



## Case Study

### Change Detection

# TerraSAR-X based Monitoring of Forest Degradation in Ghana

## Challenge

According to the WWF, the Republic of Ghana has lost 90% of its native rain forest over the last 50 years and Ghana's remaining forests are further in decline. The Government of Ghana has therefore initiated a national strategy fighting deforestation and forest degradation and has applied for the United Nations Collaborative Programme on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries (UN-REDD) in 2010. The programme aims at creating financial value for the carbon stored in forests, thus offering incentives for developing countries to reduce emissions from forested lands and invest in low-carbon development.

Proof of emission reduction requires a specialised approach of monitoring, reporting and verification for large, inaccessible areas at pre-defined observation frequency, independent of local interests and weather conditions. Additionally, the correct interpretation of the data and the link with field surveys require training and capacity building in the country.



TerraSAR-X-based forest disturbance monitoring provides an innovative method of estimating the area of forest degradation and thus supports a sustainable and precise carbon accounting following international standards.

## Solution & Results

In 2011, Airbus Defence and Space joined forces with the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) to overcome the obstacle of forest degradation monitoring as a major driver of decline in Ghana. Based on weather-independent TerraSAR-X radar satellite data allowing for frequent observation of endangered forests, the experts of Airbus Defence and Space were able to detect subtle forest disturbances

over large areas. Newly acquired TerraSAR-X StripMap images with 3m resolution were compared with archive datasets, facilitating the detection of even small scale variations. Airbus Defence and Space implemented an Amplitude Change Detection process in order to automatically detect changes in the forest canopy used as indicator of small-scale selective logging or other disturbances. Changes detected

were validated during field trips with Ghanaian trainees and staff from the forestry commission. The project has shown the invaluable benefits and efficiency of TerraSAR-X data for reliable tropical forest monitoring - no matter how remote or difficult to access the observed area might be.

## Benefits

- Frequent and timely change detection due to weather-independent data acquisition of TerraSAR-X.
- Efficient forest disturbance monitoring for difficult-to-access areas in Ghana
- Robust detection and mapping of small-scale forest disturbances due to TerraSAR-X's unique geolocation accuracy, very high resolution and radiometric stability.
- Cost-efficient solution for REDD+ reporting, combining TerraSAR-X satellite data and in-situ field measurements in multi-stage national forest inventory concepts.
- The project supported successful and sustainable capacity building in the country.

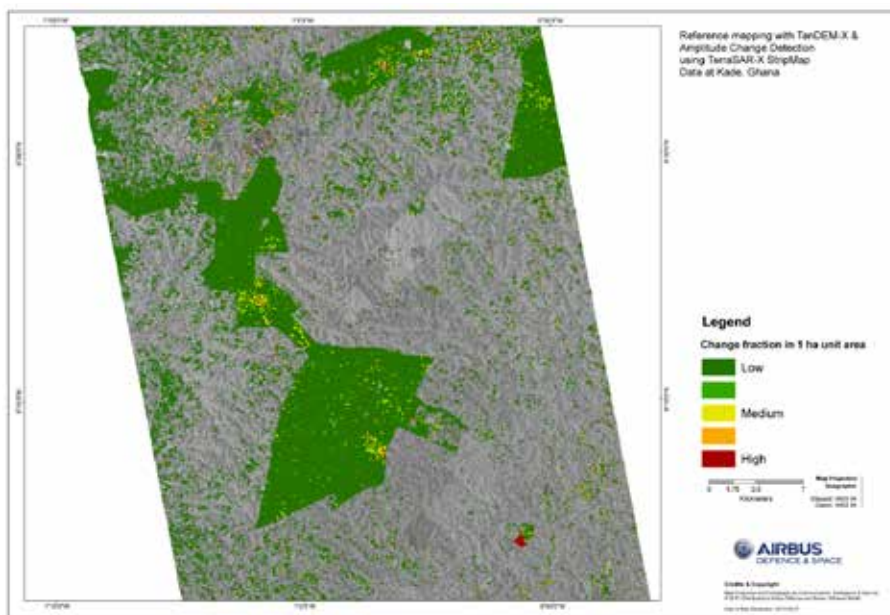
## Applicability

TerraSAR-X data facilitates the reliable monitoring of forest resources – independent of location and weather conditions. Radar technology also supports the detection of irregular activities (e.g. mining and related logging).

## Organisations involved



The services delivered by the **Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH** draw on a wealth of regional and technical expertise and tried & tested management know-how. As a federal enterprise, GIZ supports the German Government in achieving its objectives in the field of international cooperation for sustainable development.



Change fraction in 1ha grid cells showing degradation pattern (forest remains forest but loses biomass)

**Challenge** Improving national measurement, reporting and verification (MRV) capabilities to quantify deforestation and forest degradation and monitor forest resource management.

**Solution & Results** TerraSAR-X radar satellite data provides a powerful tool for reliable change detection and monitoring worldwide.

**Benefits** Improvement of national authorities' and in-country know-how in the field of reducing carbon emissions and monitoring forest areas supporting a sustainable forest.