



Photo: ESA

PROJECT DESCRIPTION

What is the objective of the project?

The **ASM-Alert** project is motivated by the need to address the environmental, human rights, social, economic, and legal aspects associated with artisanal & small-scale mining (ASM) in general, and in the Venezuela part of the Guiana Shield in particular.



Artisanal and small-scale (gold) mining is big business, BUT:

It strongly affects the environment

It affects the health of miners and all people that are in direct contact with the mine activities using mercury and other chemicals that are not professionally used

In most cases the miners are those that have the least benefit from the mining

In most cases illegal activities are involved (smuggling, prostitution, organised crime)

In most countries ASM is not very well managed or even lacks governmental regulation

Sometimes countries call ASM illegal, but mostly it is named "irregular" – i.e. the legal terminology is not very precise.

Some countries are aware of the problems and want to fix them.

Other countries seem to ignore them – because they profit so much from ASM.

The overall objective of the **ASM-Alert** project is to contribute towards containing and overcoming the negative effects of ASM. More specifically the project aims to a) implement an easy-to-use ASM monitoring and alert system for stakeholders on all levels - from local communities to international organisations -, b) demonstrate and validate the use of the system and c) make stake-holders aware of the benefits in using the **ASM-Alert** tool.

Why is Venezuela chosen as the Area of Interest (AOI) for this project?

As Wouter Veening, Chairman of the Institute for Environmental Security (IES), explains, “The situation in Venezuela is very serious and extremely complicated”.

The VALUE: The value of the selected AOI is that Venezuela is a mega biodiversity country and an important part of the Amazonian region, which plays a crucial role in regulating the global climate. As with biodiversity in Colombia, Brazil, and the whole of the Guiana Shield, Venezuela is home of unique species of fauna and flora. One of the areas, which is of great importance to the whole world is the Canaima National Park - a World Heritage site - spread over 3 million ha in south-eastern Venezuela reaching the borders with Guyana and Brazil. In addition this area is the home of several indigenous people, residing in and protecting this heritage.



Map of Guiana Shield © SarVision. [2]. The Canaima Park is in the area shown in the centre near the border with Guyana.

The THREAT: The major threat to this biodiversity is illegal gold mining that results in ecocide - the pollution and destruction of large areas of the natural environment because of human activity. The use of mercury and/or other poisonous chemicals destroys the homeland of indigenous people. As mercury is a highly toxic chemical, which does not break down but builds up, its use may easily be also a direct threat to human health, especially for pregnant women and infants, causing serious health problems, including changes in the nervous system, as well as brain damage. Mercury spreads out through the water and through the atmosphere. Mercury from the Guiana Shield is thought to be found in migrant birds in northern Canada and in the Arctic Circle [3].

The gold mining in Venezuela either takes place on rafts on the river where hoses are used to destroy the embankments of the rivers and clear waters are being transformed into muddy pools full of the toxic mercury, or river terraces are transformed into mud pools to wash the gold. The drivers of the illegal mining are criminal miners, protected by Colombian guerrilla [4] and partly by the Venezuelan military and police itself, and smugglers



Most of the gold is fraudulently legalized after being smuggled into Colombia, Brazil, and Guyana, among other countries. Venezuelan blood gold ends up in the Middle East, Europe, Africa, and the United States.
 Source: CSIS, 16 April 2020. [4]

that launder the gold through other countries [5]. Venezuela used to be a major oil exporter, but this source of income has been radically reduced as the whole oil exploitation infrastructure has been neglected and become dilapidated and international commercial sanctions are effective. Therefore, gold mining and the mining of diamonds and coltan in the southern part of Venezuela have become an important source of cash for the regime.

The LEGAL SITUATION: There are almost no official licencing procedures, or they exist only on paper but are not followed in practice [6]. The activities are carried out without any structured official system in place. In addition, Venezuela is not a party to the Minamata Convention on Mercury, which is an international treaty designed to protect human health and the environment from anthropogenic emissions and releases of mercury and mercury compounds. Parties to the convention are obliged to produce an action plan to include controls and reductions across a range of products, processes, and industries where mercury is used, released or emitted. Without the country obliged to even have such an action plan it is easy for the government to neglect all claims. Venezuela is part of the World heritage convention (the Canaima National Park), but this convention also has no, or minor enforcement means. Also, the OECD is aware of the possible gold smuggling and laundering and is advocating due diligence in dealing with problems arising with the production and trade of gold in Venezuela [7].

A possible future LEGAL ENFORCEMENT: Currently, Venezuela is being referred to the International Criminal Court (ICC) for crimes against humanity [8]. In addition, because of these crimes and the bad situation with food and medical care, millions of Venezuelans have fled to Colombia and some to Brazil and Guyana as well. S.O.S Orinoco and the organisation “Stop ecocide International” (SECI) are making the case that ecocide should be recognized as a separate crime against peace in the Rome Statute of the ICC given the large-scale destruction to the environment, which is caused by the mining. Indeed the EU and some countries of Latin America (Mexico, Chile) include ecocide as a crime in their laws / constitutions.

Satellite Earth Observation (EO) as an EVIDENCE COLLECTOR: Any law that may be enforced needs evidence for its application. Direct evidence for ecocide is being gathered in Venezuela by a few scientists who are able to test soil and water samples to ascertain the concentration of mercury in the mined rivers and forests. However, this is dangerous and probably not sufficient. Another way to collect evidence is by satellite based EO. This is the major aim of this project and the satellite based **ASM-Alert** tool to be developed. The tool should provide valuable data and evidence for the ICC, the OECD, the World Heritage Convention and other organisations and entities, which have been identified as potential primary and secondary end users of the tool.

How will the ASM-Alert tool work?

As Dr Bernd Schulte, Project Manager, Geological Information Services, at GAF explains “The use of Earth Observation enables the users to discover new mining activities and monitor them in near real time”.

The proto-type development utilizes a web-based platform and cloud-technology demanding hardly any technical know-how, large data storage or IT infrastructure facilities on the user premises. It shall not require a special technical knowledge about application software, web technology or geology. It can be used by administrative or legal staff of NGOs, CSOs, and officers of the mining or environment authorities.

This tool has two main functionalities that target two goals: First **ASM-Alert** shows locations on a screen that indicate potential ASM sites together with a mining probability based on geology and adjacent water streams, thus allowing a prioritisation for further follow up. Secondly, it provides an interface to order - on command - the most up to date Very High Resolution (VHR) imagery of a potential ASM spot, being the basis for the verification, additional evidence collection, and the decision making concerning further steps.

The first indicator of possible ASM in wide tropical forest areas, which is detectable by EO, is disturbance of forest canopy by the removal of trees. Thus, the project involves the integration of a near real-time early detection and warning system on forest disturbances based on cost-free satellite sensors (Copernicus Sentinel-1, Sentinel-2) covering large areas and allowing dense time-stack analyses.

Beside forest cuts, intense earthworks of open soil and construction of water ponds in the direct vicinity of the forest cuts are the most important ASM indicators. The spatial association of all 3 indicators are thus a very good first proxy to detect ASM.

Once the potential sites of gold mining are localised, the next step is to compare them with the background information about possible potential to find gold in the region. If the gold occurrence potential is high, the probability that the indicators really represent ASM is also high.

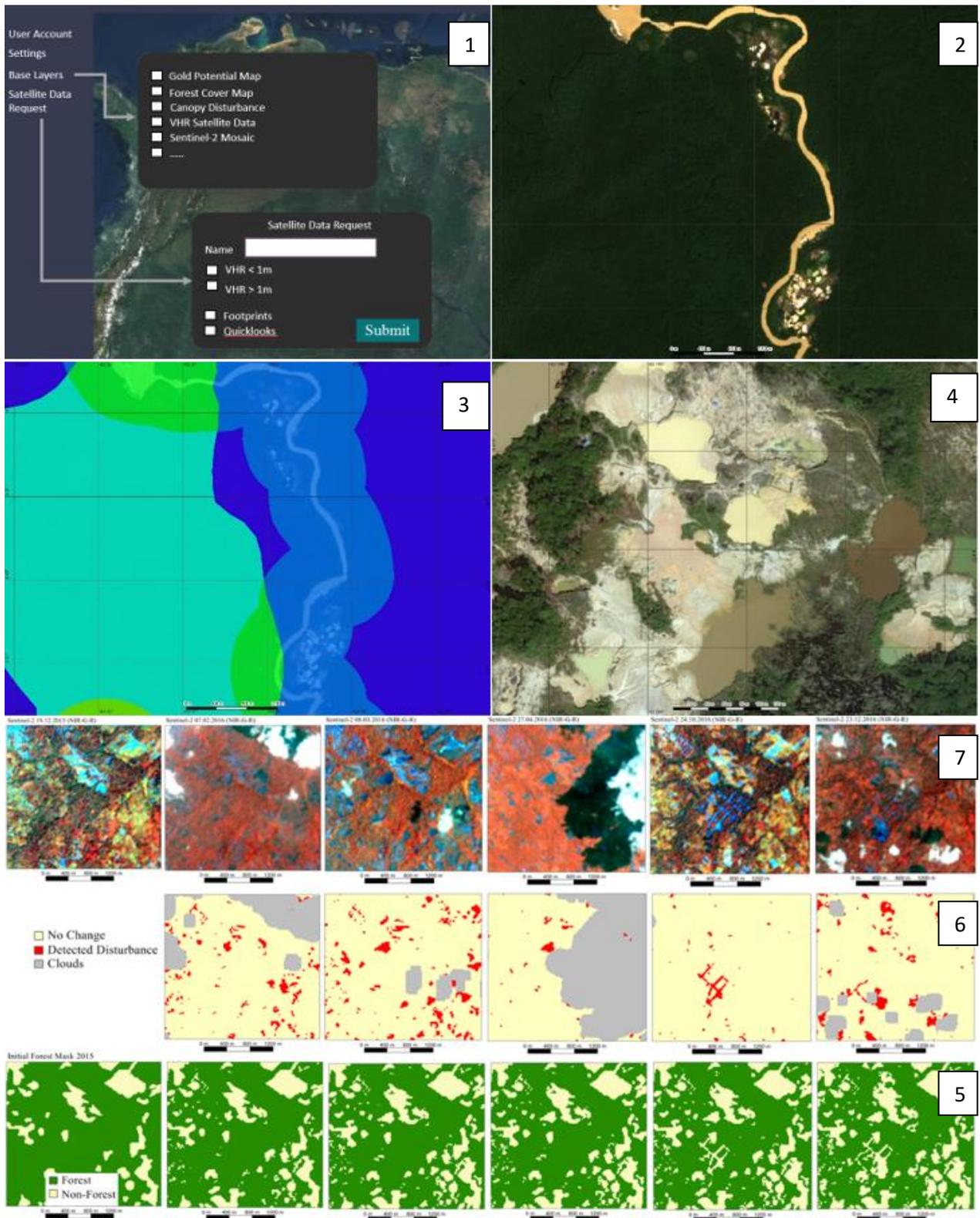
If the potential to find gold is low, one should look for other possible indicators. For example, are recent Google Earth or Bing map imagery available, i.e. a satellite image that has a higher spatial resolution? Is the probable mine site inside or outside the national park areas? Is it inside/outside of mining lease areas (if available)? Based on these observations a decision may be taken to order (commercial) VHR satellite imagery.

VHR imagery in turn may then be used by the stakeholders for further follow-up actions, such as on-site inspections, legal follow up or public awareness.

After technical testing and verification, a phase of validation and capacity training is planned to recognize ASM in satellite imagery and to use the system.

Registered users will be assigned credentials to log in to the secure platform thereby protecting the privacy and security of the stakeholders and end users. Stakeholders will be provided with a user's manual along with on-line training led by GAF and IES.

For maximum uptake/outreach of the **ASM-Alert** tool the project will include a tailored awareness / promotion campaign for relevant stakeholders and potential users on all levels including affected local/indigenous communities, CSOs, and NGOs, as well as government authorities and international organisations.



- 1: Draft Design of the main screen of the **ASM-Alert** tool
 - 2: Sentinel-2 image of ASM location at 4,4433° N 62,2095 W at the SW border of the Canaima National Park
 - 3: Same spot with gold potential map as background (**bright green** = moderate potential, **bright blue** = moderate to low potential)
 - 4: Microsoft Bing Maps imagery of the same spot 2021 with clear evidence on ASM mining
- Bottom rows: **5**: Example of a result map showing change of forest cover; **6**: detected change; **7**: on basis of a Sentinel-2 series



VHR image of sluice in similar AOI in Nigeria
(Source: Microsoft Bing Images)



VHR image of rafts in pond in Venezuela
(Source: Microsoft Bing Images)



Raft on Cuyuni River, Venezuela
(Source: SOSOrinoco)



Cutting pump in Venezuela
(Source: SOSOrinoco)

What is expected of the stakeholder / end user participating in the project?

“Primary users” are those that have a direct relation to the AOI, (e.g. IES, S.O.S. Orinoco, OAS, ICC and the Minamata Convention). They use the **ASM-Alert** tool for monitoring (during and after the training) for their specific areas of interest providing feedback on the usefulness of the tool and possible extensions.

“Secondary users” are those, that have no direct relation to the AOI, but have a general interest in the monitoring of ASM, and who will provide feedback and comments on promotional media and documents provided by the project.

Which kinds of organisations are being invited to participate in the project?

The Organisation of American States (OAS) welcomes **ASM-Alert** and has expressed interest in participating in the project as has S.O.S. Orinoco. In addition, the IES is in contact with the International Criminal Court (ICC), the OECD programme on illegal resource flows, and the secretariat of the Minamata Convention as well as UNEP, which assembles the data for the convention.

Other actors who are expected to be interested in the use of the tool and findings include the neighbouring countries of Venezuela, affected by the mercury pollution (Brazil, Colombia, and Guyana) and other parties to the Amazon Cooperation Treaty along with the US State Department and Treasury Department, members of the U.S. Senate, Members of the European Parliament and officials

of the European Commission and the European External Action Service. Still others to be contacted include the Venezuelan programmes of the World Bank and the Inter- American Development Bank. In addition, GAF plans to be in contact with African countries that GAF knows to be interested in ASM monitoring, e.g. Cameroun, Ghana, Malawi, Nigeria and Sierra Leone.

What is the duration of the project and what happens afterwards?

The **ASM-Alert** project launched in July 2021 runs through June 2022. Participation by stakeholders is by invitation only and is entirely free of any costs. Users will be able to use the technology to monitor the incidence and impact of illegal mining and make use of the information in their work from awareness building and campaigning to supporting legal and other action by the international community.

The end goal is to demonstrate that the **ASM-Alert** technology can support and provide legal evidence for compliance with and enforcement of international environmental law.

Why are GAF and IES teaming up in this project?

GAF: One-stop-shop EO experience for public and commercial EO data:

1. Acquisition of EO data
2. Processing of EO data
3. Thematic cartography
4. EO tailored software development

Technical Assistance for mining governance and ecosystem monitoring:

1. Mining cadastre
 2. Mining inspectorate
 3. Geologic-and mining data management
 4. Forest disturbance / monitoring systems
- Worldwide

IES: An international NGO working to advance global environmental security by promoting the maintenance of the regenerative capacity of life-supporting eco-systems:

1. Create enhanced scientific based decision tools
2. Promote linkages between policies relating to environment, security, and sustainable development
3. Contribute to the development of effective law/governance systems
4. Introduce new financial support systems to support ecosystems
5. Enhance knowledge and capacity of civil society and governance authorities

Who can be contacted for further information?

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ASM-Alert is a project of GAF AG, Munich in association with the Institute of Environmental Security, The Hague with the support of the European Space Agency (ESA) under activity line 5 “EO for a Civil Security”. The tool aims at the target domains of ecocide, crime against humanity, criminal threats, money laundering and smuggling. The tool combines state-of-the-art EO observation and analysis, platform technology and geological “intelligence”.



NOTES

[1] See: UNIDO, “**USD 180 million investment to tackle the hidden cost of gold**”, 18 February 2019. <https://www.unido.org/news/usd-180-million-investment-tackle-hidden-cost-gold?fbclid=IwAR2I4P-WKGcNm-xpHPknBhRhBdX2xajTa7uW6tl-eKx2rzaukeDICETYSk>

and specific sources quoted in the infographic.

[2] **Map of Guiana Shield** by SarVision as published in Andrea Berardi, Jayalaxshmi Mistry, Céline Tschirhart, Elisa Bignante, Odacy Davis, Lakeram Haynes, Ryan Benjamin, Grace Albert, Rebecca Xavier, Deirdre Jafferally and Géraud de Ville, **Applying the system viability framework for cross-scalar governance of nested social-ecological systems in the Guiana Shield, South America**, Ecology & Society, VOL. 20, NO. 3 > Art. 42, 2015. <https://www.ecologyandsociety.org/vol20/iss3/art42/>

By Tom Hollowell, NMNH Informatics - Biological Diversity of the Guiana Shield Map, Public Domain, <https://commons.wikimedia.org/w/index.php?curid=13259772>

[3] See Arctic Council, “**Mercury and Toxic Cocktails affect the Arctic Ecosystems, Wildlife and Human Health – How to take action?**”, 23 October 2020. <https://arctic-council.org/news/mercury-and-toxic-cocktails-effects-on-arctic/>

[4] According to the Center for Strategic & International Studies “*While the economic, humanitarian, and political crisis in Venezuela worsens, criminal groups—including gangs, Colombian guerrilla groups, and colectivos (paramilitary groups)—are competing for control of the country’s valuable mineral resources. These resources include bauxite, coltan, diamonds, and, particularly, gold. Illegal mining is causing irreversible damage to the environment, fueling human rights abuses, and creating significant security threats for Venezuela and the region*”.

See “**Illegal Mining in Venezuela: Death and Devastation in the Amazonas and Orinoco Regions**”. CSIS, 16 April 2020.

https://www.csis.org/analysis/illegal-mining-venezuela-death-and-devastation-amazonas-and-orinoco-regions?utm_source=CSIS+All&utm_campaign=3fafa829b6-EMAIL_CAMPAIGN_2020_03_05_04_38_COPY_02&utm_medium=email&utm_term=0_f326fc46b6-3fafa829b6-

[5] See: Marshall Billingslea, Assistant Secretary for Terrorist Financing, U.S. Department of the Treasury presentation at an informal Arria-formula meeting of the Security Council that focused on the **pervasive corruption in Venezuela that has led to instability and a humanitarian crisis, a key aspect of which is the current Gold Rush that is devastating the environment and indigenous peoples**. 10 September 2018.

<https://sosorinoco.org/en/facts/illicit-business/video-clip-of-arria-formula-meeting-of-the-security-council-formula-on-gold-rush-in-venezuela/>

[6] See: “**How illicit business has thrived under the Maduro Regime in Southern Venezuela**”

<https://sosorinoco.org/en/facts/illicit-business/>

[7] See: OECD (2021): “**Gold flows from Venezuela: Supporting due diligence on the production and trade of gold in Venezuela**”. <https://mneguidelines.oecd.org/Gold-flows-from-Venezuela-supporting-due-diligence-on-the-production-and-trade-of-gold.pdf>

[8] The case has been brought by six members of the Organisation of American States (Argentina, Canada, Chile, Colombia, Paraguay, and Peru) and under preliminary examination by the court’s Office of the Prosecutor since February 2018. In December 2020, the office reported that based on the information available during the preliminary examination it had found a reasonable basis to believe that crimes against humanity had been committed in Venezuela. See: “**Venezuela, the International Criminal Court, and Impunity**”. Human Rights Watch. 21 July 2021.

<https://www.hrw.org/news/2021/07/21/venezuela-international-criminal-court-and-impunity>