Survey of REDD projects in Central Africa
Etude des projets REDD en Afrique Centrale

(formulaire à renvoyer à cdewasseige@foraf.eu et philippe.mayaux@jrc.ec.europa.eu)

1) General description / Description générale

Project name / Nom du projet:

Pan–Tropical Mapping of Forest Cover and Associated Above-Ground Carbon Stock

Domain of activity / Domaine d'activité

(n answers possible, if possible sorted by priority 1= highest priority
plusieurs réponses possibles, si possible par priorité 1= plus haute priorité)

Monitoring of forest cover (deforestation and degradation) Suivi du couvert forestier (déforestation et dégradation)	1
Assessment of carbon stocks Mesures des stocks de carbone	2
Forest dynamics Dynamique forestière	
Modelling of forest dynamics (including reference scenario) Modélisation des dynamiques forestières (dont scénario de référence)	
Political and institutional context Context Institutionnel et Politique	
Capacity-building and technology transfer Renforcement des capacités nationales et transfert de technologie.	3
Promotion of participation of local communities Promotion de la participation des communautés locales	
Field Project with REDD potential (project generating emission reduction from Deforestation and Degradation without an MRV component) Projet de terrain ayant un potentiel REDD (projet permettant la réduction des GES liées à la déforestation et la dégradation sans composante MRV)	
REDD Pilot Project (project aiming to generate measurable and verifiable GHG emissions reduction from deforestation and forest degradation) Projet Pilote REDD (projet visant la reduction mesurable et vérifiable des émissions de GES liés à la déforestation et à la dégradation forestière)	

General objective / Objectif général

The purpose of this project is to establish a pan-tropical baseline forest cover map to support and promote the co-benefits provided by a range of ecosystem services, including biodiversity, carbon sequestration, and the protection of human health, livelihoods, and well-being. This is

accomplished through two main objectives, described below.

Specific objectives / Objectifs spécifiques

This pan-tropical project has two major objectives:

1. The first is focused on production of three pan-tropical data sets
(a) 2007 high-resolution, cloud-free radar imagery from the Japanese ALOS sensor
(b) a forest cover map derived from this radar imagery to serve as a baseline for subsequent change monitoring, and
(c) medium-resolution, pan-tropical biomass/carbon map based on the fusion of optical (MODIS), radar (ALOS), and lidar (GLAS) data sets.

2. The second is focused on capacity building through technology transfer and engagement in calibration and validation, and through integration of the data sets from Outcome 1 into policy decisions. As part of this project we have held and will hold additional technical workshops in each of three tropical regions: Latin America, Central Africa, and Southeast Asia. We engage stakeholders in discussions that involve the application of map products in the identification of priorities for a number of applications. As part of this activity we support scholars to spend time with Woods Hole Research Center (WHRC) scientists to work on the project.

Region of interest / Région d'intérêt

The scope of the activity is the tropical regions of South America, Africa, and Asia.

Budget

(order of magnitude if confidential / ordre de grandeur si confidentiel)
The activity is funded for 3 years, beginning November 2008, with approximately $2M for the sub-saharan Africa component.

2) Partners / Partenaires

(Institution, contact person, email)
Woods Hole Research Center :

Principal Investigators

Josef Kellndorfer – Associate Scientist
Nadine Laporte – Associate Scientist (e-mail: nlaporte@whrc.org)

Co-Investigators :

Alessandro Baccini – Assistant Scientist
Scott Goetz – Senior Scientist
R.A. Houghton – Acting Director, Senior Scientist
Tracy Johns – Policy Advisor
Wayne Walker – Assistant Scientist

Technical and scientific partners / Partenaires techniques et scientifiques

SPOT Image Planet Action Initiative, U.S. National Aeronautics and Space Administration (NASA), Alaska Satellite Facility (ASF), Japanese Aerospace Exploration Agency (JAXA), SARMAP, American Museum of Natural History (AMNH), Wildlife Conservation Society (WCS).

Instititional partners (COMIFAC countries) / Partenaires institutionnels (Pays COMIFAC)

Ministries of Forests and Environment in several COMIFAC countries.

3) Earth Observation component / Composante d'Observation de la terre

This part aims at identifying the characteristics of the Earth observation component if there is one. Leave it blank if it not the case.
Cette partie veut identifier les caractéristiques de la composante d'observation de la terre, s'il y en a une. Ne remplissez pas cette partie si ce n'est pas le cas.

Data used / données utilisées

Dataset Doonées	Sensor / capteur Radar/optical/lidar…	Resolution	Coverage Couverture	Time & frequency Date et fréquence	Quality / qualité (good-medium-bad)	Accessibility (free access-with conditions – restricted)
Remote sensing	Landsat Radar Lidar MODIS	2.5 to 1km	Pan tropicale at 500m and 30 m, Samples at 2.5m	Variable depending on sensor.	good	Variable depending on data set.

Methods / Méthodes

(short description on sampling, classification methods… / description de l'échantillonnage, des méthodes de classification…)

We are in the process of generating the first pan-tropical map of above-ground carbon stock using a combination of remotely sensed data, field observations and non-parametric data-mining algorithms. The approach leverages a combination of field data that provide accurate information at the plot level, and remote sensing data that are continuous in space over large areas. A mosaic of best-quality Moderate Resolution Imaging Spectroradiometer (MODIS) observations provides cloud-free spectral reflectance data for the entire region. MODIS data have been shown to capture the spatial variability of above-ground biomass (Baccini et al. 2004, Baccini et al. 2008). Field measurements from forest inventories and carbon estimates derived from LIDAR waveform metrics and spectral reflectance are then be used to calibrate model that estimate above ground carbon.

Expected results / résultats attendus

(short description of products, parameters measured, frequency, expected accuracy..

Courte description des produits, paramètres mesurés, fréquence, précision attendue…)

Results generated for a first map of tropical Africa's above-ground biomass can be found here:

Baccini, A., N. Laporte, S.J. Goetz, M. Sun, and H. Dong. 2008. A first map of tropical Africa's above-ground biomass derived from satellite imagery. *Environmental Research Letters* (3)045011 doi: 10.1088/1748-9326/3/4/045011, online journal http://www.iop.org/EJ/abstract/1748-9326/3/4/045011/

map available at : http://www.whrc.org/africa/carbonmap2000.htm

Pan tropical map of above ground biomass at 500m for one time circa 2007 – initial overview is provided at http://www.whrc.org/policy/CopenhagenReports/assets/Biomass_COP15.pdf

Pantropical map of forest at 50-100 m res. for one time circa 2007 is also still in progress, with general information available here: www.whrc.org/pantropical

Others :

Goetz, S.J., A. Baccini, N.T. Laporte, T. Johns, W. Walker, J. Kellndorfer, R.A. Houghton, and M. Sun. 2009. Mapping and monitoring carbon stocks with satellite observations: a comparison of methods. Carbon Balance and Management, 4:2. http://www.cbmjournal.com/content/4/1/2

Validation

(short description of validation protocols, reference data… / courte description des protocols de validation et des données de référence)

To be determined, depending on available field data sets.

4) Ground component / Composante sol

Parameters collected / paramètres collectés

(list of parameters with short description of collection method / liste des paramètres collectés avec une courte description des méthodes de collecte)

For field surveys these include stand forest biometry, e.g. DBH, vegetation types. We expect to have compiled, ultimately, field measurements at some 300 locations across the pantropical region.

Statistical analysis / Analyse statistique

We use a wide range of statistical techniques depending on the specific application.

Integration Earth Observation - ground / Intégration Télédétection-sol

Integration methods / Méthodes d'intégration

(assimilation models, statistical models…)

The field data that are collected to conincide with the locations of radar and lidar acquisitions. The field data are used to develop estimates of above-ground biomass within the plots using a series of allometric equations. Once estimates of biomass are developed, the spectral values are sampled for use as predictors and map production.

Final products / Produits finaux

(estimation de biomasse, de flux de carbone, de flux financiers…)
pantropical maps of forest exent for 2007
pantropical maps of biomass for 2007

Validation

(short description of validation protocols, reference data…)

Validation is done using statistical cross valiation assessments using reserved sample data as well as with a range of independently acquired field data sets.

5) Political component / Composante politique

Beneficiaries / Benéficiaires

(REDD focal points, forest services, monitoring services, local communities… / points focaux REDD, services forestiers, services de suivi, communautés locales…)

The pan-tropical program has the potential to provide local, national, and international institutions tools and datasets essential to understanding the policy implications of REDD and provide a robust monitoring framework for current and future REDD programs.

Theme / thème

(Negotiation, reporting, monitoring, retrocession of payment… / négociation, reporting, suivi, distribution des bénéfices)

Monitoring

Type of action

(training, awareness-raising, field project, demonstration project, development of economic alternatives to deforestation and/or degradation, political study… / formation, sensibilisation, projet de terrain, projet de démonstration, développement d'alternatives à la deforestation et degradation, étude politique)

Training in theoretical aspects of remote sensing and applied science.

5) Capacity Building activities

Trainings delivered

(theme, beneficiaries, location, date, duration, frequency / thèmes, bénéficiaires, lieu, date, durée, fréquence)

To date, five national and regional workshops in Uganda, Ecuador, Colombia, Bolivia, and Vietnam have been conducted as a basis for understanding remote sensing techniques and the potential implications of using satellite imagery in a REDD framework for estimation of above-ground carbon stocks. In a local context, workshop training on the collection of forest data for integration into forest biomass models has been conducted. And, at the national level the WHRC workshops have been a tool for increasing indigenous and host-country capacity to understand potential methodologies for estimating carbon stocks that will be proposed as part of the REDD framework for monitoring in upcoming UNFCCC negotiations. Furthermore, in these countries, training has been a crucial component in supporting field data collection.

Recently, the WHRC Pan-Tropical Mapping Program hosted a three-week workshop that focused on building capacity in emerging remote sensing techniques for experts in eight tropical countries spanning S. America, Eastern Africa, and SE Asia. This workshop allowed participants to train on high-resolution imagery for the purposes of developing land cover maps, developing estimates of tree cover, and the estimation of above ground biomass stocks. This workshop has been such a success that the participants are independently working on many of the remote sensing applications they have learned while at the WHRC, and several of them are planning to present their results at various venues.

Workshops organized

(theme, beneficiaries, location, date, duration, frequency / thèmes, bénéficiaires, lieu, date, durée, fréquence)

Capacity Building Workshops

Annual workshops will take place through 2011 in Central Africa, Latin America, and Southeast Asia. The goal of these workshops is to instruct national authorities and other stakeholders in the methods to produce and understand national-level forest cover and carbon stock map products. Although workshops will be largely instructional, efforts will be made to foster new collaborations, and to strengthen existing ones between individual countries and the WHRC for the benefit of the current project and among country representative for longer term advancement of regional measurement and monitoring activities. At the first workshop, from November 12th to November 14th, 2008, the Woods Hole Research Center's Africa program team, conducted a workshop at the Kaniyo Pabidi Ecotourism Site located in the Budongo Forest Reserve, Western Uganda. The workshop was designed to bring together practitioners in forest biometrics to share information on tools, techniques, and protocols to improve forest inventory designs for the purpose of more readily enabling the integration of forest field measurements and remotely sensed data. Standardized protocols that ensure consistency in measurement acquisition and statistical soundness in sampling design were discussed to produce protected-area, as well as, national-level, continental, and pan-tropical maps of biomass/carbon stocks. Participants included over 40 individuals from seven African countries. Further information and details can be found at: http://www.whrc.org/africa/PAWAR/Workshops/index.htm

September 4-6, 2009 – The WHRC pantropical mapping project conducted an addendum workshop to the Forum on Readiness for REDD that was being conducted in Puyo, Ecuador. This workshop was facilitated by COICA (Coordinator of Indigenous Organizations of the Amazon Basin) and the Confederation of Indigenous Nationalities of Ecuador (Cofenaie). Technical training was conducted by WHRC scientists and included over 25 participants from a variety of indigenous backgrounds. Most participants had experience in community-level mapping. The workshop was designed to provide background information on the practical

aspects of remote-sensing and integration of remote-sensing and forest surveys to develop estimates of above-ground biomass. On the second-day, participants were trained in standardized forest inventory design and field measurements to provide a basis for estimating forest-level biomass.

September 12-14, 2009 – The WHRC pantropical mapping project conducted provided an addendum workshop to the Forum on Readiness for REDD that was being conducted in Melgar, Colombia. This workshop was facilitated by COICA (Coordinator of Indigenous Organizations of the Amazon Basin) with over 15 participants from indigenous groups in around Colombia. Technical training was conducted by WHRC scientists and focused on the practical aspects of remote sensing and integration of remote-sensing and forest surveys to develop estimates of above-ground biomass. On the second-day, participants were trained in standardized forest inventory design and field measurements to provide a basis for estimating forest-level biomass.

October 30 – November 1, 2009 - The WHRC pantropical mapping project conducted provided an addendum workshop to the Forum on Readiness for REDD that was being conducted in Concepcion, Bolivia. This workshop was facilitated by COICA (Coordinator of Indigenous Organizations of the Amazon Basin) with over 25 participants from indigenous groups around Bolivia. Technical training was conducted by WHRC scientists and focused on the basic aspects of remote sensing and integration of remote-sensing and forest surveys to develop estimates of above-ground biomass. On the second-day, participants were trained in standardized forest inventory field measurements to provide a basis for estimating forest biomass.

November 9-12, 2009 Workshop at CatTien Nation Park Vietnam
The WHRC Pan-Tropical Mapping Program organized a technical workshop with over 32 participants from seven countries (Vietnam, Thailand, Indonesia, Papua New Guinea, Lao, Cambodia, Malaysia). Technical training was conducted by WHRC scientists and focused on the basic aspects of remote sensing and integration of remote-sensing and forest surveys to develop estimates of above-ground biomass. During the last day, participants were trained in standardized forest inventory field measurements to provide a basis for estimating forest biomass.

Support Provided for the organisation of local communities and/or local project management institutions

(Types of institutions created, structure and modus operandi, legal status, contractual arrangement and benefits sharing agreement / Types d'institutions créées structure et modes opérationnels, staut legal, accord contractules et accord sur le partage des benefices)

None yet.

Potential support in training/capacity building activities organized by others

To be determined.

6) General Details (For REDD Pilot Projects Only /Pour projets pilotes REDD seulement)

Pays	
Surface	ha
Type de certification (MDP, VCS, ...)	
tURCE/VER générées	
Date de début du projet	
Méthodologie utilisée	
Période de comptabilisation	
Coûts d'investissement (hors composante carbone)	Si disponible
% fonds propre	Si disponible
% dette	Si disponible
Revenus carbone	Si disponible
Delta TIR	Si disponible
Promoteur	Si disponible
Financeur	Si disponible

7) Publications

List of publications or reports available in or relevant for the project – please send a digital copy of the public documents for publication on the OFAC web site
Liste des publications ou rapports disponibles dans le projet – envoyez une copie digitale des documents publics pour mise à disposition sur le site de OFAC)

Websites :

Pan-Tropical Mapping of Forest Cover and Above-Ground Carbon Stock
http://www.whrc.org/pantropical/

A first estimation of above ground woody biomass in Africa using satellite imagery and forest inventories
http://www.whrc.org/Africa/carbonmap2000.htm

The Woods Hole Research Center
http://www.whrc.org

Papers :

Goetz, S.J., A. Baccini, N.T. Laporte, T. Johns, W. Walker, J. Kellndorfer, R.A. Houghton, and M. Sun. 2009. Mapping and monitoring carbon stocks with satellite observations: a comparison of methods. *Carbon Balance and Management* 4:2 doi:10.1186/1750-0680-4-2. Online journal: www.cbmjournal.com/content/4/1/2

Johns, T., Merry, F., Nepstad, D., Laporte, N., & Goetz, S. (2008). "Coupling political and economic options to address the range of developing country circumstances on REDD". *International Forestry Review, 10*, 458-464

Baccini, A., N. Laporte, S.J. Goetz, M. Sun, and H. Dong. 2008. A first map of tropical Africa's above-ground biomass derived from satellite imagery. *Environmental Research Letters* (3)045011 doi: 10.1088/1748- 9326/3/4/045011 Online journal: http://stacks.iop.org/ERL/3/045011

Reports:

Laporte**,** N., F. Merry, A. Baccini, S. Goetz, R. Houghton, J. Stabach, and M. Bowman. 2008. Réduire les emissions de CO 2 liée au déboisement et de la dégradation dans la République Démocratique du Congo: Une étude exploratoire (Reducing CO 2 Emissions from Deforestation and Degradation in the Democratic Republic of Congo: A First Look). Remise a jour du document anglais préparé pour le treizième session de la Conférence des Parties (COP 13) de la Convention-cadre des Nations Unies sur les changements climatiques (CCNUCC). Falmouth, MA: Woods Hole Research Center.

8) Free comments / Commentaires libres

(including what you expect from this survey / incluant ce que vous attendez de cette enquête)