

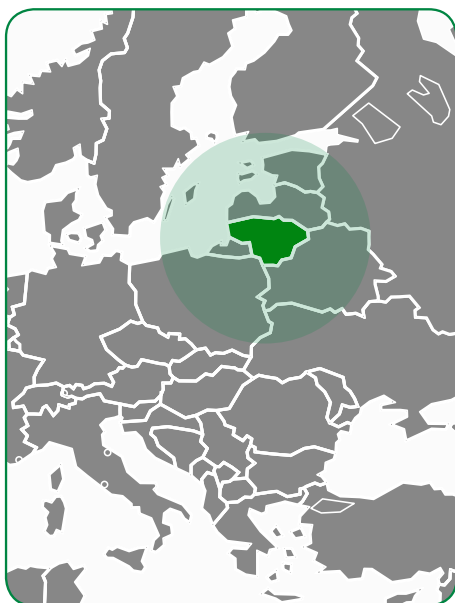
# ILLEGAL WILD BOAR ACTIVITY IN LITHUANIA

Copernicus Sentinel data is being used by the courts in Lithuania to help resolve legal disputes, leading to more efficient use of the judiciary's time, fairer judgements and swifter compensation payments for plaintiffs.



## THE CHALLENGE

Wild boars are becoming a common sight, causing problems for farmers and disturbing citizens in many areas across Europe. In Lithuania, farmers near the Kaliningrad border have been suffering recently, but found it difficult to prove in court what had caused damage to their crops. Evidence is needed by insurance companies or civil plaintiffs to show which party is liable for the damage. Moreover, estimating the extent of the damage in order to calculate the compensation owed often involves strenuous efforts by independent assessors on behalf of the courts. Farmers commonly enter contracts whereby they guarantee the delivery of a certain amount of produce to buyers at a future date. Should anything out of their control reduce their harvests, farmers need to be able to rely on the courts to settle disputes regarding liability and compensation. The crop loss can arise for a multitude of reasons, including human activity, animal activity, floods or drought. These cases pose a significant challenge to the courts in both assigning liability and calculating payments. External experts need to travel to inspect the area in question to help understand the cause and severity of the damage incurred; costing both time and money. A number of cases of this kind have been brought to court but one in particular in the Vilkaviškis district of southern Lithuania highlights the intricacies and specificities involved in each dispute. In this case, a farmer growing corn near the Lithuania/Kaliningrad border found his fields damaged as a result of suspected animal activity. After initial investigations, it became evident, at least to the farmer, that the damage was caused by wild boars that had been driven into the area by a local hunting club. The farmer decided to pursue a civil case against the hunting club in search of compensation, however, he first needed to prove his suspicions in a court of law. To do so, Copernicus Sentinel data was called upon.



## HOW SATELLITES CAN HELP

A small Lithuanian-based company, GEOMATRIX UAB, focussing on remote sensing and automated geo-processing, has been called upon by legal practitioners to provide evidence in several court cases. Satellite imagery is being used to evaluate the extent of crop damage as well as, in certain cases, the probable cause of the damage itself. This type of analysis has been made commercially viable thanks to the free and open data available from Copernicus.

Sentinel-1 data is used to produce damage assessment maps of farmers' land remotely, removing the need for inspectors to physically visit the area to undertake the time-consuming analysis. Using a classical statistical analysis approach, comparisons are made of maps of the fields which have experienced damage, to historical Sentinel-1 images of the same fields, in effect using the historical maps as control samples. This allows the relative degree of crop loss incurred to be quantified. By comparing full yields from previous years to current images of partial yields, the courts can calculate reimbursement costs. In another quantitative approach, current maps of a damaged field are compared with current maps of a similar field nearby to help understand the cause of the disturbance. This type of analysis can help prove that something such as localised animal activity caused the damage as opposed to more macro level variables such as high winds or heavy hail, which should have affected the entire region uniformly.

By employing Copernicus Sentinel imagery, the image analysis experts can remotely assess and quickly exhibit differences between damaged and untouched fields. Sentinel imagery can easily be presented in court, in the form of pictures and maps, to plainly show the extent of the crop loss incurred. It can also, quite accurately, estimate when it occurred thanks to Sentinel's extensive historic data archive and time series capabilities.

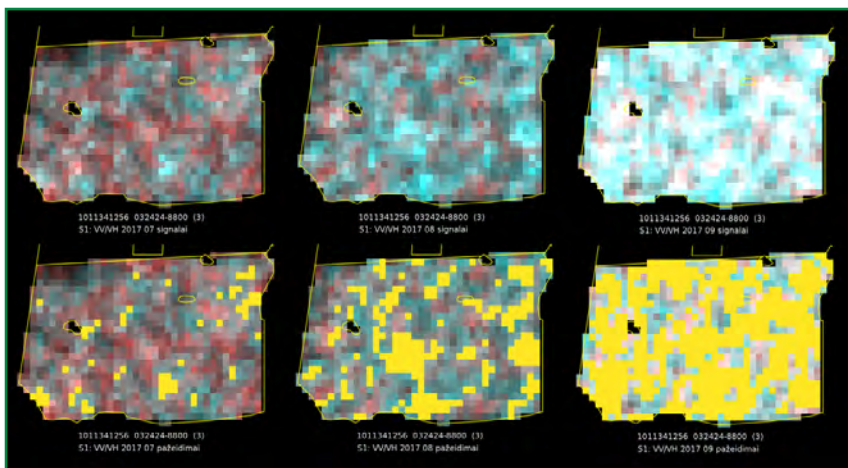


Figure 1: Sentinel-1 imagery of affected corn fields

### The satellite data:



Sentinel-1 is the Copernicus radar mission, providing an all-weather, day-and-night supply of imagery of Earth's surface. The mission consists of two satellites embarking C-band synthetic aperture radars (SARs) in continuity of the ESA's ERS-2 and Envisat missions. The mission images the entire Earth every six days for the benefit of manifold applications such as, for example, monitoring of Arctic sea ice extent, surveillance of the marine environment, monitoring land-surface for motion risks, mapping for forest, water and soil management.

Copernicus Sentinels data are available under an open and free data policy.

Sentinel-2 data can be accessed at <https://scihub.copernicus.eu>

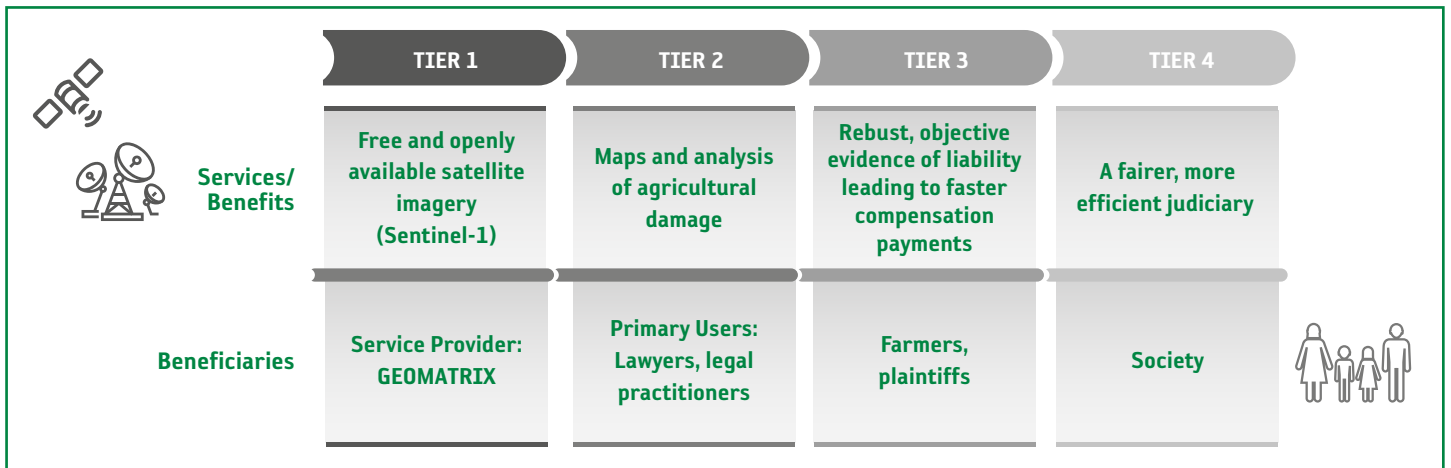
More info: <https://sentinels.copernicus.eu>

### The Service Provider

GEOMATRIX UAB is a small company established in 2011 and based in Kaunas, Lithuania. GEOMATRIX mainly focusses on the areas of applied research and consultancy in eco- and geo-informatics and providing services of automated geo-processing and operational mapping. The company was founded by a remote sensing expert, Dr. Gediminas Vaitkus. The main business idea of the company involves developing and providing services of "extreme" geo-computing based on the implementation of flexible "robotic" workflows on parallel computing systems powered by Open Source technology.

## UAB GEOMATRIX

<https://uab-geomatrix.business.site>



Schematic representation of the main beneficiaries along the value chain, including the corresponding services and benefits provided.

## WHO IS CONCERNED?

In the case of the farmer who suspected that wild boar had intruded on his land and destroyed his corn, the prosecution called upon GEOMATRIX to help build their case. Comparing the maps of the affected corn fields to other untouched corn fields nearby, the prosecution could unequivocally prove that some form of localised damage had occurred at the time in question, which could not have been a consequence of an indiscriminate, widespread disturbance in the region.

As the case developed, with the help of the Sentinel-1 imagery, lawyers for the prosecution could demonstrate that it was indeed wild boars which were driven into the locality by the hunters, and not storms (as argued by the defence) that led to the destruction of the farmer's corn. The farmer won his case and the hunting club were held liable for damages and loss of income incurred by the farmer.

In an interesting turn of events, the hunting club also approached GEOMATRIX to try to help them build a counterargument. They suspected that the corn destroyed had been left unharvested from the previous year, thereby making it older and less valuable. Unfortunately for them, their own potential counterargument was proved to be wrong. Sentinel-1's historic data showed that the farmer had indeed reaped the previous year's harvest and also demonstrated, through an array of chronological time series images, that the destroyed corn had been grown that year. Unsurprisingly, the defence decided not to use this argument in court!

The clear visuals produced by Sentinel-1, along with the accompanying in-depth analysis have proven to be invaluable assets to lawyers in court cases involving crop and land damage liability. The clear-cut, transparent and objective comparisons of damaged fields make it easy for judges to better understand the facts of the case and rule accordingly. In fact, the use of Sentinel data in these cases in Lithuania has led to swift and irrefutable judgements on several occasions.

### The Primary Users

The Vilkaviškis Municipality Department of Agriculture, who represented the farmer in court, used GEOMATRIX's analysis and expertise to help shed some much-needed light on the situation. By exhibiting Sentinel imagery, the Department of Agriculture proved the farmer's assertion in the Kaunas Regional Civil Court, chaired by Judge Mrs Janina Vitunskienė. The official ruling from the Kaunas Regional Civil Court, published in April 2018, initiated a truce which resulted in the hunting club paying compensation to the farmer.

This pioneering case not only served justice but blazed a trail for how future cases involving crop damage could be approached. Judge Vitunskienė was so impressed with the transparency and objectivity of the Sentinel satellite imagery that she recommended **"the use of such Sentinel data should become commonplace in all future crop damage cases"**. Since this endorsement, Sentinel data has been used in several cases to help the Lithuanian courts settle disputes and uphold the law.

[www.vbs.lt](http://www.vbs.lt)





Figure 2: Kaunas Regional court building

### WHAT ARE THE BENEFITS?

Farmers who are seeking compensation as a result of crop or land damage are a core beneficiary of these satellite-enabled products. Without the use of satellite images, it could potentially be very expensive and time consuming for farmers to prove the cause and extent of damage incurred to their crops. Traditionally, independent assessors would have to be hired to travel to the affected areas and conduct laborious investigations. The free, remotely accessible and reliable nature of Sentinel data ultimately provides farmers with a cheaper and faster alternative source of evidence, should they need to fight their case in court.

Companies such as GEOMATRIX experience great benefits from using Sentinel satellite data as it allows them to build a business and provide a service while incurring fewer overhead costs due to Sentinel's free and open data.

Lawyers, judges and the legal system as a whole benefit from the use of satellite data as it allows legal decisions to be taken on the basis of objective evidence. Satellite data can contribute to, or form definitive proof which ultimately leads to swifter judgements, saving time and in the end, contributes to a more efficient and fair judicial system. Evidence derived from satellite imagery also makes it more difficult for fraudulent claims to slip through the legal system without being noticed. This means that the general public and ultimately society as a whole experience a benefit in knowing that Sentinel satellite data is helping to uphold the integrity of the country's legal system.

The key benefits are:

- **Financial:** faster payment of damage compensation to plaintiffs, and systematic savings by avoiding on-site field inspections.
- **Efficiency:** faster and improved appraisals of crop damage due to expert analysis, automation and the use of historic data.
- **Societal:** decisions by the judiciary are based on objective evidence, leading to a fairer, more efficient legal system.
- **Awareness:** improved knowledge about the state of the fields between September and April.
- **Societal:** Companies such as GEOMATRIX can emerge, innovate and thrive as a result of the free and open Copernicus data.

### EXTENDED IMPACT

This type of satellite image analysis is not limited to cases involving crop damage caused by animals. It can also easily be applied to a multitude of cases involving seasonal crop failure, intrusive human activity or blight as well as to cases involving damages to land or property caused by drought, flooding or storms. The data and techniques used in this case are also applicable worldwide. Sentinel images provide global coverage and disputes involving damage liability are common in any part of the world where farming activity is being undertaken. GEOMATRIX could easily study a dispute in any part of the world from their Lithuanian offices thanks to the easily accessible Copernicus data. Parts of the world prone to more extreme weather events could benefit greatly from this type of analysis as greater risk is taken on by farmers in these regions and liability disputes are also more common.



## ABOUT THE PROJECT

The Sentinel Benefits Study (SeBS) is conducted by EARSC (European Association of Remote Sensing Companies) with partners The Greenland, IIASA (International Institute for Applied Systems Analysis) and Evenflow on behalf of the European Space Agency (ESA). It has the goal to study 20+ full cases by analysing the impact of the use of Sentinel data along a value-chain. This short-case has been prepared where there has been an interesting use made of Sentinel data, but it has not (yet) been possible to conduct a full case. It tells the story of the use of Sentinel data without going deeply into the economic or environmental benefits.



We acknowledge that the understanding of the case was supported by discussions with Dr. Gediminas Vaitkus from GEOMATRIX UAB. We thank him for his valuable insights and availability.



*The use of such Sentinel data should become commonplace in all future crop damage cases.*

*Judge Vitunskienė, Kaunas Regional Court*



**Do you know an interesting case demonstrating the benefits derived from the use of Sentinels data?**

**Email [info@earsc.org](mailto:info@earsc.org)**

**More Information on Sentinels Benefits Studies:**

**[www.earsc.org/sebs](http://www.earsc.org/sebs)**



European Union



European Space Agency

The Sentinels Benefits Study is funded by the EU and ESA. The views expressed in this study cannot be taken to reflect the official position of the EU or of ESA.