

What is SarCarbon?

SarCarbon is an integrated, radar remote sensing based, carbon monitoring system for forests and trees. It combines different remote sensing sensors for accurate estimation of carbon stock baselines and monitoring and estimation of carbon budgets through time. Products, and carbon stocks calculations are provided at an annual basis. SarCarbon uses forest degradation output of the SarSentry Forest monitoring system.



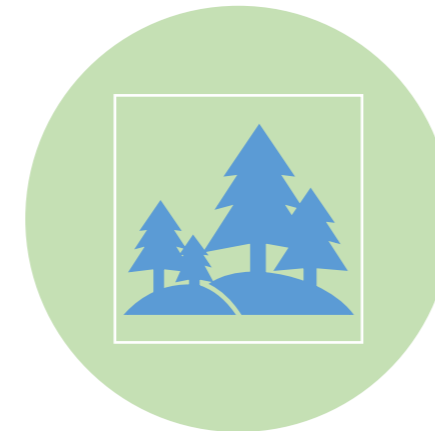
Field Biomass inventories in large forest areas are very costly and do not record spatial variability. At the moment most of the Carbon projects need expensive field campaigns to make good biomass estimates.



Rarely high levels of accuracy are proven to be achieved in the carbon baselines: Most of the biomass baselines available are at 1 Km resolution and accuracies are not higher than 80% with estimation errors much higher than the allowed 10%.



Rarely changes in the carbon fluxes, at a long term, are monitored consistently: Most of the carbon budget assessments come from analysis of changes due to deforestation, disregarding the important contribution to the emissions by degradation processes. Also the contribution to the budget by vegetation regeneration is not well accounted.



To assess the carbon contribution of individual trees in tree-scarce environments, current methods are complex and use either expensive high resolution imagery, or require very extensive field work.

A look into the present:
Carbon baseline maps, validation and certification process (15m resolution).
Vegetation type stratification approach.



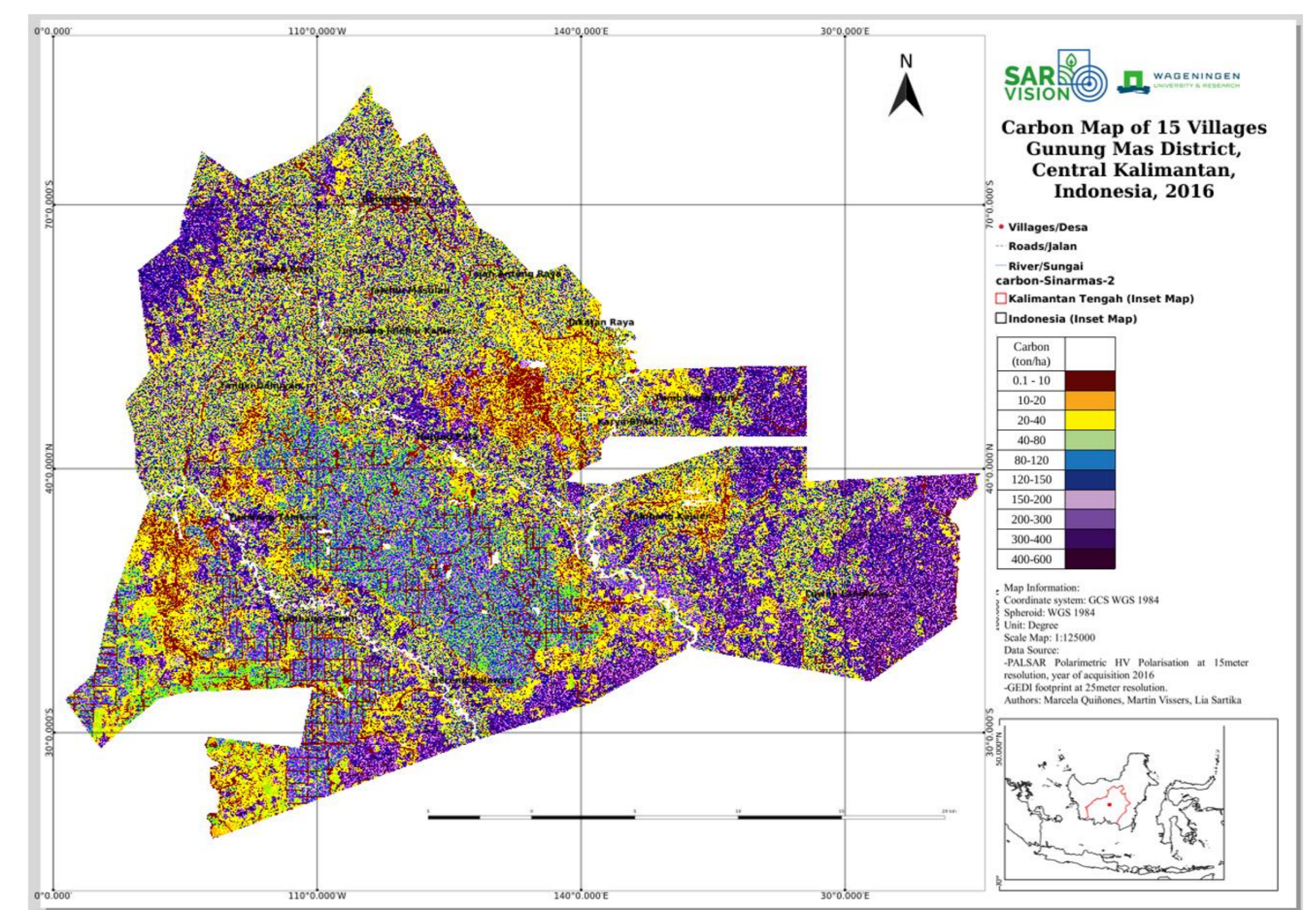
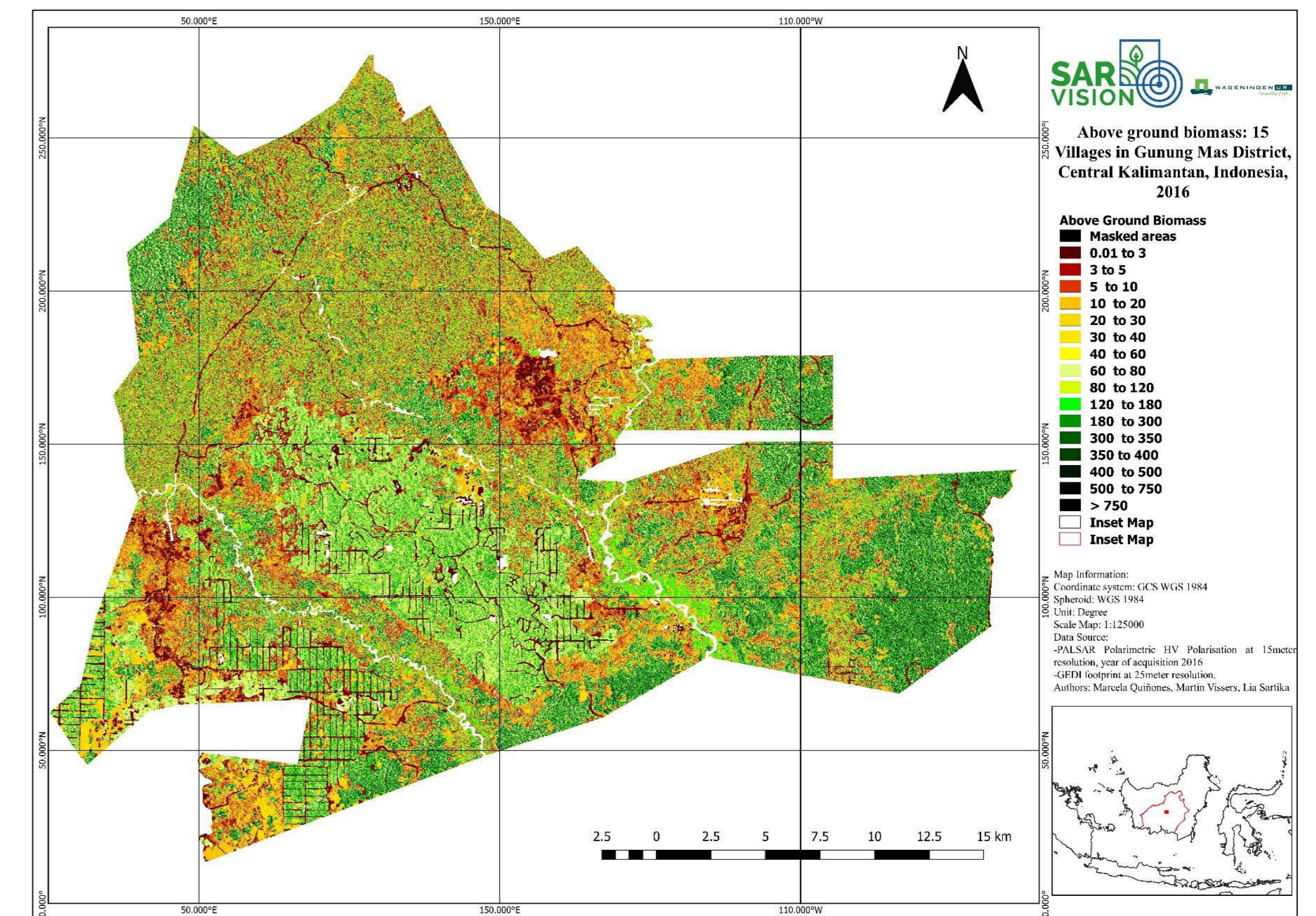
A look into the past:
Historical analysis baseline maps of land use: 20-8 years back. Historical forest degradation is derived from SarSentry forest monitoring system.

A look into the future (yearly basis updates):

- Assessment of carbon loss due to deforestation and forest degradation using radar (15m resolution).
- Assessment of carbon gain using radar (15 m resolution).
- Automated carbon budget calculations.
- Consistent updates of Carbon stocks or baselines (every 5 years)
- Validation and verification procedures for certification at a long term! 10-20 years.

For selected areas: Carbon assessment and monitoring of individual trees ($\pm 5m$) with the Tree module.

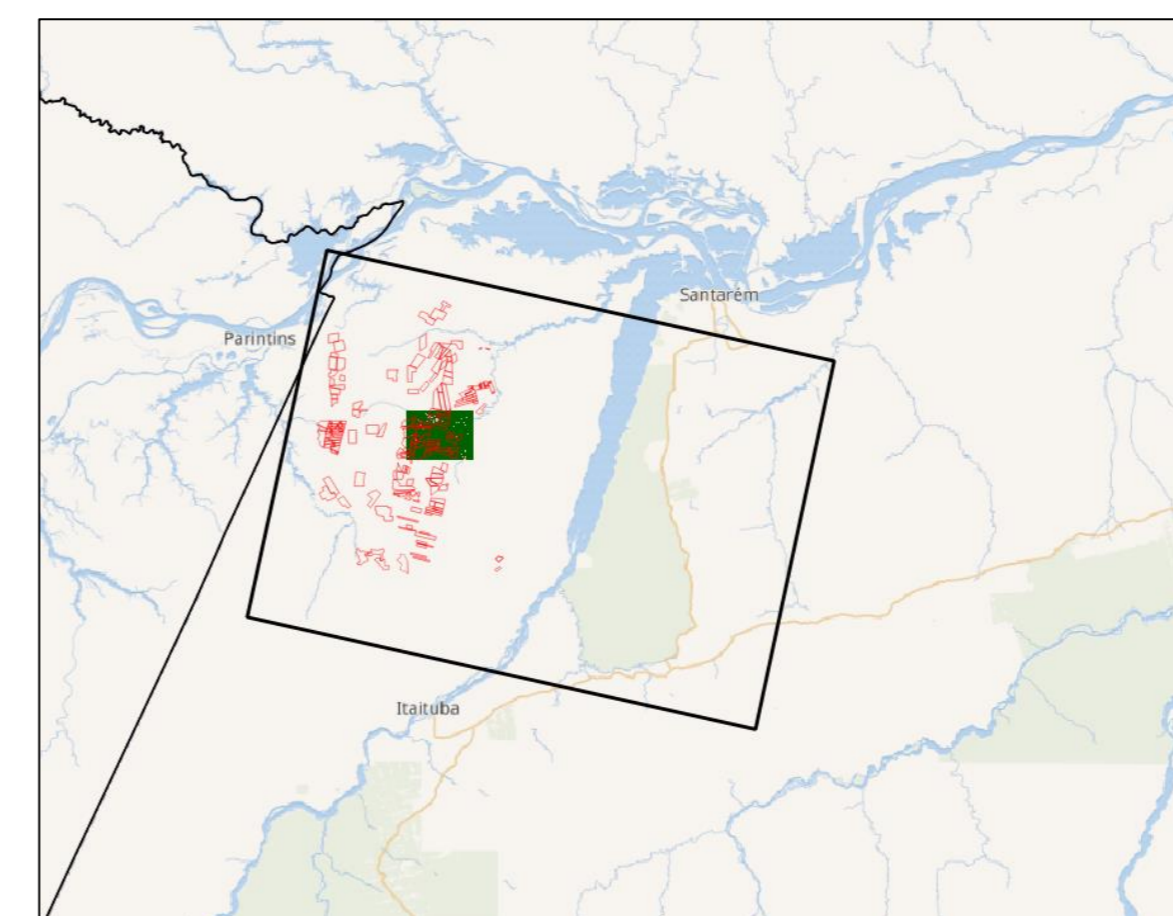
Biomass map of Gunung Mas district in Central Kalimantan



Carbon map of Gunung Mas district

Unique characteristics:

- High spatial resolution (15m)
- Include calculation emissions due to forest degradation
- Integration of different remote sensing technologies: RADAR, Optical, LiDAR, drones.
- Use of biophysical models to relate RS data and carbon estimates. Defined models help upgrading the systems to new technologies
- Relative low cost (mostly based on freely available RS data)
- Automated and robust system, with evolving technology where data from new Satellites can be easily integrated



Santarem-West forest concession area in Par , Brazil. Test site ESA SarSentry demonstration project ARTES 4.0 Business application project



SarCarbon provides the clients with measurements: spatial data maps, validation protocols and accuracy assessments.



Information is presented in specific formats according to selected standards, acceptable for verification.



SarCarbon products require a reduced amount of field information, minimizing costs and investments for clients.



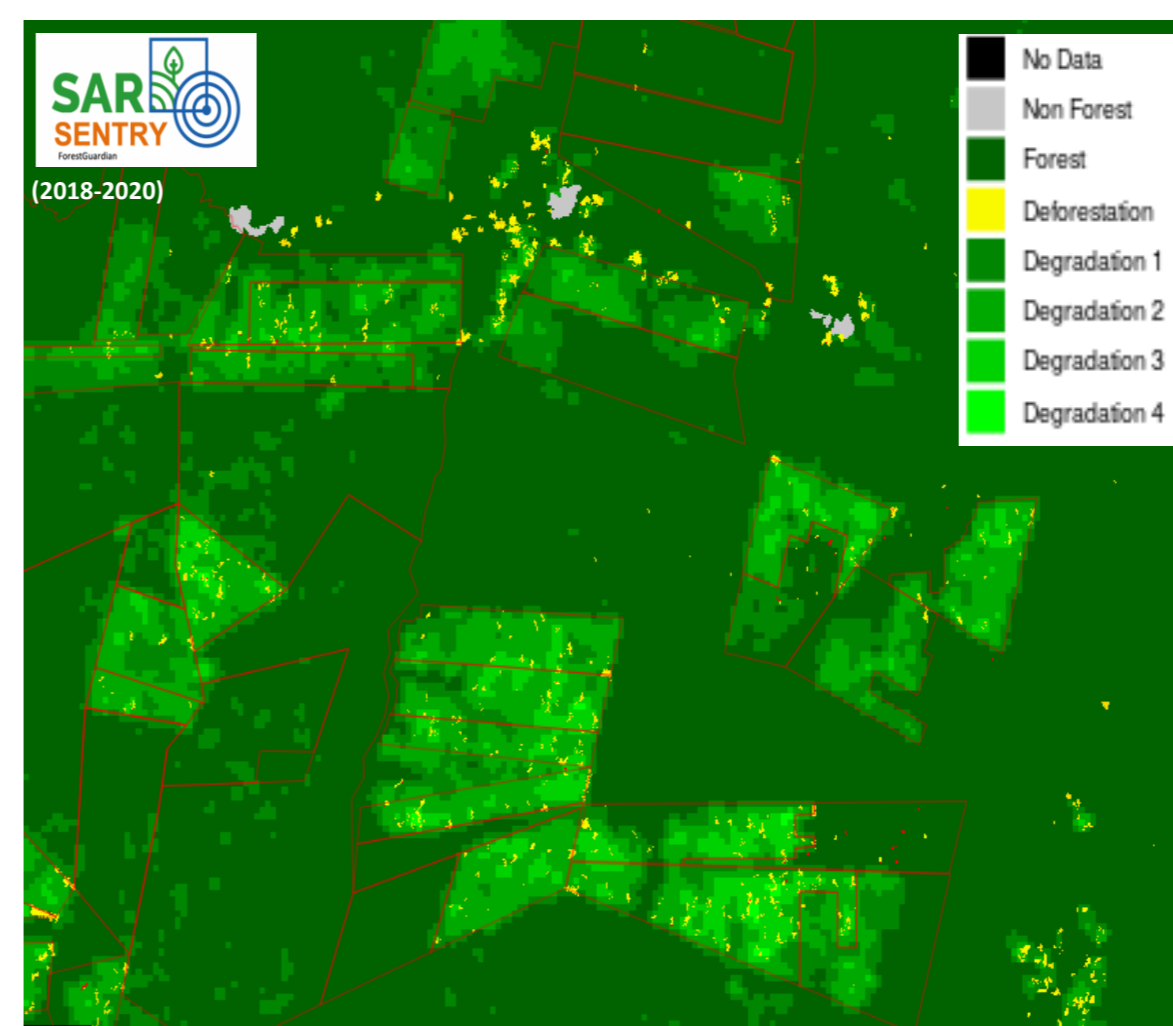
SarCarbon measurements of carbon emissions include estimations due to deforestation and degradation and regeneration, improving the accuracy of the carbon budget.



Monitoring of forest change in surrounding areas for potential leakages is done simultaneously with the carbon accounting assuring concurrency in the observations.



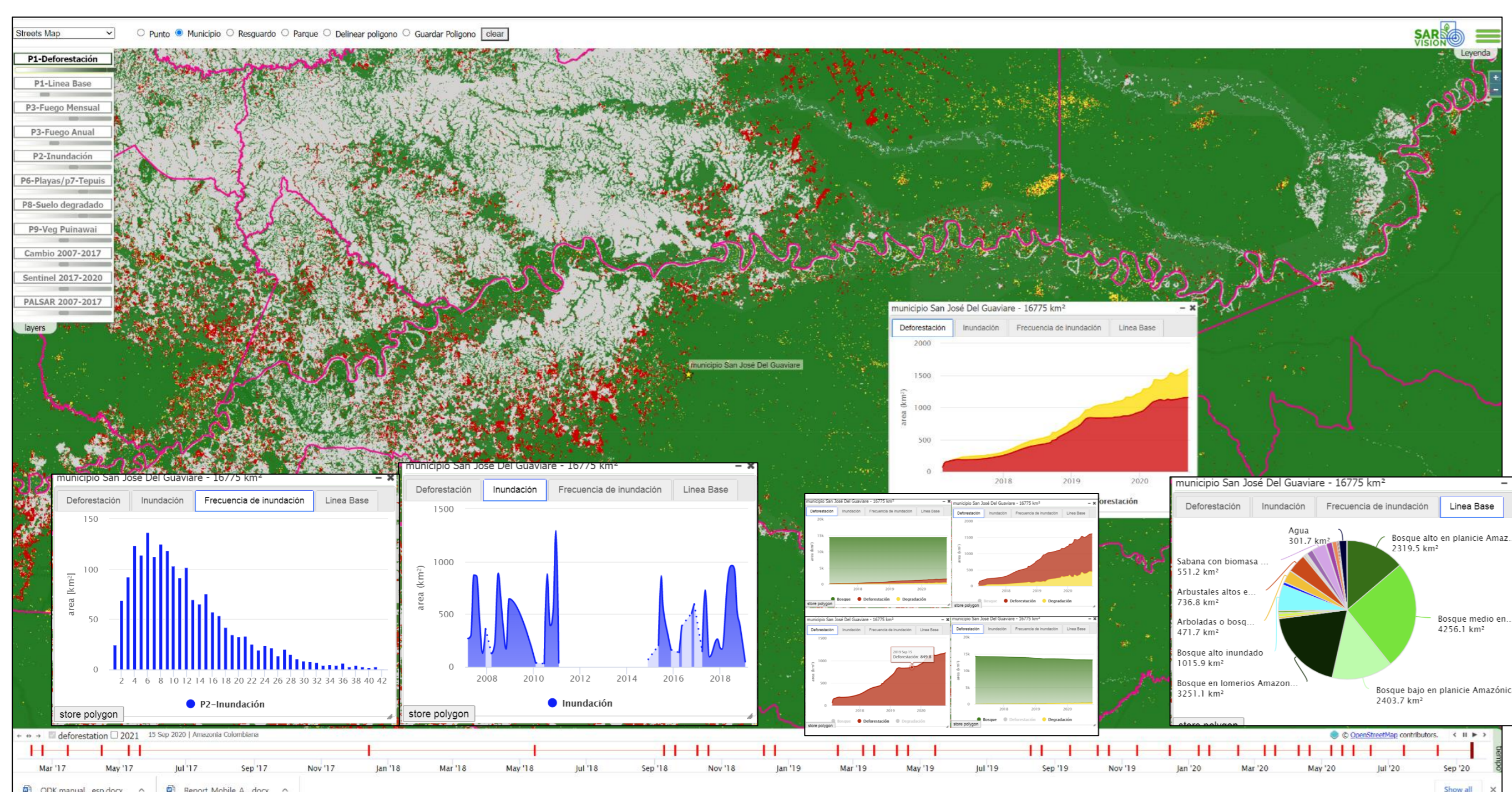
SarCarbon's tree monitoring module allows yearly monitoring of individual trees based on free-of-cost Sentinel-1 data. Carbon contribution of e.g. shade trees can be determined, supporting and giving transparency to commodities for international markets.



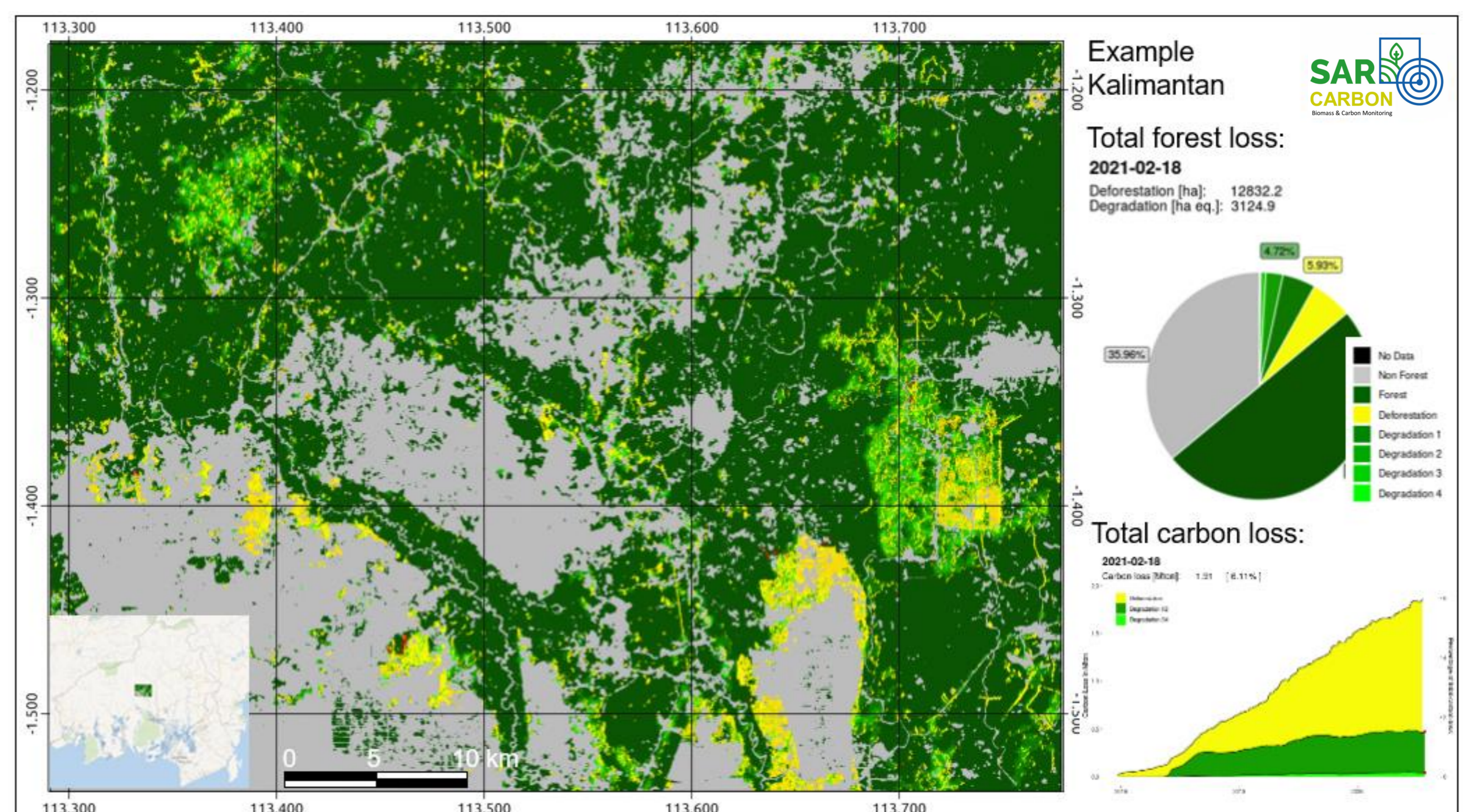
Forest degradation detection by SarSentry. Concession plots are shown in red. Logging is carried out in specific time periods and stays exactly within the plot boundaries.



Forest change detection by the GLAD system of Global Forest Watch in the same time period. The system detects deforestation, but hardly any forest degradation.



Example of SarVision's integrated webgis viewer and analysis tool.



Linking forest loss by deforestation and forest degradation with carbon loss for a test area in Kalimantan, Indonesia.