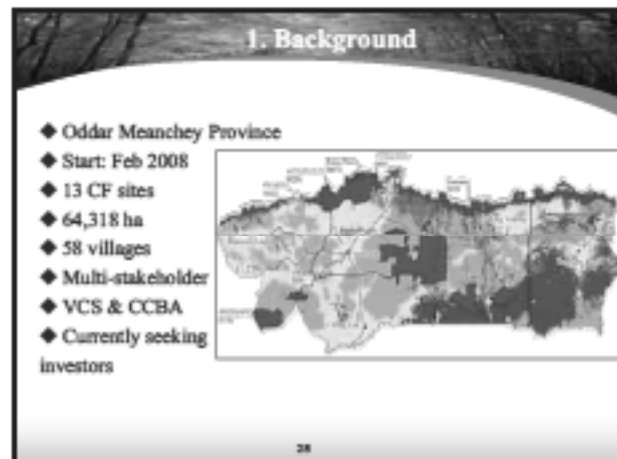
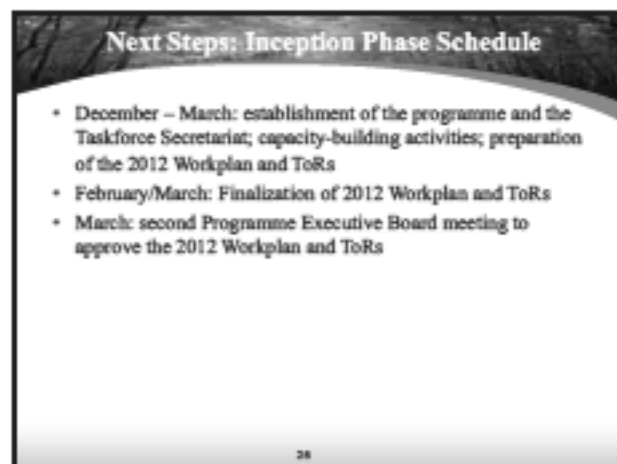
UN-REDD Programme Coordination & Implementation arrangements

**TASKFORCE SECRETARIAT
(= UN-REDD Programme Management Unit)**

- The Taskforce Secretariat fills the function of the Programme Management Unit and is responsible for overall management of day-to-day operations of the programme.
 - Chief: FA
 - Vice-Chief: GDANCP
 - Government representatives (FA, GDANCP, FA)
 - Other supporting staff

18





5. Links to the Development of a National REDD+ Strategy

- ◆ Capacity building for local stakeholders
 - Carbon stock, social and biodiversity assessments
 - REDD project development process
- ◆ Demonstration activities to inform policy development
- ◆ Engagement of local and indigenous people (Community Forestry Network)
- ◆ Benefit sharing (Government Decision No.699)
 - 1) improve forest management;
 - 2) provide maximum benefits to local communities; and
 - 3) support development of new REDD projects in Cambodia

31

6. Conclusion

- ◆ Community forestry is a suitable platform for REDD+
- ◆ Continue to capture and utilize lessons learned from the project to inform the national framework
- ◆ Stronger links between REDD+ implementers to influence national policy as well global regime

32

33

Seima has been the site of a joint program between the Forestry Administration and WCS since 2001
It was declared a Protection Forest in 2009

34

Exceptional biodiversity

41 globally threatened birds, mammals and reptiles are present (4 Critically Endangered)

35

The key communities are ethnic Bunong (Pnong)

The livelihood value of the reserve for these communities is very high – farmland, forest resources and cultural values

36

REDD+ Activities

The REDD+ project will target voluntary market

VCS VERIFIED CARBON STANDARD
A Global Standard for Carbon
offsets assurance

CCB Standards
The Clean, Consistent & Credible Alliance
for Forest Carbon Programs

- > Significant additional income (feasibility study: c. 200,000 credits/year)
- > Validation expected to begin in early 2012, sales 6-9 months later; 30-60 yr period
- > REDD+ was a factor in a recent legal upgrade of the reserve

The government is the project proponent and carbon owner

Additionality from: increased budget/staffing, new legal status, new enforcement strategies and new incentive systems

Community aspects will aim to incentivize conservation
Core REDD+ activities include a strong focus on alternative livelihoods
Benefit-sharing also expected to include a portion of any net revenues

National relevance – key issues

- ◆ Protected Forests will eventually cover 3 million ha
- ◆ Involvement of indigenous groups / safeguards
- ◆ Demonstration of the value of resolving tenure
- ◆ Hard data on deforestation, drivers and carbon stocks
- ◆ Testing interventions for avoiding deforestation
- ◆ Management of revenues, benefit-share/incentives
- ◆ Monitoring biodiversity and social co-benefits
- ◆ Scope for scaling up to province/sub-national
- ◆ Raising broader awareness of, and support for, REDD
- ◆ Communities/LNGOs bring experiences to national debate

38

Land: Indigenous Communal Titles



- ✓ Secure legal tenure
- ✓ Agro-forest boundaries
- ✓ Zone regulations
- ✓ Framework for cooperation
- ✓ A safeguard during the REDD+ process




Difficult land; exceptional progress around Sotera; >15 villages now involved

Better process: consultations, consent and monitoring

The CCB Standard provides a valuable framework:

- ◆ Forest/land rights are recognised and in most cases, enhanced
- ◆ Project design requires no relocations
- ◆ Net positive social impacts will be measured using qualitative and quantitative monitoring of livelihood indicators

- Free, Prior and Informed Consent specific to REDD is being obtained through extensive consultations that aim to meet best practice
- Formal community agreements ensure role of government and community are clearly set out
- Annual consultations will maintain consent/ guide management



40

Thanks for your kind attention !

Email: vathana.khuh@gmail.com
Tel : 855 12 686768



41

Training Seminar on Implementation of
A/R CDM and REDD+ in Cambodia, Feb. 2012

Methods of Carbon Stock Estimation and Field Monitoring

By Tokunori MORI

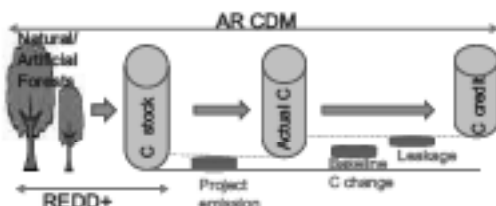


Contents

1. Introduction
2. Estimation of carbon stock of living tree
3. Monitoring method

Main contents are AR CDM rules, but basic ideas are similar for REDD+

I. Estimation of Carbon Stocks in AR CDM and REDD+



AR CDM	
Ex post estimation	Approve of additionality in PDD
Ex ante estimation	Approval of CO ₂ removals by project
REDD+	
Estimation of C stock by data of forest inventory	

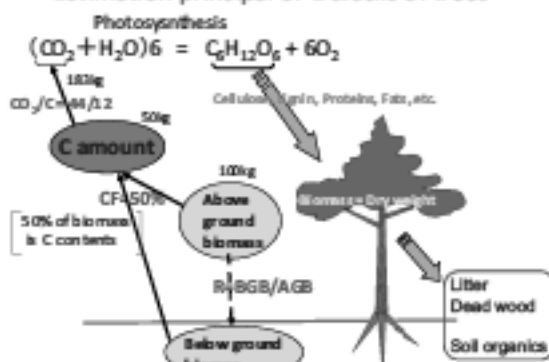
Selection of Carbon Pools in Forests

There are 5 carbon pools admitted

- A. Living Trees
 - (1) Above and (2) Below Ground Biomass
 This 2 pools are selected in all approved methodologies
- B. (3) Dead Wood, (4) Litter and (5) Soil organic C within the project boundary

Today's Topics is only A. subject

Estimation principal of C stocks of trees



Estimation of Living Tree Biomass

1. Above ground biomass (AGB)

A. Direct Method: Allometric equation

Example: $AGB = a \times (DBH)^b$ (kg d.m./tree)

B. Indirect (BEF) Method: Stem Volume → Biomass

DBH and H → (equation or table) → Stem volume (SV)

$$SV \times \text{Wood density} \times BEF = AGB \text{ (ton d.m./tree)}$$

(m³) (ton/m³) (ton/m³)

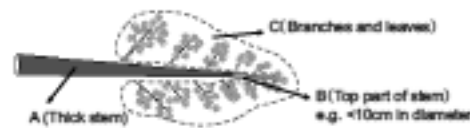
1ton = 1Mg = 10⁶g

2. Below ground biomass (BGB)

$$BGB = AGB \times R$$

WD, BEF & R are default values specific to species, growth conditions etc.

★ Biomass Expansion Factor
(BEF = AGB/Stem biomass, kg/kg)



(Biomass ratio)
BEF1: $(A+B+C)/A$ kg/kg ← Whole stem biomass
BEF2: $(A+B+C)/A$ kg/kg ← Merchantable stem biomass

★ $R = BGB/AGB$ (kg/kg)

Estimation of Carbon and CO₂ stocks from tree biomass

1. Carbon stocks of above and below ground biomass

$AGC = AGB \times 0.5$ (CF: carbon factor) (t C/tree)

$BGC = BGB \times 0.5$ (CF: carbon factor) (t C/tree)

2. Tree (Total) Carbon stocks

$TC \text{ Stock} = AGC + BGC$ (t C/tree)

When it is not needed to separate AGC and BGC,
 $TC \text{ stock} = AGB \times (1+R) \times CF$

3. CO₂ stocks of trees (t CO₂/tree)

$CO_2 \text{ stocks} = TC \text{ stock} \times 44/12$ (Ratio of CO₂/C)

We can estimate Carbon amounts or CO₂ amounts of tree at a certain time using DBH and/or H of the tree at that time

A. Direct biomass estimation method
(Allometric equation)

Use relationships between tree biomass and tree size

Tree sizes are generally DBH (cm), Tree height (H, m), and, in some cases, Wood density(WD, t/m³), Basal area (BA, m²/ha) and combination of them.

An equation is specific for species and forest site, generally.

Example:

- $AGB = 0.1242 \times DBH^{2.42}$ (C) *Chrysomela japonica* forests
- $AGB = 0.1123 \times DBH^{2.416}$ (4) BL forests in central Japan
- $AGB = 0.1285 \times (DBH^2)^{0.91}$ (5) tropical planting tree species
- $AGB = 0.1083 \times (DBH^2 \times H)^{0.80}$ (Secondary forest, humid tropics)
- $AGB = 6.0711 \times BA + 0.7672$ (100 forests of 19 tropical and 3 subtropical countries)
- $AGB = 34.4703 - 8.0671 \times DBH + 0.6569 \times (DBH)^2$ (BL tree, humid tropics)
- $\ln(AGB) = -1.265 + 2.036 \times \ln(DBH) + 1.7 \times \ln(WD)$ (Mangrove)
- $AGB = -1.398 + 2.731 \times \log(DBH)$ (*Macodium distichum*)

Dimension of AGB is kg/tree in general. *: t/ha BL: broad leaved tree

Calculation example for estimation of forest carbon stocks by direct (allometric equation) method

Table: Monitoring data of example plot

No. of trees	DBH (cm)	Height (m)	AGB (kg/tree)
1	10	11	29.35
2	12	13	44.92
3	14	15	64.45
4	16	15	79.92
↓	↓	↓	↓
Total			1,000.00

$AGB = 0.1083 \times (DBH^2 \times H)^{0.80}$
AGB (kg/plot)

If plot area is 500m²,
 $1,000(\text{kg/plot}) \times 10,000(\text{m}^2)/500(\text{m}^2) = 1,000 \times 20 = 20,000$ (kg/ha) = 20 (t/ha)

Carbon stocks of above ground = 20×0.5 (CF) = 10 (t/ha)

B. Indirect biomass estimation (BEF) method

$AGB = SV \times WD \times BEF$

1. Estimations of stem volume (Example)

- A) By stem volume equations (Example)
Example: $V = k1 + k2 \times D$ $k1 \sim k2 = \text{constant}$
 $V = k1 + k2 \times D + k3 \times D^2$ $D = \text{DBH (cm)}$
 $V = k1 + k2 \times BA \times H$ $BA = \text{basal area} = (\pi(D/2)^2)$
 $V = k1 + D^2 \times H^2$ $H = \text{tree height (m)}$
 $\log V = \log k1 + k2 \times \log D + k3 \times \log H$

B) By stem volume table (*Tectona grandis*) (m³/tree)

DBH	10	12	14	16	18
V	0.0482	0.0502	0.0623	0.0803	-
D	0.0694	0.0795	0.0896	0.0987	-
H	0.0945	0.1088	0.1220	0.1358	0.1495
W	-	-	0.1594	0.1773	0.1953

Calculation example of C Stock of *A. mangium* forest

Condition: 7-year-old, Av. DBH: 12.2cm, H: 15.3m
Stem volume of the stem yield prediction table: 100m³/ha

- 1 Above ground biomass by BEF method
 $100\text{m}^3/\text{ha} \times 0.5(\text{WD ton/m}^3) \times 1.2(\text{BEF}) = 60 \text{ ton/ha}$
 - 2 Below ground biomass
 $60 \text{ ton/ha} \times 0.20(R) = 12 \text{ ton/ha}$
 - 3 Total C of trees
 $(60+12) \times 0.5(\text{CF}) = 36 \text{ ton C/ha}$
 - 4 CO₂ of trees
 $36 \times 44/12 = 132 \text{ ton CO}_2/\text{ha}$
- ★ Annual CO₂ removal: $132\text{ton}/7 \text{ years} = 18.8 \text{ tonCO}_2/\text{ha}\cdot\text{yr}$

Range of CO₂ stocks (t/ha·yr): 10 ~ 40 tonCO₂/ha·yr

Appropriateness of allometric and stem volume equations

Ex-ante estimation

- 1: species-, genus-, family-specific in the country or neighboring countries (e.g. similar edapho-climatic zone)
- 2: forest type-specific in the country or from neighboring countries
- 3: pan tropical forest type-specific such as those provided in Table 4.A.1 to 4.A.3 of LULUCF (IPCC 2003)

Ex-post estimation (REDD+)

- 1: Species or group-of species specific equation in similar edapho-climatic conditions and if one of following conditions is satisfied
 - (a) Use in national forest inventory of the host party
 - (b) Use in commercial forestry for 10 or more years
 - (c) equation derived from data based >30 trees and $R^2 > 0.85$
- 2: If it does not meet the above conditions, make equation using the data from planted trees in the project. Use the standard method indicated in methodological tools (EBIS-Annex28 and 29)

W, DBH, and H may also have to satisfy the above criteria

11

Estimation of annual changes of GHG removals by trees in AR CDM

Table. Estimated amounts of GHG removals in Cao Phong Project of Vietnam

Year	Distributed net anthropogenic GHG removals (in PDD)	Net anthropogenic GHG removals (in monitoring report)
0	0	
1	-9,269	
2	1,926	
3	3,927	
↓	↓	
15	3,849	
Total	42,985	

Unit: ton of CO₂-equivalent

We have to estimate annual changes of CO₂ removals by trees before and after the project start

12

Ex ante estimation of annual CO₂ removals (in PDD)

A: DBH &/or H increment with tree ages

B: MAI (mean annual increment)

Simple but coarse method

C: CAI (current annual increment)

Precise but less data method

By yield prediction table or equation etc.

Ex post estimation of annual CO₂ removals (in Monitoring Report)

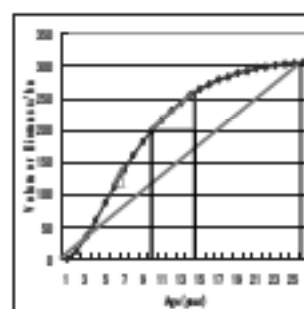
C: PAI (periodic annual increment)

Stock change method (use in REDD+)

By monitoring (time $t_1 - t_2$) of the forest

13

Stock change of tree volume/biomass with age



CAI (m³/ha-yr)

(current annual increment)

$$V_{t+1} - V_t$$

MAI (m³/ha-yr)

(Mean increment for a period)

$$V_p/t$$

PAI (m³/ha-yr)

(periodic annual increment)

$$(V_{t_2} - V_{t_1})/t$$

(Stock change method)

14

II . Monitoring procedures

- 1) Determination of project and strata boundaries and their area
- 2) Monitor for each stratum (e.g. species, planted years, forest types)
- 3) Determination of size and number of sample plots
 - Plot size: 100m² to 1,000m² depending on standing tree densities
 - Number of sample plots is calculated by the equation of the AR CDM method obligatory of (EBIS Annex15)
- 4) Locating of sample plots: random and systematic setting in every stratum (Slide 10)
- 5) Measuring of sample trees (number of trees, species, DBH, H and so on)
- 6) Calculation of carbon stocks
- 7) QA and QC procedures
 - for example, re-measurement and data checking by third party
 - data maintenance and archiving e.g., uncertainty assessment etc.

(MRV in REDD+ may require similar procedures in larger scale (area))

15

Strata and sample plot size in Cao Phong Project of Vietnam

Stratum	Species	Planting year	Planting density (N/ha)	Total area (ha)
1	<i>A. mangium</i>	1	1,600	140.19
2	<i>A. mangium</i>	2	1,600	140.19
3	<i>A. auriculiformis</i>	2	2,000	28.12

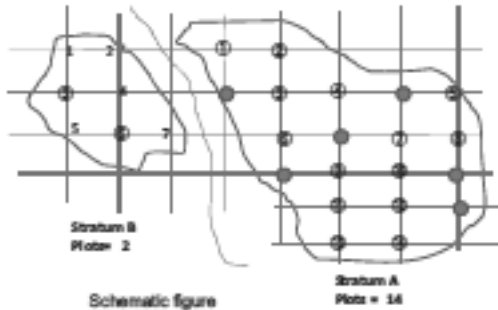
Sample plot size 20m × 20m (400m²)

It is desirable to include at least 30 number of trees in one sample plot at the harvesting year.

In *A. mangium*, 50% thinning at 8 years, then one sample plot includes 1600 × 400/10,000 × 0.5 = 32 trees

16

Random and systematic Distribution of Sample plots (e.g. n=16)



Example of Forest monitoring plot in Japan

Forest monitoring plot for national forest inventory



About 2,500 plots
for 25 million ha forest.
Plot diameter: 36m

Carbon stocks of dead wood, litter, and soil of forest in Japan

	Dead wood	Litter	Soil (0-30cm)
Carbon (g/tw)	0.30~0.51	0.36~0.61	5.0~8.0
Carbon (t/ha)	3.0~5.1	3.6~6.1	50~80

AR CDM methodological tools related to estimation of CO2 removals

- Document No. (ES-Jr/nea)
- ★ General
 - ★ Demonstration and assessment of additionality (16-17)
 - ★ Combined tool to identify baseline and additionality (15-19)
 - ★ Project emission
 - ★ Tools for testing significance of GHG emission (21-25)
 - ★ Estimation of GHG emission from fossil fuel combustion (23-24)
 - ★ Estimation of N₂O from nitrogen fertilization (28-34)
 - ★ GHG emission from burning of biomass (35-41)
 - ★ Carbon pools except for living trees
 - ★ Procedure to determine soil organic carbon pool (93-15)
 - ★ Estimation & determination of C stock change from dead woods & litter (28-34)
 - ★ Baseline
 - ★ Estimation of changes C stocks existing trees and shrubs in baseline (46-48)
- (continue)

Continue from above slide

- ★ Leakage
 - ★ GHG emission related to displacement of grazing (39-42)
 - ★ Estimation of GHG in crease attributed to displacement of Agriculture (51-55)
 - ★ Monitoring
 - ★ Calculation of number of sample plots (for monitoring) (56-65)
 - ★ Estimation of change in soil organic carbon (55-21)
 - ★ Application of allometric & stem volume equations (65-28,29)
 - ★ ES Meeting report <<http://cdm.unfccc.int/ES/index.htm>>
 - ★ Approved AR CDM Methodology for C pools other than living trees
 - ★ AR-AM002 & AM001: Dead wood, litter, Soil organic
 - ★ AR-AM004, 5, 6: Soil organic
- All approved AR CDM methodologies include methods of C estimation of living trees, and if necessary, project C emission, baseline C changes, leakage and so on.
- ★ CDM methodologies
 - <http://cdm.unfccc.int/methodologies/ARmethodologies/approved_schms/>

Thank you for your kind attention



Tree biomass measuring works

Recent Studies of FFPRI and FA on Forest Carbon Monitoring

Bureau of Climate Change, Forestry and Forest Products Research Institute (FFPRI),
Jumpei TORIYAMA (Ph.D.)
 1 February 2012
 FA training center, Phnom Penh

About me

- **2009.7**
 Graduate school of Kyoto University
 Soil moisture dynamics under evergreen and deciduous forests in Cambodia
- **2009.8—2010.3**
 Post doctoral research fellow of FFPRI
 Estimation of ecosystem carbon stock of tropical forests in Cambodia, Indonesia and Malaysia
- **2010.4—present**
 Research fellow of FFPRI
 Estimation of soil carbon stock of tropical forests



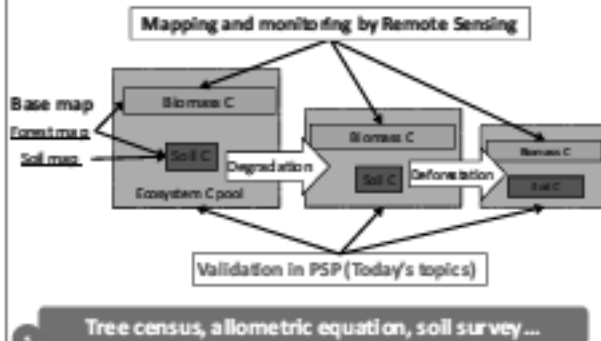
Today's topic

1. Flow of forest carbon monitoring
2. Specific works
 - 2-1. Allometric equation
 - 2-2. Soil carbon stock inventory
 - 2-3. Temporal change in soil carbon stock
3. Short Video

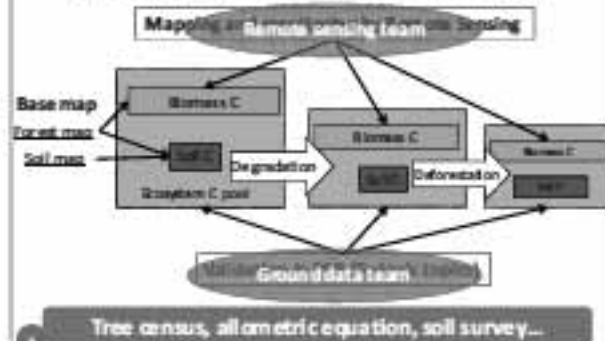
Today's topic

1. Flow of forest carbon monitoring
2. Specific works
 - 2-1. Allometric equation
 - 2-2. Soil carbon stock inventory
 - 2-3. Temporal change in soil carbon stock
3. Short Video

Flow of forest carbon monitoring



Flow of forest carbon monitoring



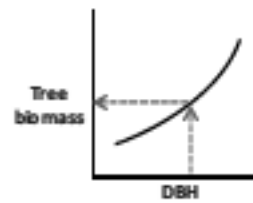
Today's topic

1. Flow of forest carbon monitoring
2. Specific works
 - 2-1. Allometric equation
 - 2-2. Soil carbon stock inventory
 - 2-3. Temporal change in soil carbon stock
3. Short Video

7

Allometric equation

Why allometric equation?



- To convert tree census data to tree biomass (Mg ha^{-1})

8

Allometric equation

Equations for tropical rainforest

- Following equations are available for estimating biomass of both lowland and hill dipterocarp forests.

Stem (W_s)	$W_s = 0.313 (DBH)^{2.282}$	Kato et al. (1978)
Branch (W_b)	$W_b = 0.0390 (DBH)^{2.048}$	Kato et al. (1978)
Leaves (W_l)	$1/W_l = 1/(0.124 W_s^{0.796}) + 1/125$	Kato et al. (1978)
D-H relation	$1/H = 1/(2.0 D) + 1/61$	Kato et al. (1978)
Root (W_r)	$W_r = 0.023 D^{2.99}$	Niyama et al. (2010)

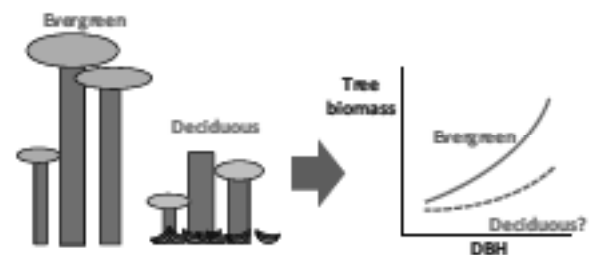


Fig. Destructive sampling

9

Allometric equation

Tree shape varies with forest types



- We need different equations for different forest types.
- Little information on deciduous forest in seasonally dry tropics

10

Allometric equation

Large deciduous tree is necessary

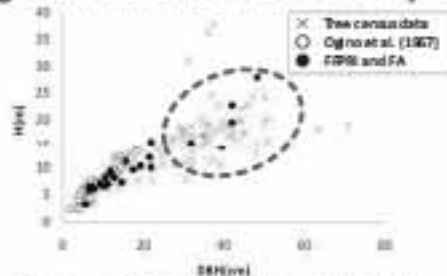


Fig. DBH-H Relationship in deciduous forest

- We conducted destructive sampling for 24 trees in Kratie.

11

Allometric equation

Cut, Cut, Cut...



- This is survey, not illegal logging...

12

Today's topic

1. Flow of forest carbon monitoring
2. Specific works
 - 2-1. Allometric equation
 - 2-2. Soil carbon stock inventory
 - 2-3. Temporal change in soil carbon stock
3. Short Video

13

Soil C Inventory

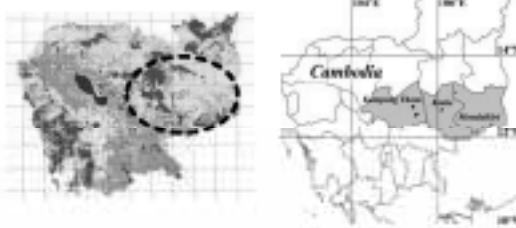
Backgrounds

- Soil C inventory is still inadequate in Cambodia though soil C is an important component of the greenhouse gas balance at national level.
- Objective of the study is to determine soil C stock in Cambodian forests, focusing on different forest and geological types.

14

Soil C Inventory

Study site



- Nine soil profiles in evergreen and deciduous forests growing over sedimentary rock and basalt area (1500-2000 mm ann. rainfall with clear dry season)

15

Soil C Inventory

Evergreen forest stands

- Sedimentary rocks area ($N = 4$)



- ✓ Closed canopy
- ✓ High tree biomass
- ✓ Deep (>5 m) and weathered soil

- Basalt area ($N = 5$)



16

Soil C Inventory

Deciduous forest stands

- Sedimentary rocks area ($N = 6$)



- ✓ Open canopy
- ✓ low tree biomass
- ✓ Shallow (<3 m) soil

- Basalt area ($N = 3$)



17

Soil C Inventory

Two types of soil sample

- Soil samples by **plastic bag** for total C contents (TC; $Cg\ g^{-1}$)
- Soil samples by **metal cylinder** for bulk density (BD; $Mg\ m^{-3}$)

18

Calculation

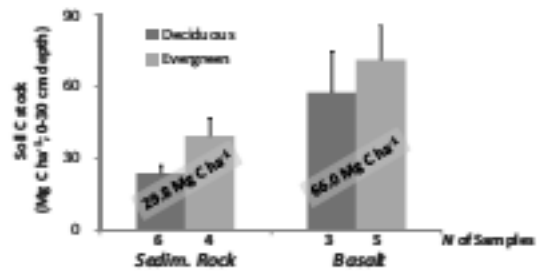
- Cumulative soil carbon stock (Soil C stock; Mg C ha^{-1}) for depths of 0–30 cm as the products of TC, BD and the thickness of each soil horizon.

$$C_{\text{stock}}(n) = \sum_{i=1}^n \frac{TC(i)}{\text{Total C}} \times \frac{BD(i)}{\text{Bulk density}} \times \frac{TH(i)}{\text{Thickness of horizon}}$$

- TC = 2%, BD = 0.8 g cm^{-3} , TH = 30 cm,
Soil C stock = $2 \times 0.8 \times 30 = 48 \text{ Mg C ha}^{-1}$
- Please care the unit!

Soil C Inventory

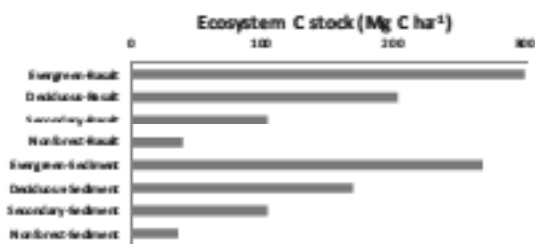
Soil C stock



Larger soil C stock in basalt and evergreen forests

Soil C Inventory

Forest ecosystem C stock



- We can calculate from four-pool C (Tree, Litter, deadwood, understory) + soil C.

Soil C Inventory

Ecosystem C mapping

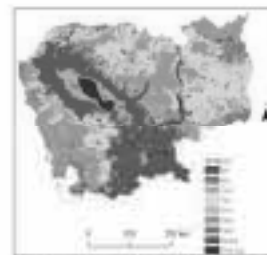


Fig. Ecosystem C map in Cambodia (Example)

We need higher spatial and time resolution.

Today's topic

- Flow of forest carbon monitoring
- Specific works
 - Allometric equation
 - Soil carbon stock inventory
 - Temporal change in soil carbon stock
- Short Video

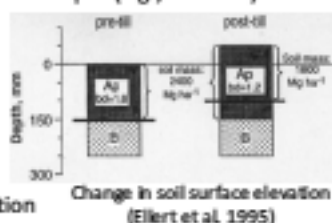
Soil C stock change

Backgrounds

- How to estimate temporal change in forest soil C stock?
- How to reduce the estimation error?
- We focused on the problem of Stock Change Method, a major methodology at present.

Problem of Stock Change Method

- Comparison of soil C stocks per unit area between two different time points (Mg C ha^{-1})
- Measurement to a fixed depth (e.g., 0–30 cm) is common.
- Surface elevation of soil can change.
- **Large estimation error!**
- Soil C data can be adjusted by calculation to equivalent soil mass basis.



20

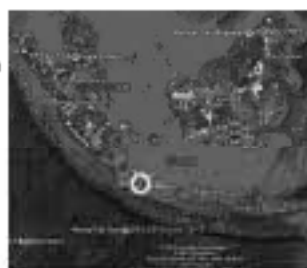
Objectives

1. To compare the changes in soil C stocks between the soil depth- and mass-based approaches
2. To propose a methodology for detecting relatively small changes in soil C stocks in forest ecosystems

21

Study site

- West Java, Indonesia
- Annual rainfall: 3000 mm
- Hilly area of Tertiary Sedimentary rocks
- Year: 2001–2005
- Two secondary forests under similar climate
 - Low AG biomass after shifting cultivation
 - Middle AG biomass without cultivation history



Location of study site

22

We created two scenario

Recovery of biomass after planting

- Cutting low biomass forest, planting *Acacia mangium* (Marbaya)
- Cutting middle biomass forest, planting *Shorea leprosula* (Ngaruh)

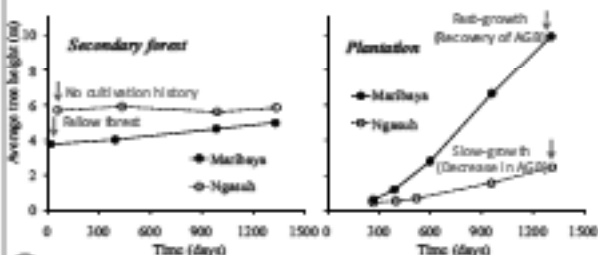


Fig. Change in average tree height

23

Picture of forest sites



Secondary forest in Marbaya



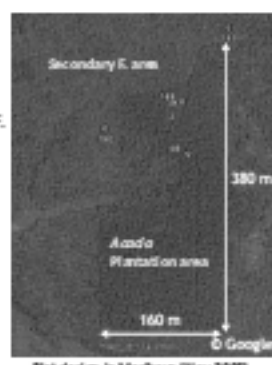
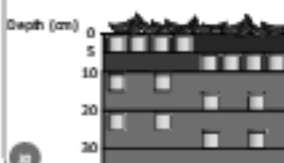
Acacia plantation in Marbaya (Aug 2005)

Shorea plantation in Ngaruh (Feb 2004)

24

Sampling

- 5 ha of plantation inside 15 ha of Secondary forest
- 40 sampling points in both plantation and Secondary F.
- Soil: 2001 and 2005
- Litter: 2001–2004



Plot design in Marbaya (Nov 2005)

25

Soil C stock change

Calculation of soil C stock

- Depth-basis

$$C_{stock-depth}(n) = \sum_{i=1}^n \frac{TC(i)}{N \text{ of horizon}} \times \frac{BD(i)}{\text{Total C}} \times \frac{THA}{\text{Bulk density}} \times \frac{THA}{\text{Thickness of horizon}}$$
- Mass-basis

$$C_{stock-mass}(n) = C_{stock-depth}(n) + \frac{THA}{\text{Equivalent soil mass}} \times (\frac{M_{mass-depth}(n)}{\text{Measured soil mass}} - \frac{M_{mass-depth}(n)}{\text{Measured soil mass}})$$
- Adjustment by the difference in soil mass

Let us move to result...

Soil C stock change

How much soil mass changed?

Table. Change in soil mass

Site	Location	Depth	2001	2005	2005/2001	Relative difference of 100 to 1950 year	
Acacia PL (Increase in ASB)	Maribaya	0-5 cm	300	281	(93.7)	4.2	Decrease in soil mass (Expansion)
		0-10 cm	710	654	(92.1)	6.4	
		0-20 cm	1590	1401	(88.1)	16.4	
Secondary F.	Ngasuh	0-5 cm	2493	2251	(90.3)	23.1	
		0-10 cm	490	391	(79.6)	4.4	
		0-20 cm	650	514	(79.1)	6.1	
Shorea PL (Decrease in ASB)	Maribaya	0-5 cm	200	202	(101)	0.0	Increase in soil mass (Compaction)
		0-10 cm	1040	1082	(104.0)	11.2	
		0-20 cm	1917	2080	(108.5)	26.1	
Secondary F.	Ngasuh	0-5 cm	200	201	(100.5)	0.1	
		0-10 cm	1020	1011	(99.1)	0.4	
		0-20 cm	1910	1840	(96.3)	20.4	

Large change in topsoil and plantation...

Soil C stock change

Temporal change in soil C stock

Table. Change in soil C stock

Site	Location	Depth	2001	2005 (Depth)	2005 (Mass)	SD/SE	P-value
Acacia PL (Increase in ASB)	Maribaya	0-5 cm	144 ± 7.3	143 ± 7.3	138 ± 7.3	1.0	0.10**
		0-10 cm	210 ± 9.7	201 ± 9.7	197 ± 9.7	1.7	0.10**
		0-20 cm	451 ± 19.7	414 ± 19.7	345 ± 19.7	4.9	0.00***
		0-20 cm	14.1 ± 0.4	13.1 ± 0.4	12.1 ± 0.4	0.7	0.00***
Secondary E	Ngasuh	0-5 cm	281 ± 14.1	265 ± 14.1	259 ± 14.1	1.7	0.10**
		0-10 cm	654 ± 32.7	617 ± 32.7	581 ± 32.7	4.1	0.00***
		0-20 cm	1401 ± 70.1	1251 ± 70.1	1081 ± 70.1	9.4	0.00***
		0-20 cm	0.2 ± 0.01	0.1 ± 0.01	0.1 ± 0.01	0.01	0.00***
Shorea PL (Decrease in ASB)	Maribaya	0-5 cm	199 ± 10.0	197 ± 10.0	197 ± 10.0	0.4	0.10**
		0-10 cm	951 ± 47.6	951 ± 47.6	951 ± 47.6	0.1	0.10**
		0-20 cm	1817 ± 90.9	1817 ± 90.9	1817 ± 90.9	0.1	0.10**
		0-20 cm	0.1 ± 0.005	0.1 ± 0.005	0.1 ± 0.005	0.001	0.00***
Secondary E	Ngasuh	0-5 cm	200 ± 10.0	201 ± 10.0	201 ± 10.0	0.1	0.10**
		0-10 cm	1000 ± 50.0	1000 ± 50.0	1000 ± 50.0	0.1	0.10**
		0-20 cm	1910 ± 95.5	1910 ± 95.5	1910 ± 95.5	0.1	0.10**
		0-20 cm	0.1 ± 0.005	0.1 ± 0.005	0.1 ± 0.005	0.001	0.00***

n = 42; ** p < 0.01; *** p < 0.001; * p < 0.05

Change in significant level by mass-based approach

Soil C stock change

Why unclear on depth-basis?

- Negative correlation especially in topsoil

Fig. Relationship between Total C and Bulk density

Total C and bulk density counteract!

Soil C stock change

Change in litter stock

- Increase in *Acacia mangium* (Maribaya)
- Decrease in *Shorea leprosula* (Ngasuh)

Fig. Change in litter stock in four years

Soil C stock change

Consistent with litter on mass-basis

- Positive correlation between soil C and litter on mass-basis

Fig. Relationship between soil C (0-5cm) and litter stock

Summary for specific works

1. Allometric equation

- To make better allometric equation for deciduous forest in seasonally dry tropics, destructive sampling was conducted for 24 trees in Kratie, Cambodia.

2. Soil C inventory

- Evergreen forests on volcanic rock (basalt) showed higher soil C stock than deciduous forests or forests on sedimentary rock in Cambodia.

3. Soil C stock change

- Estimation of soil C stock change was improved by mass-based approach.

11

For more detail

1. Allometric equation

- Kenzo T et al. (2009) *Journal of Tropical Ecology* 25 pp. 371-386.
- Niyama K et al. (2010) *Journal of Tropical Ecology* 26 pp 271-284.

2. Soil C inventory

- Kiyono Y et al. (2010) *JARQ* 44 (1) pp. 81-92.
- Toriyama J et al. (2011) *JARQ* 45 (3) pp. 309-316.
available from (www.jtrcas.affrc.go.jp)

3. Soil C stock change

- Toriyama J et al. (2011) *Forest Ecology and Management* 262 pp. 1659-1667.

12

Today's topic

1. Flow of forest carbon monitoring
2. Specific works
 - 2-1. Allometric equation
 - 2-2. Soil carbon stock inventory
 - 2-3. Temporal change in soil carbon stock

3. Short Video

13

Any question?

14



15

Thank you for your attention!

Action Plan

Proposed Contribution to National Forest Monitoring System to Promote REDD in CAMBODIA


Capacity Building for National Forest Monitoring REDD System to Promote November 18, 2011

UM SUNNA
(Forestry Administration, Cambodia)

OUTLINES

- General Information
- Objectives
- National Forest Inventory in Cambodia
- Proposed REDD+ Application Method
- Biomass Estimation
- Expected Outputs
- Implementation Actions

General Information



Country Status :

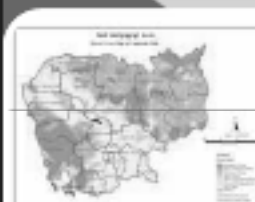
- Country Area : 181,035 Km², located in S-E Asia
- Population : 14.8 M, 1,705% and density is about 77/Km²
- Geographically, 1/3 is low land and Mekong river, Tonle Sap
- Climate : tropical zone and two seasons.
- 85% of population is based on agriculture

Land Use(2005)

- Arable land: 20.44% (rice, wheat, maize)
- Permanent crops: 0.59% (rubber, coffee ...)
- Other: 78.97% (pasture, forest, city, barren areas)

General information (cont.)

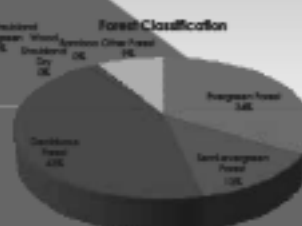
Forest Situation :



Forest definition: Area is covered by 10 percent and above of forest in the minimum land area of 0.5 ha and tree height is 5m and above.

General information (cont.)

Forest Classification :



Forest Types	Area (ha)
Evergreen forest	3,448,902
Semi-evergreen Forest	1,342,438
Deciduous Forest	4,442,092
Wood Shrubland Dry	37,028
Wood Shrubland Evergreen	91,367
Bamboo	35,802
Other forest	271,241

Source : Forest Inventory 2005

General information (cont.)

Deforestation and Forest Degradation :

- Most of forestland is owned by the RGC
- Aimed at promoting the economic growth and the increase of population, RGC has the policy to provide economic and social land concession
- Even the RGC is working hard in forest law enforcement, there are still some illegal logging and trade.

National Forest Programmes :

There are six programmes which consists of 24 sub-programmes for 20-year implementation in order to promote SFM in Cambodia.

I Objectives

- Proposed design for forest inventory system for REDD
- Set up equation for biomass estimation based on DBH parameter
- Estimate carbon stock in each forest types at sub-national level.

II National Forest Inventory in Cambodia

An inventory work was carried out in 1998, not national level, on pilot scale, (mainly) establishing methodology and process for future forest resource assessment

In 2007, forest cover 2005/06 assessment was finished based on visual analysis and digitalization on Landsat ETM satellite imageries.

- Cluster sampling was used in the grid of 40kmx4 Km on the map (Scale 1 : 10,000)
- Each cluster contains nine plots
- Each plot size is 40mx200m
- Trees were selected for measurement as follows :
 - Enumerate seedlings < 1.5m (2mx2m plot)
 - Enumerate seedlings > 1.5m (5mx5m plot)
 - Enumerate all trees (diameter 5-10cm) (10mx10m plot)
 - Enumerate all trees (diameter 10-30cm) (20mx20m plot)
 - Enumerate all trees (diameter > 30cm) (40mx20m)
 - Samplings in the center plot (20mx20m plot)

Figure 4. Cluster sampling layout

Source: Meltzer (IPF of Cambodia, 2007)

III Proposed REDD+ Application Method

The diagram shows a top-down approach starting at the National level, which then branches into multiple Sub-national levels for implementation.

IV Proposed REDD+ Application Method (cont.)

Main requirements:

- Three main forest types are considered for the estimation.
- Satellite imagery (Landsat ETM, 30m resolution) to verify estimated biomass and monitor forest cover change in the selected sub-national area.
- Ecognition and GIS are proposed for imagery interpretation and mapping.

V Biomass Estimation

Forest Classification :

- Identify forest cover spots in the area (evergreen, semi-evergreen and deciduous forest) by applying 90% accuracy
- 4m x 4m grid is made over the estimation area
- In each grid cell, sampling plot is set up
- Plot of 100m x100m in each grid cell
- Number of plots are randomly selected in each forest type base on Yamane (1974) :

$$n = \frac{N}{1 + Ne^2} \quad e=10\%$$

V. Biomass Estimation (cont.)

Top 3 Selected Sampling Plots :

Sub-national Level	Forest area (ha)	Total (N) of SP	Selected (n)SP
Kandal	18,854	11	10
Koh Kong	1,000,934	625	66
Kompong Thom	644,432	400	60
Kratie	940,832	588	65

$$n = \frac{N}{1 + Ne^k}$$

13

V. Biomass Estimation (cont.)

Field Inventory :



Tree measurement :

- Enumerate seedlings and diameters < 3cm (5m x 5m plot)
- Enumerate all trees (diameter 3-5cm) (10m x 10m plot)
- Enumerate all trees (diameter 5-10cm) (25m x 25m plot)
- Enumerate all trees (diameter 10-30cm) (50m x 50m plot)
- Enumerate all trees (diameter >30cm) (100m x 100m plot)

Biomass calculation

- Use generic equation (power) to calculate biomass in each DBH class intervals
- After finding the biomass of each class in sub-plots, we have to extrapolate for 1ha
- Estimate biomass within each forest type

14

V. Biomass Estimation (cont.)

Biomass Equation for AGB :

To set up the equation, conditions are taken as follow :

- select 3 sampling plots in each 3 different forest types
- select the dominant species within different classes of diameters
- find the trees near by plots for cutting
- Apply 90% of Confidential Interval (CI) to select trees in each species and class-intervals for destructive method. 90% of CI means

that selecting trees which are DBH between $\mu - t_{90\%}SE$ and

$\mu + t_{90\%}SE$

- Four class-intervals :

- DBH < 5cm
- 5cm < DBH < 10 cm
- 10cm < DBH < 30 cm
- DBH > 30cm

- set up equation (power) by using basal area parameters.

15

V. Expected Outputs

- Forest inventory design for REDD and measurement method
- Biomass equation, 90% of CI (target)
- Comparison of carbon stock in three different forest types at sub-national level.
- QC/QA checked by REDD Taskforce.

16

VI. Implementation Action

Activities	1	2	3	4	5	6	7	8	9	10	11	12	Responsibility
Writing proposal and seek for discussion and approval	■	■	■										Planning Office, Experts
Submission of the proposal for the support				■									Planning Office TWG F&T
Providing technical training to the team work					■	■							Forest and Wildlife training Center
Field survey						■	■	■	■	■	■	■	Team work
Data entry, processing, QC and reporting									■	■	■	■	Team work, REDD+ Taskforce

Challenges :

- People participation and commitment of sub-national level are important to secure the selected plots.
- Forest ecology is complicated to do destructive sampling
- Technical and financial support

17

example 1

Thanks for your kind attention

18

ISSUES AND CHALLENGES IN PROMOTING FOREST CARBON PROJECTS IN THE PHILIPPINES

A/R CDM and REDD+ in Cambodia
Phnom Penh, Cambodia
February 1-3, 2012

Edward V. Maningo, Ph.D.
Associate Professor II
College of Agriculture and Forestry
Negros Oriental State University
Dumaguete City, Philippines
E-mail: eamano27@gmail.com
www.nesu.edu.ph



Objectives of the Presentation

- Share the experience in implementing the carbon market mechanism in the Philippines
- The challenges encountered in the implementation
- Lessons that can be learned from the experience
- Discuss some areas needing improvement



Outline of the Presentation

- Background and status of the Philippine forests
- The carbon market initiative and its status of implementation
- The challenges confronting the implementation of the carbon market
- Recommendations to address the above challenges



The Philippine Context

- Climate change: major threat in the Philippines (economic developments)
- The Philippines is one of the countries in Southeast Asia that is highly vulnerable to climate change.
- Land Mass (Million Hectares):
 - Total Area : 30 Million
 - Forestland : 15.805 million (53%)
 - A&D Areas : 14.195 million (47%)



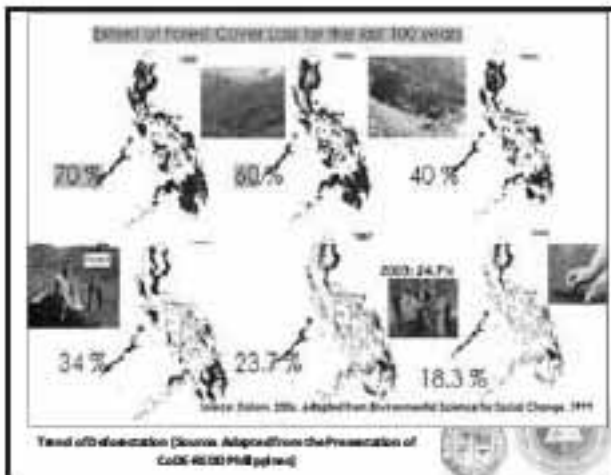
Status of the Philippines Forests

- Forest Cover:
 - Estimated forest cover (as of 1988): 7.2 million hectares (mostly located in the forestland areas)
 - Old Growth forests:
 - Remaining Area : 0.8 million Hectares
 - Dominant species : Dipterocarps
- Dominant Plantation Species: *Tectona grandis*, *Gmelina arborea*, *Swietenia spp.*, *Acacia mangium*, *Albizia falcataria*, *Eucalyptus deglupta*
- Other Important Forests:
 - Mangroves
 - Coniferous forests located at > 1,000 MASL elevation: *Pinus* (*Pinus merkusii* and *P. insularis*), *Araucaria* spp., *Podocarpaceae*



Mature stands of planted species in a government-managed reforestation project





GHG Emission from the Agriculture and Forestry Sector in the Philippines

- ❑ Sources of GHGs in Agriculture
 - ❖ Burning of Agriculture Residues: CO₂, Methane, NO₂
 - ❖ Nitrogen-based Fertilizer: NO₂ (310 times harmful than CO₂)
 - ❖ Liming: CO₂
 - ❖ Livestock: Methane
 - ❖ Litter Decomposition: Methane
- ❑ Sources of GHGs Forestry:
 - ❖ Logging: Fumes from logging equipments
 - ❖ Clearing of forests: methane, carbon dioxide
- ❑ Overall Carbon Balance: Philippines is a net sink of carbon estimated at 3,612 megatons of aboveground forest carbon found in primary and secondary dipterocarp forests and peatlands

Drivers of Deforestation

- ❑ Conflicting legal uses such mining and logging in protected areas
- ❑ Population growth and influx of informal settlers to the uplands
- ❑ Poverty, unemployment and lack of livelihood opportunities
- ❑ Increasing need to produce more food for the growing population
- ❑ Absence or inappropriate land use plan
- ❑ Increasing demand for fuelwood and sawlumber
- ❑ Limited government budget for the protection of the remaining forest stands
- ❑ Marginal production of upland farms
- ❑ Ecosystem services of the forest remain a public good

Ecosystem Services of the Forest as a "Public Good"

Perception attributed to:

- ❑ Non-valuation of the ecosystem services
- ❑ Environmental services have no real economic value/non-tradable:
 - ❖ Other land uses can be easily valued as factors of production
 - ❖ Environmental services and benefits from the forest is free
 - ❖ "Free-riders" are not excluded from benefiting the environmental services

Opportunities

- ❑ Evolving innovative carbon market mechanism
 - ❖ An opportunity to alleviate poverty
 - ❖ Provide solution to the limited budget/ fund sustainable developments in the countryside.
- ❑ Forests can now be considered as a financially viable capital

Prior Development Projects Initiated by Line Agencies that Impact Management of GHGs

- ❑ Sustainable farming projects
 - ❖ Organic Farming
 - ❖ Conservation Farming Village: help in curbing GHG emissions thru improved farming practices
- ❑ Carbon mitigation interventions
- ❑ Land Use Planning: (1) Comprehensive Land Use Planning (CLUP); and (2) Forest Land Use Planning (FLUP)

Organizational Structure of the Climate Change Commission



Carbon Initiatives

- ❑ Clean Development Mechanism (CDM) under the Kyoto Protocol
- ❑ Voluntary Carbon Market: UN-REDD Plus Programme

Clean Development Mechanism

- ❑ Implemented by DENR
- ❑ Success is still very limited
- ❑ Only 1 proposal was evaluated (as of 2008) the Laguna de Bay Community Carbon Finance Project undertaken by the Municipal of Tanay and LLDA
- ❑ Objectives of the project:
 - ❖ Capacity building
 - ❖ Pilot environmentally beneficial projects with C offsetting potential
 - ❖ Prepare projects which emission reduction credits could be purchased

Philippine REDD Plus

- ❑ Philippines has gained an observer status of the UN-REDD Programme
- ❑ 2010: Formulated the Philippine National REDD Plus Strategy (PNRPS) and adopted by the Philippine Climate Change Commission
- ❑ PNRPS Vision: "Empowered forestlands managers and support groups sustainably and equitably managing forestlands and ancestral domains with enhanced carbon stock and reduced greenhouse gases emission"
- ❑ Four REDD Plus pilot projects is currently being implemented in the Philippines
- ❑ The REDD Readiness Plan is currently being implemented as part of the subprogram under PNRPS

Aim of PNRPS

- ❑ Help monetize the carbon stored in forests in order to create an incentive to protect and sustainably manage forest assets
- ❑ Increasing the national and local stakeholder's capacity to support not only the restoration and enhancement of forest ecosystem functions but also the process of building ecosystem and human resilience to climate change
- ❑ Streamline different projects into the national REDD plus agenda.

Impact Areas of PNRPS

- ❑ Reduced Forest Degradation and Deforestation
- ❑ Poverty Alleviation
- ❑ Biodiversity Conservation
- ❑ Improved Governance

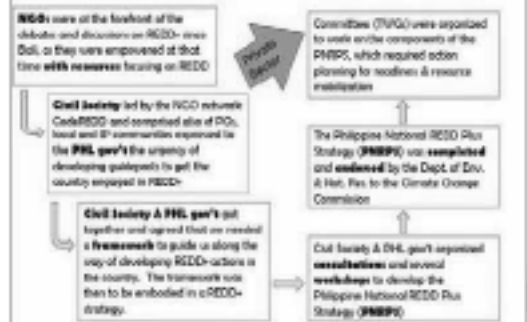
The Planning Process of PNRPS

- Bottoms up planning and participatory decision making.
- Significant participation of many NGOs

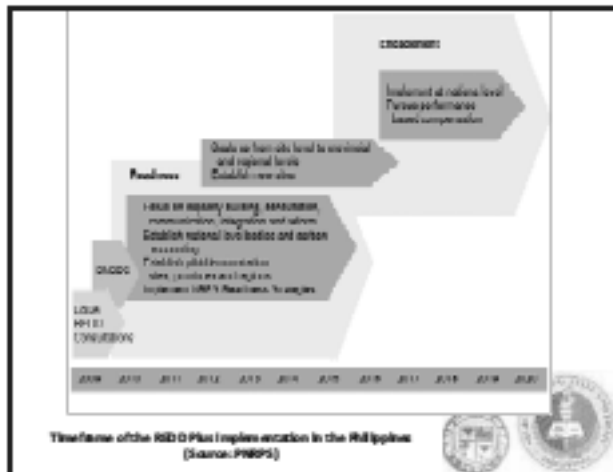


Philippine National REDD-plus Strategy

Evolution of the Philippine REDD+ Strategy



Source: Lagumbay (2011)



Timeline of the REDD+ implementation in the Philippines (Source: PNRPS)

Arrangement for REDD-plus coordinating agencies proposed under the PNRPS



Issues and Challenges (4 Key Areas)

- Governance Issues
- Technological Issues
- Economic Issues
- Acceptability and Support



Governance Issues

- Limited participation among the national and local stakeholders and key players of the carbon market
- Complexity of integrating and streamlining various development programs and initiatives to the national REDD agenda
 - ◆ Varying management capabilities among different agencies
 - ◆ Different agencies have their own reporting mechanism and sets of policies and defined sets of priorities
- Management, ownership and sharing of benefits
 - ◆ Ownership and sharing of benefits not well settled
 - ◆ Common Property Resources (CPRs) are vulnerable to exploitation because of "open" nature
 - ◆ Tendency of the benefit-sharing schemes to revert to public goods
- Limited information and baseline data on the GHG emissions and value of ecosystem services
- Conflicting need over land resource for food, fuel wood, wildlife, protection, and other services from an ecosystem
- Stakeholder readiness to implement the Philippine National REDD+ Strategies (PNRPS)



Implications of Reverting Benefits to Public Goods

- ❑ Encourage "free-riders"
- ❑ May discourage individual participation
- ❑ The scheme may not effectively address the common property resource (CPR) management issues



Conflicting need over land resource for food, fuel wood, wildlife, protection, and other services from an ecosystem

- ❑ There is a growing pressure on the finite land resource (e.g. growing population and urbanization, mining boom, etc.)
- ❑ Society's demand for services from ecosystems is increasingly diverse: water, food, forest products, esthetics, and wildlife and settlement areas for the growing population and **PROTECTION!**
- ❑ Land allocation may be sub-optimal and unable to satisfy conflicting goals



Stakeholder readiness to implement the Philippine National REDD+ Strategies (PNRPS)

- ❑ The carbon market is a relatively new concept – many things need to be learned
- ❑ Coordination remains very loose.
- ❑ The capability of the key players and implementers needs to be developed



Technological Issues

- ❑ The need for an effective and standardized monitoring and evaluation, because:
 - ❖ Standards are not widely-known among the implementers.
 - ❖ Monitoring and evaluation is constrained by the availability of funds and technological support
 - ❖ Several agencies have different standards of monitoring
- ❑ Local capability and access to technologies

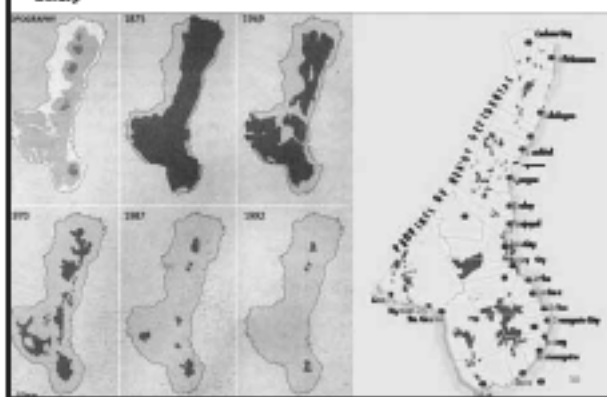


Local Capability and Access to Technologies

- ❑ Carbon initiative is highly technical and requires heavy documentation (e.g. GHG quantification) - verification and transaction is carbon trading is difficult to comprehend to the stakeholders.
- ❑ Limited manpower and skills
- ❑ Constraints in the use and access of technologies and information (e.g. accessing satellite images, spatial analysis tools)
- ❑ Allometric equations & models needs to be tested and validated
- ❑ Need to standardize the impact assessments and monitoring



Trend of deforestation in Negros Island, Philippines. The island covers two provinces: Negros Occidental and Oriental (right side). The newly established plantations in Negros Oriental are not captured by the satellite. (source: PENRO Negros Oriental, DENR)



Economic Issues

- ❑ **Pricing and trading of carbon**
 - ◆ Philippines has modest experience in carbon trading - many LGUs are not familiar of the intricacies of carbon trading
 - ◆ Mechanism is not well disseminated and well established.
- ❑ **High transaction cost**
 - ◆ Voluminous documents that need to be accomplished
 - ◆ High transactions cost involved (US\$200,000 to 250,000)
- ❑ **Limited information on the impacts of carbon market on poverty and economic wellbeing of the forest communities**
 - ◆ Market price of carbon is not enough to cover the investment cost (estimated to be only US\$250 ha.⁻¹ for 10 years)
 - ◆ Carbon market may only be used as additional income to the forests
 - ◆ Few socioeconomic impact assessments conducted



Acceptability and Support

- ❑ **Low adoption of sustainable farming**
 - ◆ Burning agricultural residues still predominates
 - ◆ Excessive application of fertilizers, particularly nitrogen based
 - ◆ Limited benefit for producing organically grown products
- ❑ **Prevailing drivers of deforestation, leakages and risks**
 - ◆ Marginal farming practices - convert larger tract of forestlands to meet the required family income and food
 - ◆ Increasing population: pushes the demand for fuelwood, construction timber, food and residential lands
 - ◆ Few investors on tree plantations
 - ◆ Ineffective law enforcement
 - ◆ Increasing demand for food



Use of fire in preparing the sites for agriculture



Recommendations

- ❑ **Strengthen governance**
 - ◆ Strengthen monitoring and evaluation
 - ◆ Strengthen collaboration and linkage
 - ◆ Improve payment for environmental services scheme
 - ◆ Build capability of stakeholders and key players
- ❑ **Institutionalize product certification and ecolabelling**
 - ◆ providing incentives of certified/ecolabeled products
 - ◆ reducing transaction costs in certification and labeling
- ❑ **Strategize the reduction of transaction cost**
 - ◆ Building a pool of experts
 - ◆ Establishing institutional linkages
- ❑ **Rationalize R&D focus**



Monitoring and Evaluation

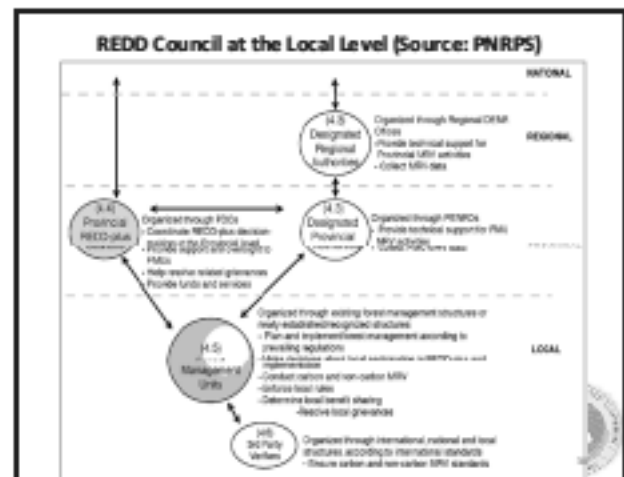
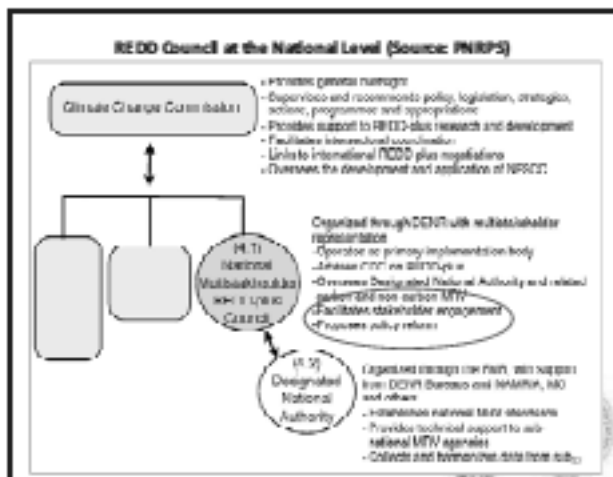
- ❑ Closely monitor areas that are highly vulnerable to deforestation
- ❑ Continuous assessment on the effectiveness of the government strategies in addressing leakages and drivers of deforestation
- ❑ Standardize the methodologies of monitoring of the forest cover
- ❑ Monitoring the trend and of GHG emissions and carbon stored



Collaboration and Linkage

- ❑ Seek convergence of various initiatives towards common REDD agenda
- ❑ Expedite the organization of the local and national consultative body (e.g. REDD Plus Councils or of Community of Practitioners)
 - Will serve as a fora for discussion and information among the different stakeholders
 - Orchestrate the integration and harmonization of programs towards a common carbon market agenda.
- ❑ Broaden the engagement, support and linkage among the different stakeholders and key players





Improve PES Scheme

- Should look at the potential income from the other services of the forests
- Should address the twin goal of solving the unemployment in the uplands and increasing the condition and ecosystem services.
- Address the issue on reverting benefits to public goods
 - ◆ Use the proceeds from PES in generating employment (e.g. seedling production, plantation establishment, forest protection) or incentives for adopting sustainable agriculture as a modality of benefit sharing
 - ◆ Getting employed in a forestry project encourages/motivates individuals to conserve the forest for continuous employment.

Build Capability of Stakeholders and Key Players on:

- Project management and decision making
- Use of management tools
- Monitoring and data gathering

Rationalize R&D Focus

- Streamline climate change issues in the R&D agenda and development programs of the government
- Mainstream precision agriculture technology
- Develop robust resource allocation methodology in land use planning
- Upscaling of best management practices
- Improve the quantification and assessment protocols of GHG emissions
- Assess impacts of land use changes and practices

Land Allocation Methodology

- Land allocation should be optimal
- Should consider conflicting priorities of the different stakeholders (this is difficult!)
- Mathematical tools are indispensable in overcoming complexity in land allocation or decision-making – but these are not readily comprehensible and not popular among the resource managers

Example of Land Allocation Problem:

Allocation Problem: How are the land management unit be allocated to: (1) intensive agriculture; (2) bamboo; (3) agroforestry; (4) forage production; (5) cassava; (6) rubber or fuelwood production; (7) permanent forest?

The allocation should consider the following:

Goals:

- Minimize Greenhouse Gas Emission, Soil Erosion or Runoff
- Maximize Carbon Sequestered, Food Production, Fuelwood Production, Forage Production, Total Revenue

Constraints:

- Minimum food to produce (in Kilo Calories) should satisfy the food security requirement
- Total land allocation should not exceed the area of the planning unit
- Each land use should conform to their suitability requirement
- Food, fuelwood and forage produced should sufficiently support the needs of the community



Tools that Useful in Carbon Market Project

GIS Software

- QSB
- SAGA
- ILWIS
- DIVA

Modeling Tools

- Ex-Ante Carbon Balance Tool (Ex-ACT)
- STELLA

Optimization Software

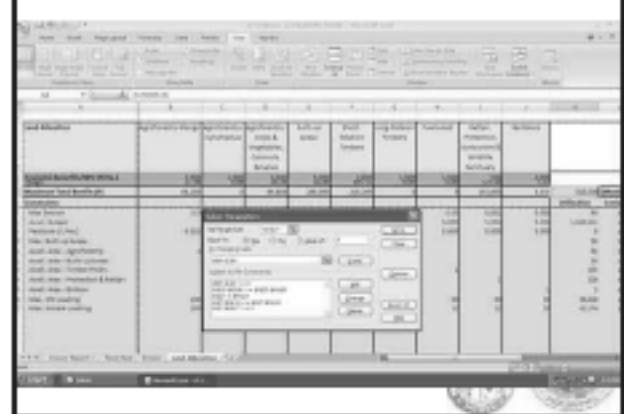
- QSB
- LIPS
- LINGO
- LPSolve
- MS Excel's Solver



Optimization Tool: LIPS



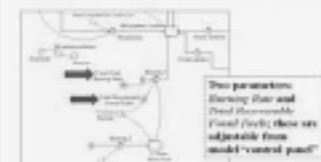
MS Excel Solver Function



Ex-Ante Carbon Balance Tool (Ex-ACT)



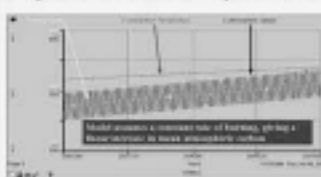
Simple Global Carbon Cycle Model 5



Extended Model – Burning of Fossil Fuels

STELLA

Simple Global Carbon Cycle Model 6



Extended Model – Reproduction of the Keeling Curve



Conclusion

- ❑ The innovative carbon market offers an opportunity of supporting the sustainable development in the Philippines.
- ❑ REDD+ appears to have gained wider acceptance compared to CDM
- ❑ Both approaches are still complicated and very technical requiring strong linkage, capability building and financial support.
- ❑ Technological advancements and the development of various tools greatly facilitate the management of the carbon project.
- ❑ Training and capability building are essential component of the program.



References

IFOR. 2011. Cracking Code REDD+ Filipino and leaders diversifying sustainable forestry sources. Center for International Forestry Research (CIFOR) blog. <http://blogs.cifor.org/2011/08/28/cracking-code-redd/>. Accessed 20 October 2015.

Kenada, A.C.T. 2010. REDD+ and A/R CDM Regime in the Philippines. ASEAN Knowledge Network on Forests and Climate Change, Jakarta, Indonesia 30 October 2010.

Lagumbay, M.L. 2011. The Philippine National REDD+ plus Strategy and Current Status. Philippine conference on capturing economic benefits from ecosystem services. 25 August 2011, Asian Development Bank, Manila.

Lacey, R.D. 2010. Facilitating mitigation projects in the land-use sector: lessons from the CDM and REDD+. <http://www.sustainabledevelopment.un.org/system/DownloadAttachment.do?attachmentId=130720110212>. Nature Climate Change. 2010. DOI: 10.1038/nclimate1262. Policy Brief, The Nature Conservancy, June 2010. NRI/N-CRIS/CI/NAI/ICMAN/06.5 pp.

PCARRD. 2010. Philippine REDD+ pilots and climate change in the agricultural, forestry and natural resources sectors (2009-2010). Los Baños, Laguna: Philippine Council for Agricultural Science, Forestry and Natural Resources and Development, Department of Science and Technology (PCARRD-DOST). 2010. 112 pp. (Book Series No. 130/2010).

Philippine National REDD+ plus Strategy (PNRS). 2010.

Rubio, J.M. 2010. Integrating REDD+ Architecture Implications for the Philippines' Community-based Forest Management: The Asia Dialogue on Community Forests and Property Rights in the Context of Climate Change 11 and 12 August, 2010 Park Migration Hotel and Resort, Balaibawa.

Sato, M. 2007. Reducing emissions from deforestation in developing countries. CDM+ Media Briefing, Vienna, August 29, 2007.

Schlegelher-Feldt, C. 2010. Carbon Revenue Possibilities for Agriculture, Forestry and Other Land Use Projects in a Smallholder Context. Natural Resources Management and Environment Department, Faculty of Agriculture/ Organization of the United Nations (FAO), Rome, February 2010. 13 pp.

UN Collaborative Programme on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries, National Programme Document. UN-REDD Programme Supporting Forest Resilience Process.



Thank You

