High and Very high Resolution EO data in African Forest Monitoring

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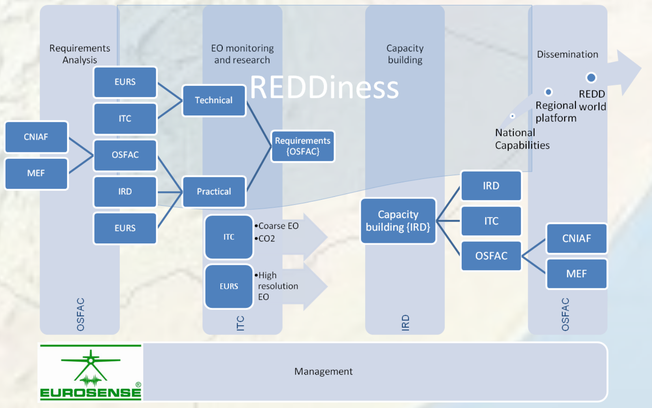
Preserving African forest contributes to global climate change challenge.
Earth Observation (EO) techniques are essential tools in forest changes monitoring for REDD (Reducing Emissions from Deforestation and forest Degradation).
REDDiness and G-Mosaic are 2 GMES (Global Monitoring of Environment and Security) projects.

REDDiness

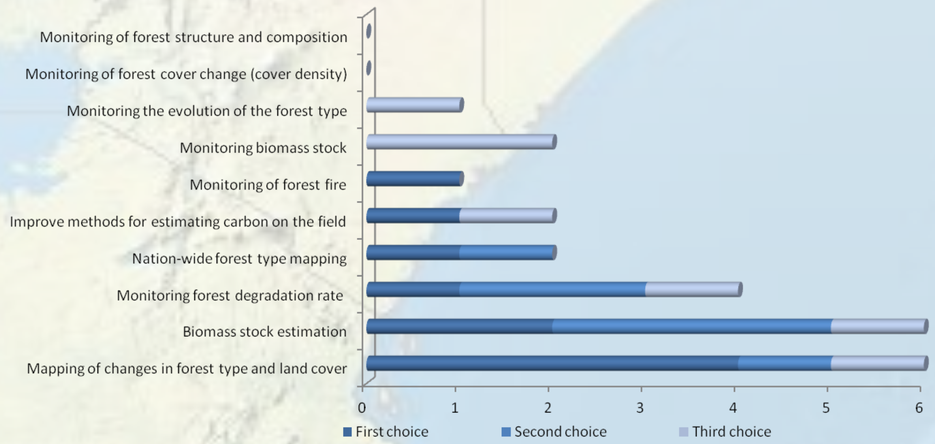
REDDiness is a Specific International Cooperation Action (SICA) to reinforce collaboration between Africa and Europe. Lead by Eurosense, it aims to develop and share up-to-date EO techniques for measuring, reporting and verifying (MRV) systems for REDD. To complement existing expertise and projects in the Congo Basin, REDDiness focuses on "EO-based assessment of forest degradation in the cloudy regions of **Gabon** and the **Republic of Congo**".



Workflow of REDDiness : from Congolese and Gabonese user requirements to REDD world

REDD Requirements analysis

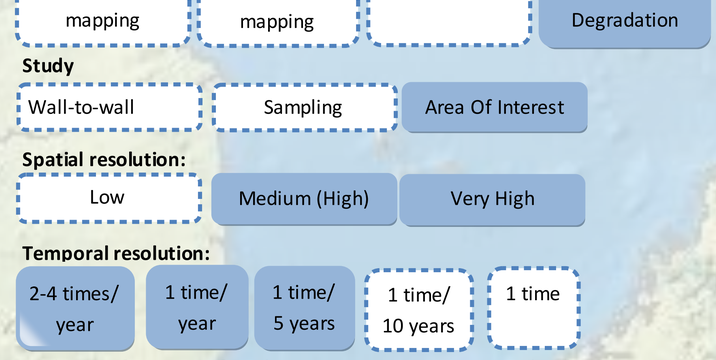
A quantitative survey was carried out in Republic of Congo and Gabon to measure needs, interest and awareness regarding EO-based products for REDD.
Eight survey participants among 26 were identified as most relevant for the in-depth quantitative analysis based on their technical understanding defined by two criteria:
(i) knowledge of EO techniques,
(ii) completeness and coherence of responses.
Survey results identify the expected EO techniques for REDD (see figure aside) and show that skills and technical resources regarding the use of EO software and data are very limited. The low level of knowledge about REDD and MRV implementation confirms the need for capacity building on REDD/REDD+ and forest monitoring in the countries involved.



"What are the 3 most important EO techniques in your national REDD strategy?"

EO monitoring solutions

The focus on "forest degradation" for REDDiness is the outcome of a detailed decision process in the consortium. The figure summarizes the relevant choices to be made by REDD projects (or countries) when deciding on starting up an earth observation strategy. The agreed aim of REDDiness is to evaluate the effectiveness of different types of satellite imagery in detecting and monitoring of forest degradation. Such an evaluation is urgently needed given:
1) the importance of forest degradation in REDD
2) the difficulty to assess forest degradation due to spatial size and pattern
3) the limited time frame in which to detect degradation (quick regeneration)
4) the frequent cloud cover in both countries limiting optical image acquisition.



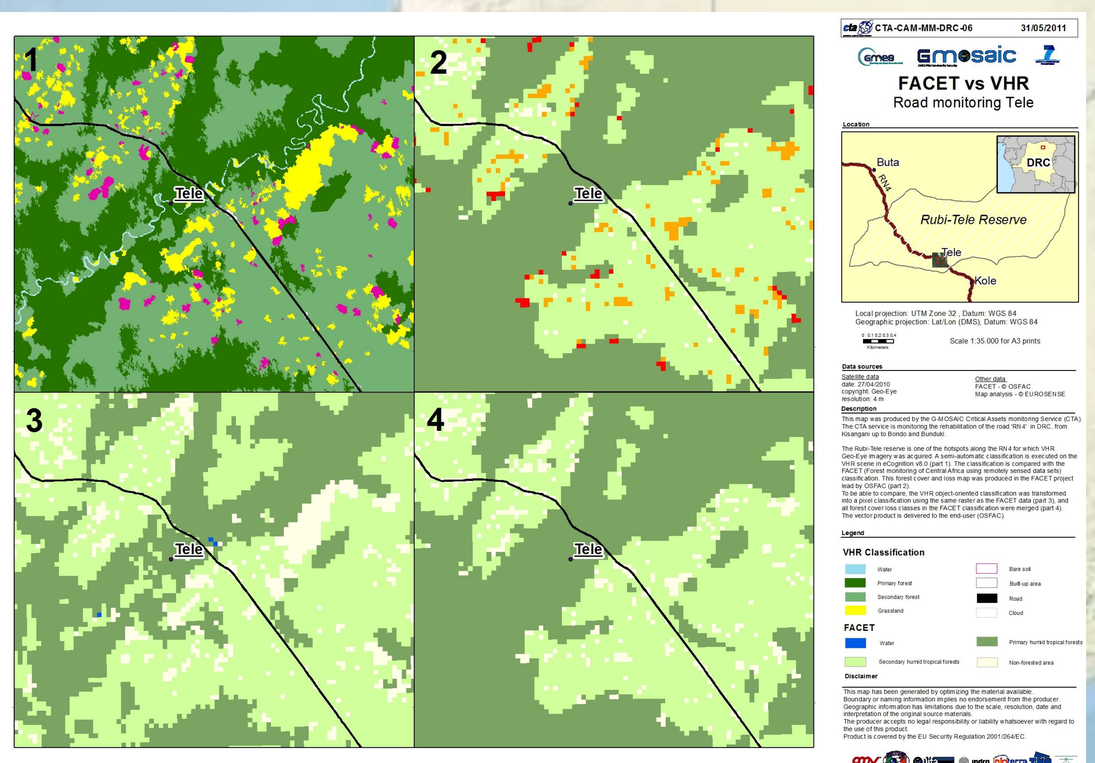
Selection of REDDiness focus by surveying 4 main questions within the consortium

G-Mosaic

G-Mosaic (**G**MES services for **M**anagement of **O**perations, **S**ituation **A**wareness and **I**ntelligence for regional **C**rises) develops EO derived information services for security related activities. In this project, Eurosense demonstrates the use of EO data in monitoring the impacts of the rehabilitation of a road in **Republic Democratic of Congo** (RDC) in terms of changes in the forest cover.

Data & Methods

Forest changes are derived from Very High Resolution images (Ikonos/Geoye and Quickbird, less than 1 m). Object-based classification methods are better suited to deal with the rich information content of VHR imagery but also to propose accurate estimation of deforestation. On the figure aside, **Eurosense G-Mosaic VHR classification** of 2010 (**1**) is compared to the **FACET** (Forest monitoring of Central Africa using remotely sensed data sets) classification (2010) produced by OSFAC (**2**). To quantitatively and visually compare these maps, the VHR object-oriented classification was degraded to the resolution of FACET (**3**), and all forest cover loss classes in the FACET classification were merged (**4**).



Comparison of "Eurosense G-Mosaic VHR" and "FACET HR" classifications in Rubi-Tele reserve, RDC

Results and validation

"Primary forest" occupies 76,81 % of the HR classification while VHR map distinguishes the very dense from the secondary forest. The VHR identify also more deforested areas (5km²) than in the FACET (2.7km²). An accuracy assessment has been carried out by an independent experienced image interpreter on a stratified random sampling point dataset using the same VHR imagery as background. These visual interpretation results have been compared with the semi-automatic classification in an error confusion matrix. The overall accuracy is 84,7% for the class *Dense forest* and 83,3% for the *Degraded forest.*

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