Capacity building

In the first project phase, the current interest and usage of GIS, EO in the project area have been reviewed. The results from the user survey confirmed the enormous potential of EO and GIS technologies. However, these results demonstrated that most of the participants have low GIS and statistics skills, and no EO skills. It is evident that local capacity building is required, which is an integral part of REDDiness.

Based on the user requirements analysis and EO research activities, a specific plan for training and capacity building has been developed. This plan ensured the uptake of REDDiness developments, mainly through the participation of local agents to field missions (use of gps, data integration into a GIS, field evidence of forest degradation...). Moreover, two training sessions of one week in GIS and remote sensing will focus on the basic principles of image processing (acquisition, correction and classification of images) and the practical use of software (open source or commercial according to national requirements).

Consortium

The consortium consists out of a highly qualified team. It is composed out of academic institutions, SME's, NGO's and governmental organizations. This way it combines specific expertise in remote sensing with expertise of specialists in forests management in African countries. Additionally an advisory board will provide concrete advice to the consortium.

EUROSENSE

IRD Institut de recherche pour le développement

UNIVERSITY OF TWENTE. ITC FACULTY OF GEO-INFORMATION SCIENCE AND EARTH OBSERVATION

CNIAF Centre National d'Inventaire et d'Aménagement des Ressources Forestières et Fauniques

EAUX ET FORETS

OSFAC

In addition, the consortium receives advices from an advisory board expert in forestry.

UCL Université catholique de Louvain

WORLD RESOURCES INSTITUTE

EUROPEAN COMMISSION DIRECTORATE-GENERAL Joint Research Centre

More information

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REDDiness is an FP7 project, and is partially funded by the European commision. The project reflects only the author's views and the Community is not liable for any use that may be made of the information contained herein.

REDDiness

Soutien aux pays d'Afrique centrale dans le suivi de la déforestation et dégradation des

Contexte et objectifs

REDD+ vise à réduire les pertes de carbone liées au secteur forestier à travers cinq activités: la réduction de la déforestation, la réduction de la dégradation des forêts, l'amélioration des forêts, la gestion durable et la conservation des forêts. L'obtention de compensations dues à la REDD+ suppose le développement d'un système robuste, fiable et transparent de surveillance des forêts. La Mesure, Notification et Vérification (MNV) en temps opportun des changements dans l'état des forêts et dans les stocks ou les émissions de carbone fait appel aux techniques de télédétection.

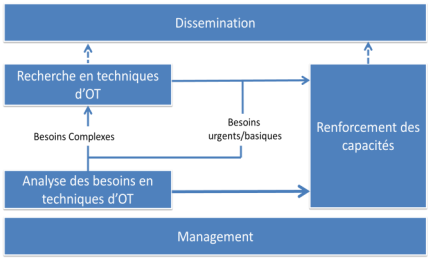

Figure 1: REDDiness workflow

Le projet REDDiness, financé par la Commission européenne, a pour but de soutenir les centres de suivi des forêts au **Gabon** et en **République du Congo** dans leur effort pour implémenter le système MNV. Ce soutien a démarré par une profonde analyse des besoins des utilisateurs en termes de suivi des forêts par télédétection. Sur base des résultats de l'analyse, les activités de recherche en télédétection et de renforcement des capacités ont été définies. Le consortium de REDDiness a décidé de se focaliser sur les méthodes de **suivi de la dégradation des forêts**.

Analyse des besoins des utilisateurs

Une enquête quantitative a été effectuée en République du Congo et au Gabon pour mesurer le niveau de connaissance du contexte REDD+ et des compétences techniques en termes de suivi des forêts. Sur les 44 questionnaires distribués dans les deux pays, 26 questionnaires (59%) ont été complétés et récoltés. En dépit d'un grand intérêt pour la REDD+ et de formations pour la mise en œuvre du système MNV, seuls 8 utilisateurs possèdent un niveau minimum pour apprendre ces techniques.

Les résultats de cette enquête ont montré que les compétences et les ressources techniques du personnel à travailler avec les SIG et les technques d'OT sont très limitées dans les deux pays. Comme le montre la figure 2 ci-contre, les résultats de l'enquête ont permis d'orienter le choix de REDDiness concernant l'activité REDD+ à développer, à savoir le suivi de la dégradation des forêts.

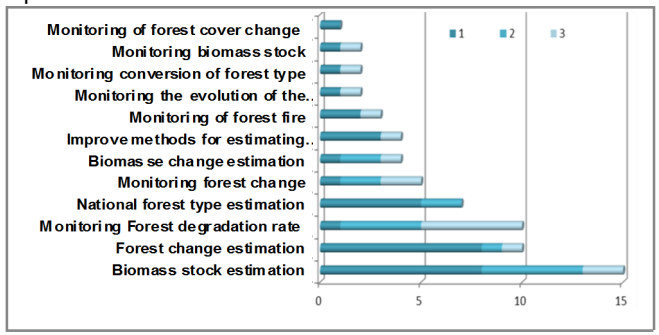

Figure 2 : Résultats des réponses à la question : « Quels sont les 3 techniques prioritaires à développer dans le cadre de votre stratégie nationale REDD+ et le suivi des forêts en particulier? »

EO monitoring : research and development

Introduction

The project specifically aims to improve methods for detecting forest degradation using various remote sensing data. To overcome the problems of the utility and availability of optical data due to persistent cloud cover in the Congo basin, the potential of active sensor were studied. Two types of satellite data were used to assess their potential for monitoring and detecting small forest degradation features (canopy gaps, narrow logging roads) : high and very high resolution of optical and radar data.

Study sites and data

REDDiness focuses its research activities on two study sites, one in the South of Congo (Youbi) and one in Gabon (Koulamoutou) (Figure 3). Four criteria were determinant for their selection :

* presence of human settlements,
* national road,
* forest concession,
* availibility good quality images.

Three types of data were acquired :

* optical : Landsat, QuickBird and WorldView;
* radar : ENVISAT ASAR, PALSAR, RADARSAT, TerraSAR-X.
* field data: georeferenced pictures.

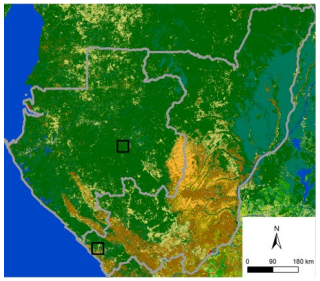

Figure 3: Location of study sites in Gabon and Congo.

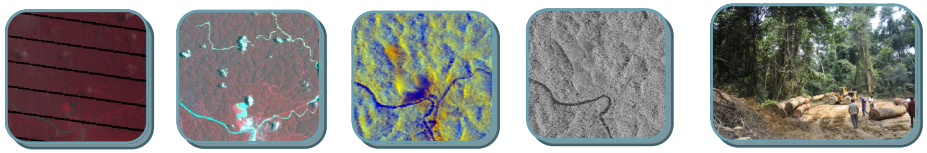

Figure 4 : Illustration of data acquired and used in Gabon. From left to right: Landsat, QuickBird, PALSAR, TerraSAR-X and a picture taken on the field.

Optical : *NDFI* analysis

The Normalized Difference Fraction Index (NDFI) is a method of spectral mixture analysis successfully applied in the Brazilian Amazon to identify and distinguish forest degradation caused by selective logging and forest fires associated with other natural disturbances. The potential of this technique was tested in both study countries.

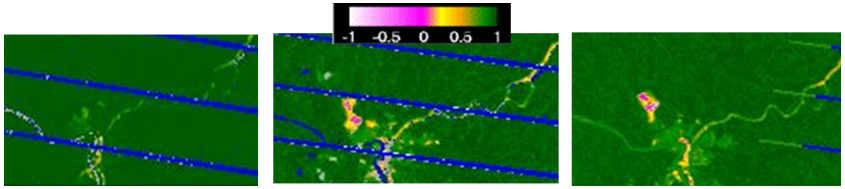

Figure 5 : Illustration of NDFI results for 2009, 2010 and 2011 for the study site of Gabon.

Optical : Degradation and forest changes detection

Based on very high resolution data, the object-based classification and multi-date segmentation techniques were tested to provide a system for monitoring small forest degradation features (< 1ha) and evaluating the rate of forest degradation. The figures 6c and 6d below show the two levels of segmentation created respectively for 2010 and 2012 to detect forest degradation. Level 1 objects (large objects) aggregate small degradation features information to highlight five level of forest degradation whereas smaller level 2 objects show the extent and the exact location of these small features. Figure 6e illustrates the level of forest degradation for each large object between 2010 and 2012.

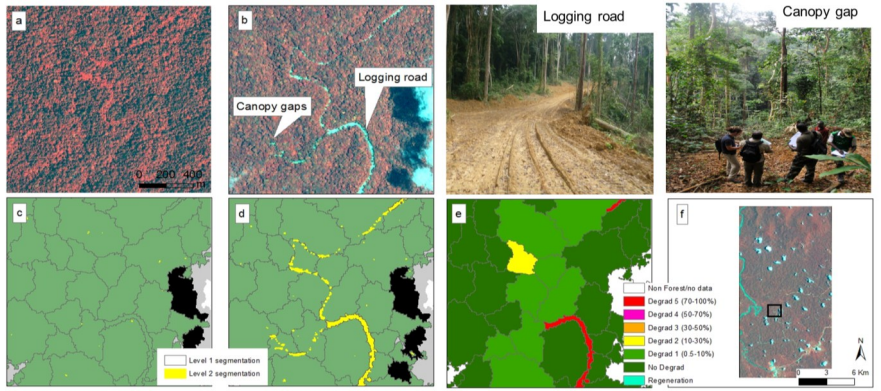

Figure 6: Input data used to create the forest degradation map between 2010 and 2012 where: a) is the Quickbird imagery from 2010, b) the Quickbird imagery from 2012, c) shows the two levels of segmentation resulting from Quickbird 2010, d) the two levels of segmentation resulting from Quickbird 2012, e) the degradation map showing the percentage difference of small patches of bare soil per level 1 object between 2010 and 2012, f) shows the image subset extent.

Radar : Mono– and multi-temporal visual analysis

The main objective of this analysis is to assess the potential and limitations of radar data in detecting forest degradation. The first, tedious, step was the preprocessing of all images acquired. The principal component analysis is a visual comparison of radar images with evidence of degradation based on very high resolution images and field data. An example of such a comparison is shown in figure 7 below.

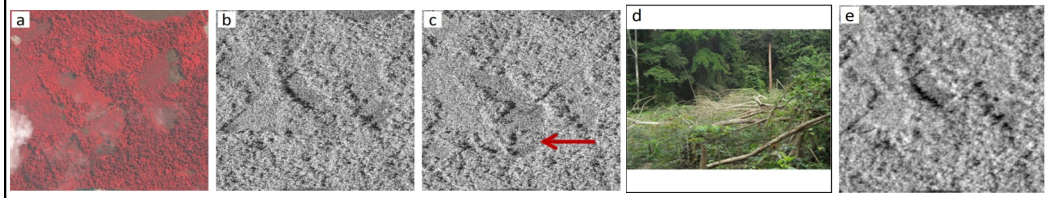

Figure 7: Expansion of cassava fields in a secondary forest through shifting cultivation practices. a) QuickBird - July 2012, b) TerraSAR StripMap - June 2010, c) TerraSAR StripMap - May 2012, d) photo taken during fieldwork showing recent clearings - August 2012, e) RADARSAT-2 scene at 34.8° incidence angle - March 2010, f) same geometry RADARSAT-2 image - March 2012, g) overview image with black box indicating location of subsets. The red arrow in the 2012 SAR images indicates new fields that were still forest in 2010.