

1. .FOR Presentation

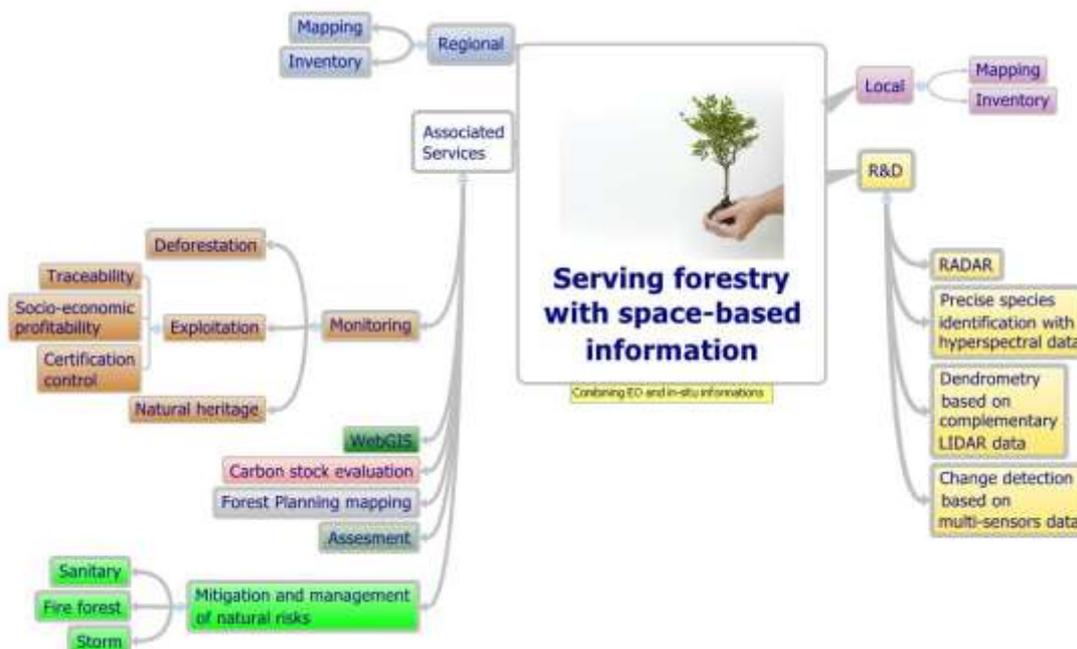
.FOR is an association of Belgian companies, created in 2010 and supported by a university laboratory. They decided to consolidate their skills and their expertise in mapping and forest inventory to provide a full range of services with high added value in the field of forestry. Based on many international references and the know-how of an internationally renowned research laboratory, the .FOR team federates the specialized expertise, operational in remote-sensing, cartography and forestry of 4 partners :



The advantages of this network of experts are:

- Complementarity of partners
- Flexibility
- Control of advanced technologies
- Constantly improving R&D
- Extensive experiences

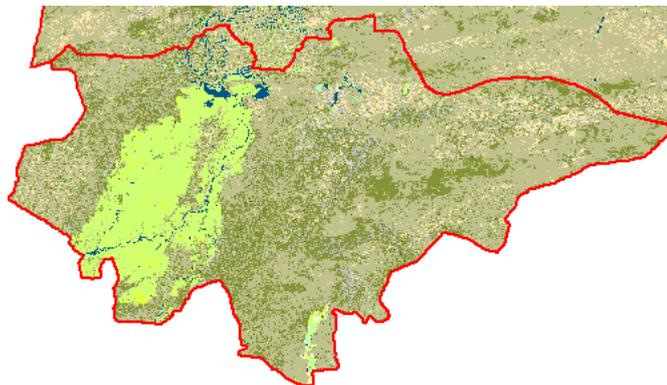
.FOR proposes cartography and forest inventory as well as a numerous related services. They are the result of an alloy between efficiency associated to remote sensing and quality of field expertise.



2. Regional Forest Inventory (RFI)

a. Cartography

The regional forest mapping identifies automatically the different forest types by spectral analysis of satellite imagery/aerial and characterizes them based on the composition of forest essences, density and age. The level of map scale is determined by the type of imagery/aerial used and the level of preciseness as well as the expanse of the area to be drawn up.



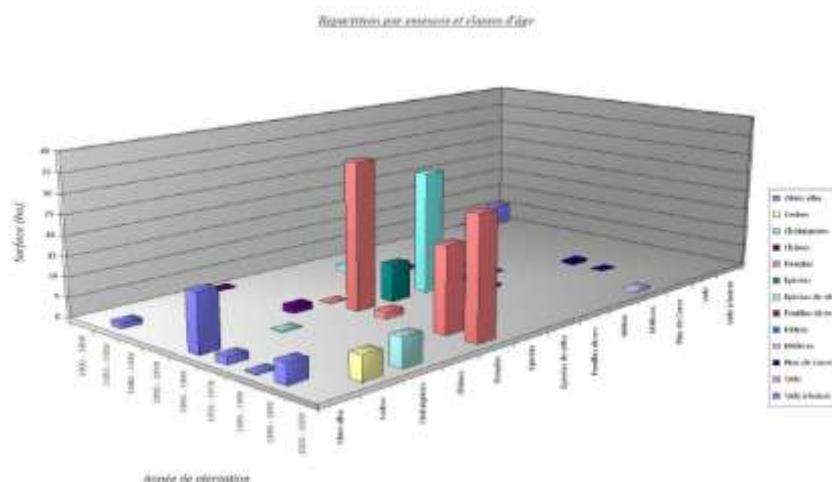
In addition to the classification of the forest plots, different map data references can be associated to the forest map. These data include among others the road network, water network, topography and / or other map information.

Therefore, with these additional data and location-based knowledge of the forest heritage, the manager has a set of essential components for an efficient and integrated management of forest resources.

b. Inventory

The regional forest inventory provides an overall assessment of the amount of forest resources:

- Number of wood
- Tree density
- Basal area
- Average volume
- etc.



as well as an information on its geographical distribution. It is based on territorial poll

for the calibration of the mapping. Data on the composition of forest massifs are integrated in the available database as queries in the Geographic information System (GIS).

The quality of information produced by remote sensing is enabled directly in the field (ground truth).

3. Local Forest Inventory (LFI)

a. Cartography

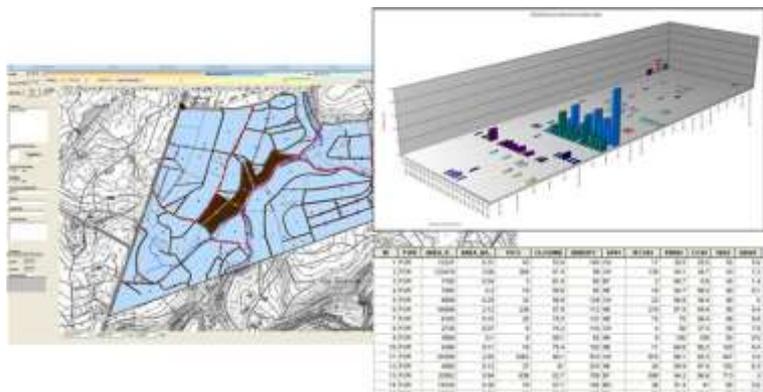
Using high resolution satellite images (similar to aerial images) makes it now possible to carry out local forest inventories on the scale of the individual. In fact, satellite data have extremely advanced in recent years both in terms of spatial resolution (<1m) as in terms of



spectral resolution (more channels in the visible, infrared, hyper spectral and radar).In addition, their costs, availability and acquisition facilities make a high quality solution possible to ensure environmental monitoring and forestry in particular. Therefore, identifying, counting and localization of trees are processes that become affordable.

b. Inventory

The forest inventory provides an accurate assessment of the amount of forest resources (number of wood, tree density, basal area, total volume ...). It is based on the counting of trees derived from the spectral interpretation of satellite images / aerial associated with accurate ground measurements for calibration. Data on the composition of standings are included in a database available for consultation as queries integrated in a Geographic Information System (GIS). This inventory can be completed by additional field surveys, targeted for specific needs that require more precision or characteristics that are not visible by remote sensing.



By combining intelligent and efficient remote sensing and field measurements, .FOR offers the forest wealth managers rich and precise geo tagged information even on large areas. The services provided by .FOR aim to increase economic and environmental profitability of forest patrimony.

4. Associated services

. FOR offers its expertise and know-how in the context of related operational services based on inventories. These services are described briefly below. We invite you to contact us for more information about our methodologies, their advantages and limitations.

a. Management Plan

The total geo-referenced inventory on the study area establishes specific qualifying and quantitative management plans to meet the most demanding criteria. It provides uniform information over large areas and allows the integration of multiple factors by crossing map layers and applications to achieve reliable statistical studies needed to establish management plans.



b. Carbon stocks

The estimation of carbon stocks is carried out based on the composition of forest standings and their geographical distribution. The total amount of carbon in the area of interest is assessed on the amount of carbon fixed per unit volume in each species or standing type. The accuracy of the estimate can be adjusted to the level of inventory carried out in advance and quantitative study of carbon fixation per unit produced. The purpose of . FOR is to provide location-based information to position favorably the manager for the preservation of carbon stocks. The interests are environmental (vital) and economic.



c. Expertise

The qualifying and quantitative forest inventory meets the demands of forestry expertise in large or small scale. It can be configured to include different criteria of land or forest expertise. It provides location-based assessment which, crossed with the cadastral layers, defines exactly the value of heritage by cadastral parcel. .FOR proposes an objective and quantifiable expertise, essentially for property insurance, for the available financial guarantee and within the context of inheritance tax.

Thanks to the geo-location information of trees by species, one can estimate the operating profitability of certain species based on their accessibility and their exploitable potential volume. This service is based on the skidding distances, slopes, means of communication, accessibility, water network, operating costs and value on potential foot of each tree. .For wishes, through this service,

to provide decision-makers and developers with relevant cross information that is necessary for the actual calculation of the profitability of a parcel on economic and socio-environmental base.

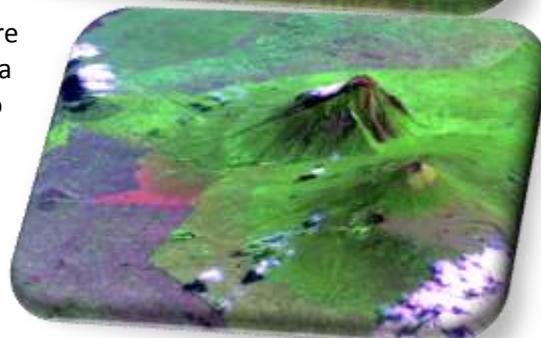
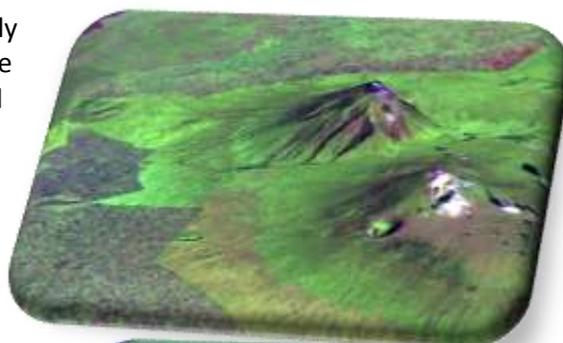
d. Follow-up

Multi-temporal inventory of forest patrimony ensures monitoring and control of the forest exploitations using geographical information of exploitations. This evaluation will allow a continuous adaptation of forest management taking into account the latest events recorded and observed through the use of satellite imagery / aerial. As the forest changes, it is important to integrate the time dimension and the change detection in the management and the monitoring.

Deforestation

The inventory of forests analyzed periodically provides georeferenced statistics used to evaluate the extent of the problems of deforestation. The deforested or reforested areas are located and quantified with satellite imagery / aerial as evidence. This accurate inventory tool is homogeneous over very large areas and can standardize the method for monitoring deforestation and respond quickly to limit the consequences.

As the satellite offer has become more and more rich and abundant, it is now possible to quickly cover a geographic area with a resolution of images suitable to monitor the evolution of natural resources. The assessment of potential cringe or growth of a forest area is therefore analyzed in relation to a reference time. The purpose of .For is to provide supervision and alerts addressed to illegal deforestation in order to preserve rights and protect natural areas that are under pressure.



District Mikeno (Virunga) Landsat on January 2003 and SPOT on June 7th 2004 and July 3th, 2004

Photos aériennes :
© WWF

Traceability of forest exploitations

Mapping provides an inventory snapshot at a particular time. The realization of successive inventories informs accurately the evolution of forest exploitations and wood stocks based on successive inventories. This service evaluates the difference between the quantities of exported wood (used in the timber industry) and the quantities of timber reaching the consumer, taking into account the transformation returns. This service checks that the delivered stock comes exclusively from the forest under concession. This service provides a sufficient or complementary global traceability to other techniques especially when the technical or budgetary means do not allow for traceability of each log.

Control of certifications

To meet the requirements of Forest Certification (PEFC and FSC), forest mapping tool provides a reliable inventory to check the correct application of certification criteria. Regular control can be applied to verify the status of forest exploitations, deforestation and reforestation and to locate in a quantifying way the volumes of certified wood. At the same time the tool is used to plot the volumes of certified timber and validate their certification throughout the timber industry. The purpose of . For is to simplify and make more effective control certifications through the provision of combined information from remote sensing and terrain.

e. Prevention and management of natural hazards

Health risks

Services related to cartography inventory find all their senses in the prevention and the follow-up of health risks. Knowledge and location of the species permit to manage accurately and efficiently the health risks identified in the field. The availability of new satellites with wider spectral ranges, especially the infrared, increases the possibilities of monitoring the health of the vegetation. The research for declining trees or extent of a health problem are mappable.

Fire and bush fires

Remote sensing offers an unequalled vision for monitoring and detection of forest and bush fires. The information used permits to monitor large areas in near real time. The collected information feeds decision-makers and men of action in order to act efficiently and to protect the environment, property and of course the people.



Storm damage (blowdown)

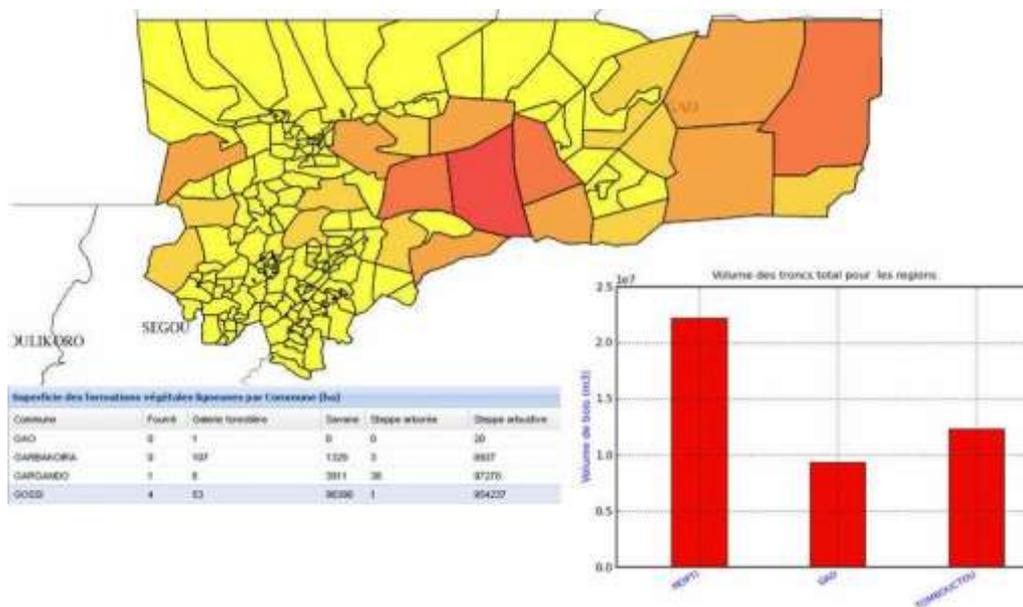
Mapping of storm damage is an indispensable tool for a reliable and accurate estimation of the quantity of damaged forest. Based on a geo-located inventory, the delimitation of areas affected by the storm is done quickly from the acquisition of a new satellite image. Quantification and location of damage is a priority after a disaster. The cartography is also very useful to set priorities and guide the teams.

f. WebGIS

In addition to the services, . FOR proposes also the management of collected information in a dedicated computer system.

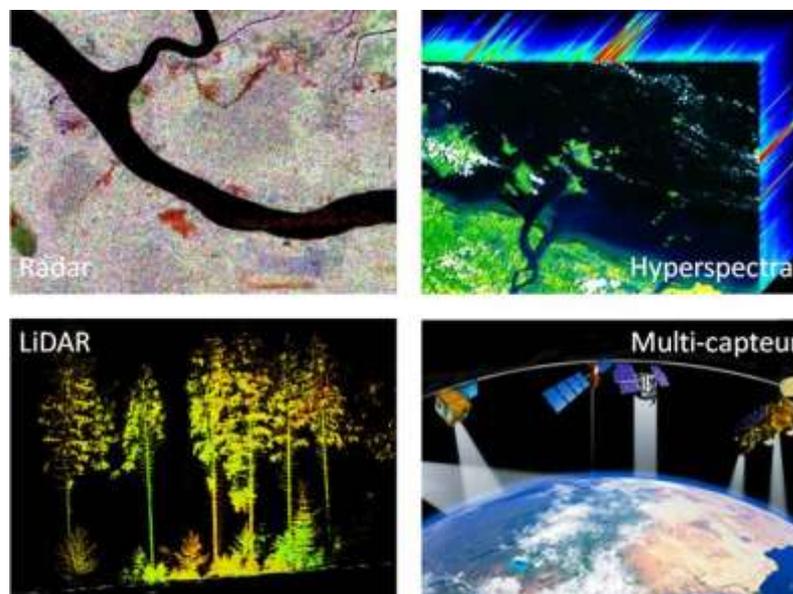
All data collected by the forest inventory is integrated into all Forest Information System. . FOR offers the opportunity to present the results through a WebGIS application for distribution via the Internet. This web application offers many advantages: accessibility, sharing of information, security access, ability to differentiate users ... In addition, this tool offers the possibility of multiple analysis by integrating map layers such as water system, roads, the distribution of population density, wildlife, flora and thus to provide reliable statistics on a large scale to understand better the socio-economic problems of forests.

Moreover the WebGIS application accepts the addition of other types of geographic information and connects easily to databases. The visual interface and interaction menu with the available information layers is user friendly and handling is very intuitive. The attributes of geographic data can be modified by this tool in the office or from the field with a mobile system.



5. Research and development

Always at the forefront of technical forest inventory by remote sensing, the team of experts investigates various issues of R&D. The results of this research are directly integrated in the chain of data processing in order to constantly improve the performance and quality of the results of forest inventory and mapping.



a. Remote sensing for tropical forests - RADAR

Cloud cover may be an obstacle to the acquisition of optical remote sensing data, especially in the humid tropical region. RADAR technology is an interesting alternative for the mapping of these forests. Thanks to recent technological advances, these images offer new opportunities for forest mapping in the tropics.

b. Recognition of forest types - Hyper spectral

The improvement of the recognition of forest species goes through the use of new spectral bands. Hyper spectral sensors record information in dozens of spectral bands, increasing the distinction of different forest types.

c. Dendrometry - LiDAR

The evaluation of the forest resources requires more reliable dendrometric estimations. The supply of the airborne laser (LiDAR) contributes to a detailed description of the forest in three dimensions. The analysis of this new information is crucial for forest inventory accuracy.

d. Change detection – Multi-sensors

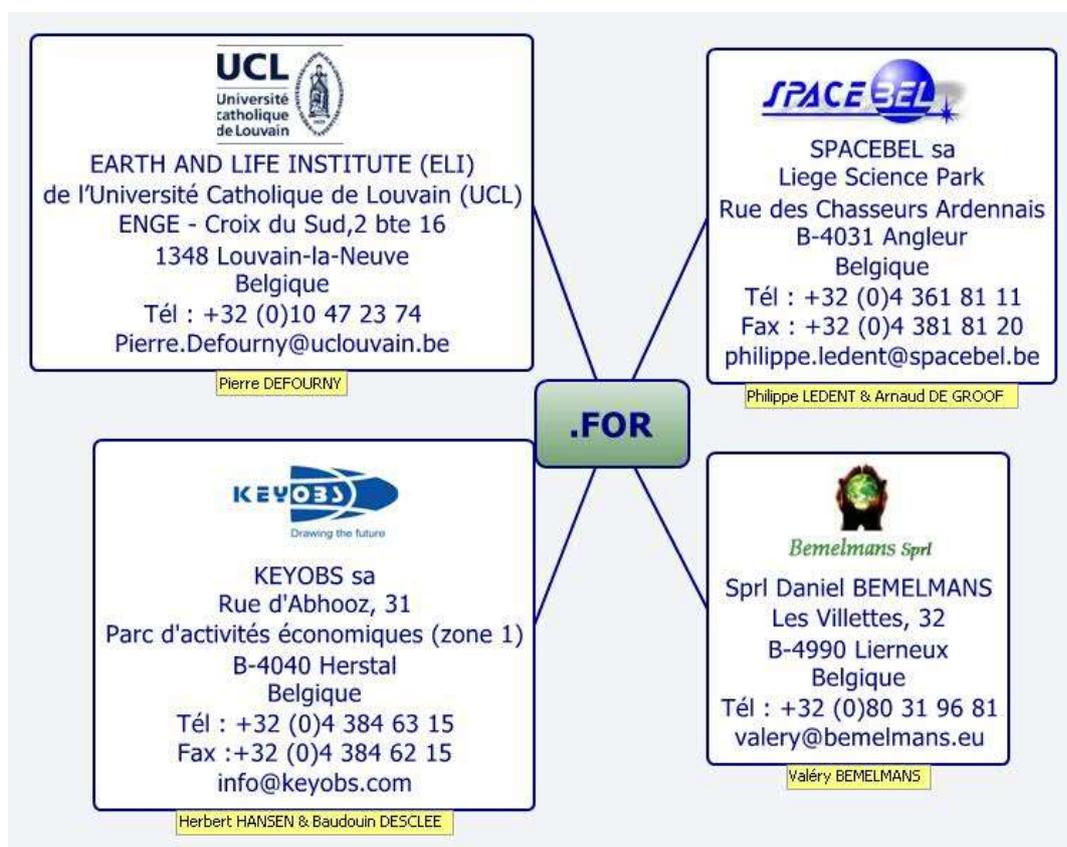
The forest monitoring by change detection techniques requires regular information. The multi-sensors approach allows juggling with the various information collected by earth observation satellites and thus assuring a multi-temporal follow-up independent of a specific type of satellite image.

6. References

.FOR consists of teams that are active for over 20 years in the forest field. .FOR gathers references of European forests, Africa, South America and in Southeast Asia. The projects were made for public managers, private operators and / or international organizations. These experiences have provided relevant information, they have advanced knowledge and have allowed an optimal asset development of our customers.

We put a list of references and publications of .For members, real witnesses of our « know-how » capital, at your disposal.

7. A team at your disposal



For more information, please contact : info.for@spacebel.be

---- v4-December 2010 ----