# Colombia

# Alluvial Gold Exploitation

## Evidences from Remote Sensing, 2018

November 2019

UNODC
United Nations Office on Drugs and Crime

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# Alluvial gold exploitation with machinery on land (EVOA)

**92.000 ha**

**2018**

## Management of territory

### National participation of EVOA on land

**Excludable mining areas (52 %)**
- Forest reserve areas
- Areas for the protection and development of renewable natural resources
- Ramsar wetlands
- National Natural Park

**Restricted mining areas (13 %)**

**Free areas for mining (35 %)**

## Legal / illegal nature of the activity

### National participation of EVOA on land

**With technical or environmental permits**
- Environmental licenses (7 %)
- Exploration and exploitation titles (21 %)

**In process of obtaining permits (34 %) Illegal**

**Outside from areas covered by current legal framework (38 %) Illegal**

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# Provincial affectation

**78 % of national EVOA on land Antioquia (40 %) and Chocó (38 %)**

- EVOA (on land / on water)*
- Only EVOA on land
- Only EVOA on water*
- No evidence*
- EVOA on land
- EVOA on water
- Rivers with alerts by EVOA on water

## EVOA on water

***Most detected alerts Caquetá river***

*Note:
Information about alerts by EVOA on water is only related to five analyzed rivers (Amazonas, Apaporis, Caquetá, Guainía and Putumayo), this does not mean absence of effects in other rivers.

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National Natural Parks of Colombia

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Photographs. UNODC/SIMCI, unless otherwise specified.

Cover images: Alluvial gold exploitation in the municipalities of Cáceres (on left - on land) and Zaragoza (on right – on water), Province of Antioquia.

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# EXECUTIVE SUMMARY

The results of detecting EVOA (evidence of alluvial gold exploitation) on land indicate that 52% is found in areas excludable from mining, 13% in areas where mining is restricted, and 35% in areas where exploitation is permitted in the regulatory framework. It is noteworthy that more than half of the detected EVOA is located in regions where, as a function of protecting and conserving the nation's environmental assets, exploitation is not permitted: 47,670 ha of EVOA are distributed in these areas and, in addition, there are alerts of the presence of EVOA in wetlands in some National Natural Parks.

In terms of special management territories, there were 724 ha with EVOA on indigenous reservations in 2018, with a total of 24 reservations affected: The most greatly affected Province is Chocó (293 ha), followed by Guainía (139 ha), Cauca (124 ha) and Antioquia (119 ha). Relative to the alerts generated by EVOA on water, there are 14 reservations directly affected by this on the Putumayo, Caquetá, Apaporis and Guainía Rivers, and six reservations with an indirect impact located in the middle basin of the Caquetá River. In addition, in the lands of Black Communities, 37,973 ha of EVOA were detected on land (in 76 Community Councils, 49% of the total for the country), mainly in Chocó (35% of the total in the nation).

Although the figures are noteworthy in terms of a need to formulate public policy, as well as intervention plans and strategies in response to the specific needs that will diminish the vulnerability of the communities living in the affected regions, the formalization process that took place in the municipality of San José del Fragua, Caquetá, along with the productive model in the Province of Antioquia should be highlighted as examples of intervention strategies implemented to diminish vulnerability in those regions.

In the first case, the characteristics of the region were identified – including the presence of illicit crops in addition to EVOA, and the community was then assisted in regulating exploitation activity by establishing an association and signing an agreement of wills with the local authorities. In the second case, an agreement was established to support indigenous communities with gold mining activities in the territory. The work in the region demonstrated the presence of illegal parties, which have an influence in the creation of "regions of impunity" and expanding illegal mining in the region. Both studies led to spearheading the formalization of mining in the regions, along with creating an intervention model that promotes the lawful production of gold to replace the illicit crops being grown there.

# TABLE OF RESULTS

| NATIONAL EFFECTS DUE TO EVOA ON LAND, 2018 | | |
|---|---|---|
| **92,046 hectares** | | |
| **Excludable Mining Areas with EVOA on Land, 2018** | | |
| **Category** | **EVOA on Land (ha)** | **% of National Participation** |
| National Natural Park | 126 | Less than 1% |
| Ramsar Wetland | 544 | 1% |
| National Protective Forest Reserve | 72 | Less than 1% |
| Area for the protection and development of renewable natural resources | 2,487 | 3% |
| Forest Reserve Area | 44,441 | 48% |
| **Total** | **47,670** | **52%** |
| **Restricted Mining Areas with EVOA on land, 2018** | | |
| **Category*** | **EVOA on Land (ha)** | **% National Participation** |
| Mining Areas (indigenous, black or mixed communities) | 7,606 | 8% |
| Areas within the urban perimeter of cities or towns | 3,331 | 4% |
| Areas occupied by a public work or ascribed to a public utility | 888 | 1% |
| **Total** | **11,825** | **13%** |
| **Free Areas for Mining with EVOA on Land, 2018** | | |
| **Special Management Territories** | | |
| **Category** | **EVOA on Land (ha)** | **% National Participation** |
| Indigenous Reserves | 274 | Less than 1% |
| Black Community Territories | 1,785 | 2% |
| Other Special Management Territories | 1,213 | 1% |
| **Outside of Special Management Territories** | | |
| **Category** | **EVOA on Land (ha)** | **% National Participation** |
| Free Territories | 29,280 | 32% |
| **Total** | **32,552** | **35%** |
| **2018 EVOA on land and areas covered by the current legal framework (% National Participation)** | | |
| **With Technical and/ or Environmental Exploitation Permits**** | | |
| Environmental Licenses | 7% | |
| Exploration and Exploitation Titles (i.e. “Amparo de títulos”) | 21% | |
| **In the Process of Obtaining Technical and Environmental Exploitation Permits** | | |
| Contract Proposals | 19% | |
| Special Reserve Areas | 9% | |
| Formalization Requests, Law 685 dated 2001 | Less than 1% | |
| Formalization Requests, Decree 0933 dated 2013 | 6% | |
| **Outside from areas covered by the current legal framework** | | |
| Evidence of Illegal Alluvial Gold Exploitation on Land | 38% | |
| **National Natural Parks (i.e. PNN for its initials in Spanish) Affected by EVOA on Land** | | |
| **Park** | **EVOA on Land in PNN (ha) - 2016** | **EVOA on Land in PNN (ha) - 2018** |
| Puinawai | 57 | 75 |
| Paramillo | 31 | 50 |
| Los Farallones de Cali | 0 | 2 |
| Los Katíos | 19 | 0 |
| Selva de Florencia | 4 | 0 |
| **Total** | **111** | **127** |

| Trends of EVOA on Land 2016 - 2018 | Area (ha) |
|---|---|
| Stable | 71,049 |
| New | 15,734 |
| Expanding | 5,264 |
| Signs of Plant Succession | 12,572 |

| Provinces Affected by EVOA on Land | | | | | | |
|---|---|---|---|---|---|---|
| National Area Detected with EVOA on Land | 2014 | | 2016 | | 2018 | |
| | 78,939 ha | | 83,620 ha | | 92,046 ha | |
| Province*** | EVOA on land 2014 (ha) | % national participation 2014 | EVOA on land 2016 (ha) | % national participation 2016 | EVOA on land 2018 (ha) | % national participation 2018 |
| Antioquia | 26,323 | 33% | 30,897 | 37% | 36,447 | 40% |
| Chocó | 36,185 | 46% | 33,024 | 39% | 35,194 | 38% |
| Bolívar | 7,361 | 9% | 7,820 | 9% | 8,913 | 10% |
| Córdoba | 3,544 | 4% | 3,592 | 4% | 3,982 | 4% |
| Cauca | 1,408 | 2% | 3,702 | 4% | 3,004 | 3% |
| Nariño | 1,676 | 2% | 2,677 | 3% | 2,921 | 3% |
| Valle del Cauca | 1,570 | 2% | 1,023 | 1% | 889 | 1% |
| Putumayo**** | 365 | Less than 1% | 537 | Less than 1% | 437 | Less than 1% |
| Guainía**** | 37 | Less than 1% | 117 | Less than 1% | 139 | Less than 1% |
| Caquetá**** | 5 | Less than 1% | 54 | Less than 1% | 50 | Less than 1% |
| Vaupés**** | 15 | Less than 1% | 32 | Less than 1% | 0 | 0% |
| Amazonas**** | 0 | 0% | 0 | 0% | 0 | 0% |
| Guaviare**** | 0 | 0% | 0 | 0% | 0 | 0% |
| Others | 459 | Less than 1% | 146 | Less than 1% | 70 | Less than 1% |

| Municipalities with the Greates Effects due to EVOA on Land 2018 | | | |
|---|---|---|---|
| Municipality | Province | EVOA on Land (ha) | % National Participation |
| Zaragoza | Antioquia | 8,229 | 9% |
| Nechí | Antioquia | 6,248 | 7% |
| Cáceres | Antioquia | 5,240 | 6% |
| Nóvita | Chocó | 5,151 | 6% |
| El Cantón del San Pablo | Chocó | 4,804 | 5% |

* Only categories with EVOA on land are taken into account.

** The ANLA's Systems has not been duly updated by the other institutions with environmental licensing capabilities.

*** The homologue term for country subdivision in Colombia is established as "Department".

**** Alerts due to EVOA on water were also detected in these Provinces.

# INTRODUCTION

Alluvial gold-exploitation[1] affects different regions of the country, impacting not only the landscape but also the communities that live in the regions where the activity takes place, as well as their economy, safety, and cultural and social aspects, among others. The national government, led by the Ministry of Mines and Energy, has been working together with local authorities to implement actions to prevent and regulate this illegal activity, including sharing information about the current mining laws with the communities in order to avoid the expansion of illegal money to other areas of the national territory.

In this context, the Ministry of Mines and Energy and the United Nations Office on Drugs and Crime (UNODC) developed a monitoring model that has been implemented since 2015. With it, based on studying the geography of the phenomenon of illegal alluvial gold exploitation with machinery on land and on water, they seek to establish the magnitude of the problem, focus interventions and engage in monitoring using remote sensing tools and geographic information systems (GIS).

The performed analyses have established a baseline since 2014, with cutoff dates in 2016 and 2018, which include different layers of information such as administrative records of gold exploitation, illegal crops in the regions where evidence of alluvial gold exploitation (EVOA, i.e. for its inintials in spanish) has been found, and the degree of restriction on mineral exploitation, in accordance with the particular characteristics of the regions.

This report covers the findings from the monitoring across the nation for EVOA on land, and a baseline for EVOA on water identified for five rivers (Putumayo, Caquetá, Apaporis, Guainía and Amazonas) during 2018: 11 of the country's 32 Provinces show EVOA on land, with a total of 92,046 ha, 10% more than the evidence detected in 2016. The EVOA on land in the country is concentrated in two Provinces: Antioquia (40%) and Chocó (38%). It was found that 14 of the 32 Provinces had EVOA in either of the two modes. Caquetá, Putumayo and Guainía showed evidence for both types of exploitation, and the Provinces of Amazonas and Vaupés reported EVOA only on water.

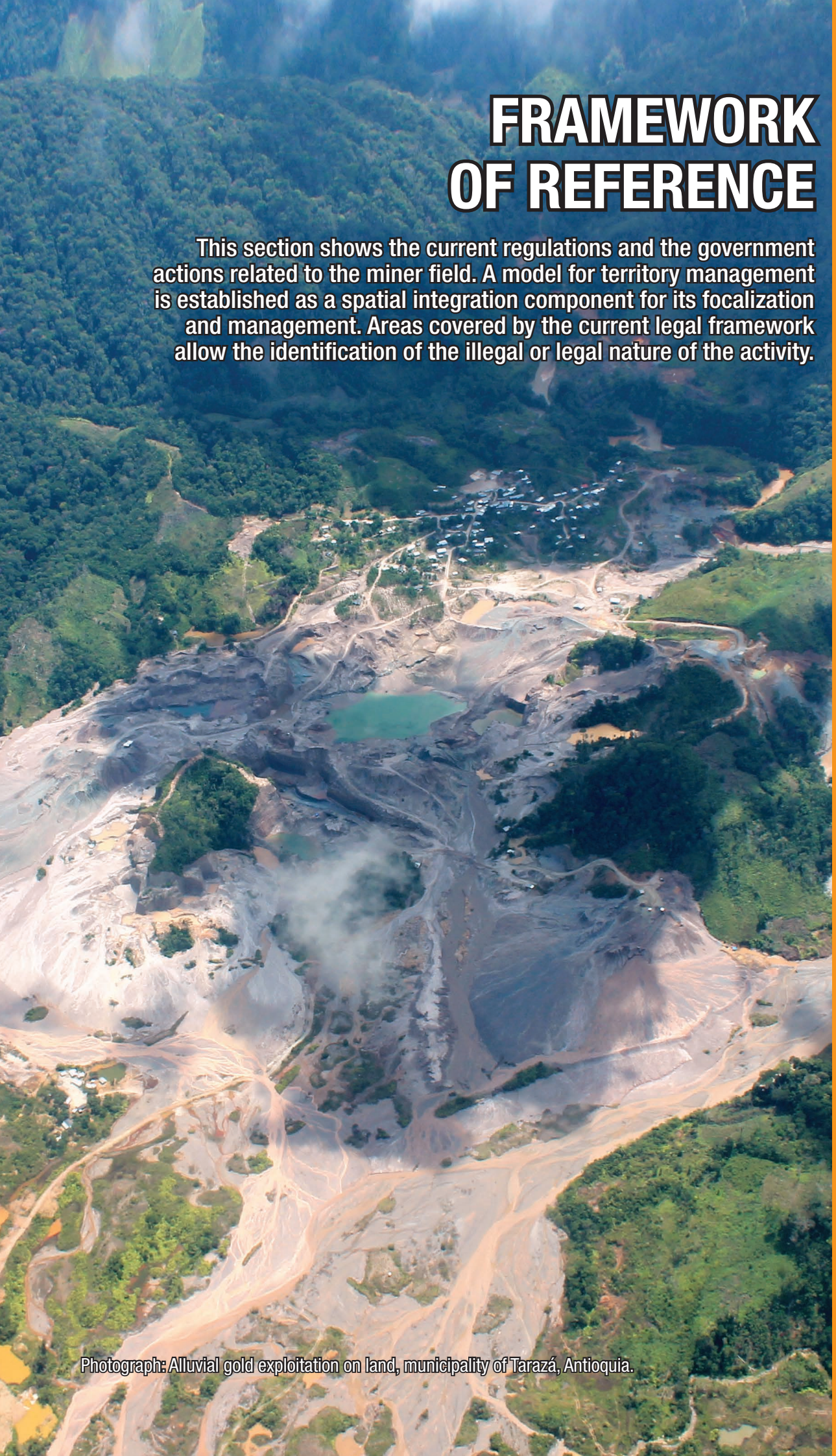
With this study, the government of Colombia and the UNODC seek to contribute to formulating public policies that will improve the social and economic conditions of regions affected by EVOA on land and in water. In the case of those that also demonstrate the presence of coca crops, the hope is to also contribute by sending an environmental alert to the national community, with all of this based on a robust research model for monitoring and designing solutions to these problems.

1 In this document the term "explotation" is used differently from "mining", according to the Ministry of Mines and Energy. First one is related to the benefit of minerals, while second one includes all legal requirements for carry it out.

SECTION I

# FRAMEWORK OF REFERENCE

This section shows the current regulations and the government actions related to the miner field. A model for territory management is established as a spatial integration component for its focalization and management. Areas covered by the current legal framework allow the identification of the illegal or legal nature of the activity.



Photograph: Alluvial gold exploitation on land, municipality of Tarazá, Antioquia.

# PREVENTION ACTIONS AND SUPPORT FOR CONTROLLING ILLICIT EXPLOITATION TAKEN BY THE MINISTRY OF MINES AND ENERGY

The national government recognizes the existence of this problem in the mining sector in different mining regions of the nation through its Ministry of Mines and Energy. Because of that, it began to take actions to control this illegal activity since 2014, supporting and coordinating the actions taken by the competent authorities in the area, in accordance with article 13 of Decree 381 dated 2012 related to the function designated as "Coordinating actions with institutions in the executive branch to control the illegal exploitation of minerals."

Actions to support the prevention and control of this scourge have been designed, planned, and implemented in the framework of the investment project "Controlling illegal exploitation," whose goal is to coordinate identifying, prioritizing, implementing, and executing activities to control illegal mining in Colombia. The activities defined and undertaken during project execution are connected with:

- Equipping and outfitting a center for information analysis, production, and interpretation for interventions and study material for the competent authority.
- Implementing a geographic information system to interpret georeferenced information related to the areas intervened by illegal exploitation.
- Recording georeferenced information for the areas identified as having this activity.
- Compiling, analyzing and generating reports on areas intervened by illegal exploitation.
- Identifying cases of illegal exploitation subject to the competent authority's operational intervention.
- Organizing campaigns to coordinate different institutions prevention and control actions.
- Implementing a plan to follow up on intervention actions with information from the identified areas.
- Supporting actions to coordinate developing prevention and operations to control illegal exploitation.

All of this is developed in the framework of the current policies and regulations for attending to this situation, with the purpose of stopping this activity's consequences in environmental, social, and economic terms, among others, while at the same time preventing its continued growth.

## Support Strategies Designed, Coordinated, or Developed by the Ministry of Mines and Energy and Other Institutions to Control Illegal Exploitation

The support actions implemented by the Ministry are technical, regulatory, and financial, and include inter-institutional coordination with the competent authorities. On its part, and based on this, two types of strategies have been defined: prevention and control. Prevention strategies include all the activities related to identifying, georeferencing, and monitoring regions affected by alluvial gold exploitation in order to generate alerts related to its spatial and temporal dynamics, in connection with areas that are stable, new, and expanding. In addition, a coordination mechanism was implemented with local, regional, and national entities through discussion tables and training

in the region, which share information about mining, commercial, administrative, environmental, and criminal regulations, and other regulations, to strengthen technical and legal aspects for competent authorities' decision-making to control this conduct.

In 2018, 12 training sessions and discussion tables were organized with national and local competent authorities and regional institutions, in the following Provinces:

**Table 1**. Training sessions organized by the Ministry of Mines and Energy with competent authorities

| Event | Province | Dates | No. Present |
|---|---|---|---|
| TRAINING | Antioquia | February 28th and March 1st, 2018 | 104 |
| | Atlántico | April 19th and 20th, 2018 | 90 |
| | Cauca | May 3rd and 4th, 2018 | 53 |
| | Tolima | June 5th and 6th, 2018 | 51 |
| | Valle del Cauca | August 23rd, 2018 | 67 |
| | Córdoba | September 13th and 14th, 2018 | 75 |
| | Riohacha | November 1st and 2nd, 2018 | 67 |
| | Putumayo | November 21st and 22nd, 2018 | 43 |
| DISCUSSION TABLES | Chocó | March 23rd, 2018 | 37 |
| | Santander | October 11th and 12th, 2018 | 45 |
| | Caquetá | October 26th, 2018 | 27 |
| | Nariño | November 15th, 2018 | 24 |

In terms of the focus of control, this Ministry strategically provided technical, financial, and administrative support, among others, for developing plans to intervene illegal mining to the National Police as the competent enforcement authority. For this purpose, the Colombian Air Force facilitated taking, processing, and analyzing images of the regions affected by this activity for the corresponding monitoring, investigation, and intervention. In addition, by providing detailed information from the sector to the Office of the Public Prosecutor General of the Nation, we supported the process to investigate criminals and criminal structures connected with this crime.

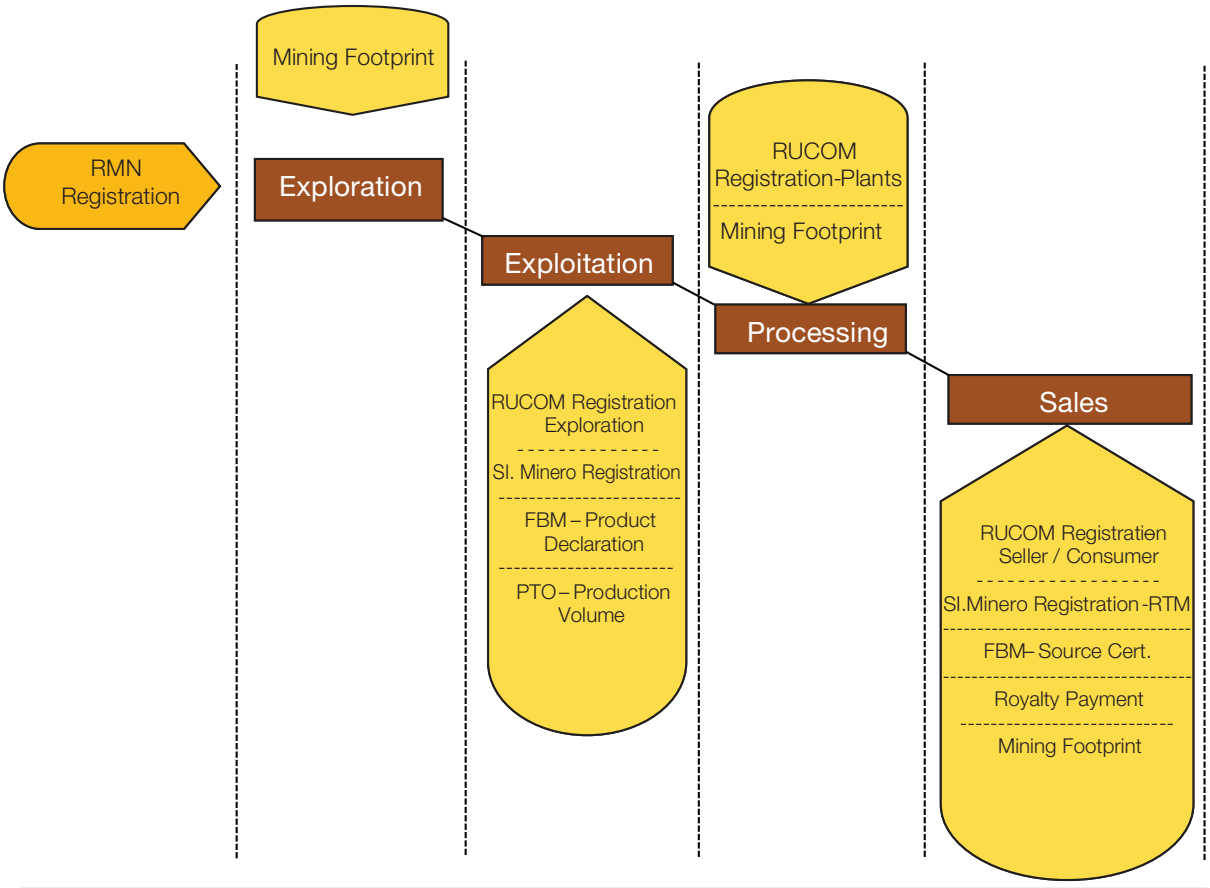
During the last 4 years, this coordination and support, provided to the National Police through different agreements, produced the following results related to the plan to intervene illegal mining operations:

**Table 2.** Results of the illegal mineral mining intervention plan

| Year | 2018 | 2017 | 2016 | 2015 |
|---|---|---|---|---|
| | Amount | Amount | Amount | Amount |
| **Actions** | | | | |
| Operations | 7 | 9 | 2 | 7 |
| Intervened mines | 31 | 51 | 31 | 33 |
| **Results** | | | | |
| **Decree 2235/2012 Destruction of Machinery** | | | | |
| Excavators | 25 | 28 | 29 | 10 |
| Dredgers | 21 | 25 | 2 | 10 |
| Motors | 18 | 8 | 0 | 0 |
| Motor pumps | 0 | 3 | 0 | 0 |

In accordance with the situation described above, a strategy was established to prevent and control this scourge throughout the mining chain in technical, administrative, commercial, and regulatory terms, which is consolidated below:

**Figure 1.** Illegal mining prevention and control strategy.



## Legislation

Decree 0381 dated 2012 modified the structure of the Ministry of Mines and Energy, creating the Vice-Ministry of Mines and the Provinces of Business Mining and Mining Formalization, establishing their functions.

In compliance with those functions and in accordance with the new institutional structure, the National Policy for Mining Formalization was adopted in 2014 by means of Resolution No. 90719 dated July 8th, 2014.

During 2016, however, the Ministry of Mines and Energy adopted the National Mining Policy by means of Resolution 40391 dated April 20th, 2016 which brought together and compiled the different existing policies and guidelines, becoming a single integrated mining policy for Colombia, which is now used to execute, among other things, the Mining formalization program on a national level.

**Table 3.** Current Regulations of the Ministry of Mines and Energy.

| TYPE OF REGULATION | NUMBER | DATE | DETAILS |
|---|---|---|---|
| General Regulations | | | |
| Law | 685 | 15/08/2001 | Mining Code. |
| Law | 1955 | 25/05/2019 | National Development Plan. |
| Decree | 1073 | 26/05/2015 | Unique Regulatory Decree of the Mining and Energy Administrative Sector. |
| Resolution | 40599 | 27/05/2015 | By means of which the Technical Mining Glossary was adopted. |
| Resolution | 40600 | 27/05/2015 | By means of which the technical mining requirements and specifications for presenting blueprints and maps applied to mining were established. |
| Resolution | 40391 | 20/04/2016 | By means of which the National Mining Policy was adopted. |
| Resolution | 143 | 29/03/2017 | By means of which the terms of reference for presenting the Minimum Exploratory Program and Works and Projects Program were adopted. |
| Resolution | 394 | 14/07/2017 | By means of which the minutes of the Unique Mining Concession Contract were adopted. |

| Illegal Exploitation of mining deposits | | | |
|---|---|---|---|
| Law | 685 | 15/08/2001 | **By means of which the Mining Code and other provisions were issued;** *Objectives. "This Code's public interest objectives are to encourage technical exploration and production of privately and state-owned mineral resources, stimulate these activities to satisfy the requirements of the internal and external demand for said resources, and for them to be mined in accordance with the rational production principles and standards for non-renewable natural resources and the environment, all within a comprehensive framework of sustainable development and economic and social strengthening for the country."* |
| | | | Illegal exploitation, according to the provisions of Law 685 of 2001 (the Mining Code), is defined as: |
| | | | "Article 159. Illegal Exploration and Exploitation. Illegal reserve exploration and Exploitation, criminalized in article 244 of the Code of Criminal Procedure, occurs when an exploration, mining or collection operation is performed on privately or state-owned property without the corresponding valid mining title or the authorization of said property's owner. |
| | | | In addition, this law establishes the competencies on controlling Illegal Exploitation as follows: |
| | | | "ARTICLE 306. MINING WITHOUT A MINING TITLE. Mayors will proceed to suspend exploitation without a mining title registered in the National Mining Registry at any time by law or due to any person's notification or complaint. This suspension will be indefinite and will not be revoked until the operators present said title. If the mayor neglects this measure after having received the notification or complaint, they will be sanctioned for serious infraction". |
| Code of Criminal Procedure, Law | 599 | 2000 | Whoever mines, explores or mines a reserve, sand, rocks or entrainment of riverbeds or river shores in ways that can seriously damage natural resources or the environment without permission from the competent authority or failing to comply with the existing regulations will be sentenced to prison for thirty-two (32) to one hundred and forty-four (144) months and a fine of one hundred thirty-three point thirty-three (133.33) to fifty thousand (50,000) legal minimum monthly salaries currently in effect. |

| | | | |
|---|---|---|---|
| Decision | 774 | 2012 | Establishes and adopts the “Andean Policy to Combat Illegal Mining.” |
| Decree | 723 | 2014 | By means of which measures to regulate, register and control importing and transporting the machinery classifiable in the subheadings were established and other provisions were dictated. |
| Decree | 2235 | 30/10/2012 | By means of which article 6 of Decision No. 774 dated July 30, 2012 of the Andean Community and article 106 of Law 1450 dated 2011 were regulated with respect to using heavy machinery and its parts in mining without the authorizations and requirements provided by law. |
| Law | 1801 | 29/07/2016 | National Police Code. TITLE X. MINING. CHAPTER I.<br>MEASURES FOR CONTROLLING ILLEGAL EXPLOITATION AND USUFRUCT. |
| Mercury Control | | | |
| Law | 1658 | Jul-13th | It established the provisions for selling and using mercury in the Country’s various industrial activities.<br>It set requirements and incentives for reducing them, and more. |
| Resolution | 1258 | May 19th, 2015 | By means of which the guidelines, environmental guide and terms of reference for the traditional mining formalization activities discussed in Decree 933 dated 2013 were adopted, and other determinations were made. |
| Resolution | 565 | April 18th, 2016 | “By means of which the requirements and procedures for the Mercury Users Registration – RUM was established for the mining sector:” From 2013 until the date the regulation was published, the Ministry of Mines and Energy supported the Ministry of Environment and Sustainable Development in formulating the document that regulates the mercury users registration for the mining sector. |
| Decree | 1421 | September 1st, 2016 | “By means of which the Unique Regulatory Decree of the Mining and Energy Administrative Sector, 1073 dated 2015, was amended and modified with respect to adopting measures related to Processing and Selling minerals, and the Unique Regulatory Decree on the Environment and Sustainable Development, 1076 dated 2015, was amended and modified with respect to environmental licensing for processing plants." |

| | | | |
|---|---|---|---|
| Decree | 2133 | 22/12/2016 | By means of which control measures were placed on importing and selling mercury and the products contain it in the framework of the provisions of article 5 of Law 1658 dated 2013: The Ministry of Commerce, Industry and Tourism, jointly with the Ministry of Mines and Energy, Ministry of Finance and Public Credit, Ministry of Health and Social Protection and the Ministry of Environment and Sustainable Development, actively participated in developing this regulatory document, which established aspects regarding importing and selling mercury, such as: the Unique National Register of Authorized Importers and Sellers, import quotas and management, previous authorizations, sales and transitional provisions, among others that are especially of interest for the mining sector. |
| Resolution | 130 | January 24th, 2017 | By means of which the requirements and procedure for the Unique National Register of Authorized Importers and Sellers (RUNIC) was established. |
| Law | 1892 | May 11th, 2018 | By means of which the "Minamata Convention on Mercury, held in Kumamoto (Japan) on October 10, 2013" was approved. |
| CAN Decision | 844 | 26/05/2019 | Created the Andean Observatory responsible for the Management of Official Information on Mercury. |
| Mining Formalization | | | |
| Resolution | 1258 | 2015 | This Resolution was promoted alongside with the Ministry of Environment and Sustainable Development. It contains the environmental Guide for formalizing traditional mining. |
| Decree | 480 | 6/03/2014 | 2014 "*By means of which the conditions and requirements for entering into and executing mining formalization subcontracts was regulated:*" This document was developed jointly with the Ministry of the Environment and Sustainable Development to regulated article 11 of Law 1658 dated 2013 and, in this manner, *"…drive and consolidate the formalization of mining, especially that of small scale gold miners…"* |
| Resolution | 414 | 27/06/2014 | By means of which the terms of reference for preparing Work Programs and Complementary Works (PTOC) for the Mining Formalization Subcontracts were adopted. |

| | | | |
|---|---|---|---|
| Law | 1753 | June 9th, 2015 | By means of which 2014 - 2018 National Development Plan “Everyone for a New Country” was issued. This law, in which all of the State’s governing bodies participated, allowed the sector to classify mining as being legally continuous, small, medium and large. Furthermore, it established goals for green growth that promote technological development and innovation for strengthening national competition. These aspects clearly aligned with the Ministry of Mines and Energy’s strategies for eliminating mercury. |
| Resolution | 546 | 20/09/2017 | By means of which the administrative procedure for declaring and delimiting Special Reserve Areas for mining communities was established. |
| Decree | 1949 | November 28th, 2017 | “By means of which Unique Regulatory Decree No. 1073 dated 2015 was modified and amended. It regulated the mechanisms for work under a mining title in small scale mining, and other determinations were made." |
| Mining Classification | | | |
| Law | 1753 | 9/06/2015 | By means of which the 2014 – 2018 National Development Plan “Everyone for a New Country” was issued. This law, in which all of the State’s governing bodies participated, allowed the sector to classify mining as being legally continuous, small, medium and large. Furthermore, it established goals for green growth that promote technological development and innovation for strengthening national competition. These aspects clearly aligned with the Ministry of Mines and Energy’s strategies for eliminating mercury. |
| Decree | 1666 | 21/10/2016 | By means of which Unique Regulatory Decree of the Mining and Energy Administrative Sector, 1073 dated 2015, related to classifying mining, was amended. |
| Decree | 2504 | 23/12/215 | By means of which Unique Regulatory Decree No. 1073 dated 2015, which defined the technical, technological, operational and administrative aspects for performing differential oversight on mining was amended, and other determinations were made. |
| Decree | 1975 | 6/12/2016 | By means of which the Unique Regulatory Decree of the Mining and Energy Administrative Sector, 1073 dated 2015, was amended in terms of the integration of areas and extension of concession contracts. |

| | | | |
|---|---|---|---|
| Resolution | 41265 | 27/12/2016 | By means of which the parameters and conditions for exercising the preferential right discussed in article 2.2.5.2.2.13 of Decree 1975 dated 2016, "By means of which Unique Regulatory Decree of the Mining and Energy Administrative Sector, 1073 dated 2015, was amended in terms of the integration of areas and extensions of concession contracts" were established. |
| Resolution | 40103 | 9/02/2017 | By means of which the maximum production volumes of subsistence mining were established.<br>Objective: to establish the maximum monthly and annual production volumes for subsistence mining. |
| Control Mechanisms for Mineral Trading | | | |
| Law | 1450 | 16/06/2011 | 2010- 2014 National Development Plan. Article 112 established control measures for mineral trading. It created a list of mining title-holders that have permission to mine and trade minerals. |
| Decree | 2637 | December 17th, 2012 | "By means of which article 112 of Law 1450 dated 2011 was regulated." |
| Decree | 276 | February 17th, 2015 | "By means of which measures related to the Unique Seller Registration (RUCOM) were adopted." |
| Decree | 1073 | 26/05/2015 | Unique Regulatory Decree of the Mining and Energy Sector, Title V, Chapter 6, Section 1. It created and regulated the Unique Mineral Seller Registration (RUCOM), the persons obligated to register, its functioning and follow-up and sanctions. |
| Decree | 1421 | 1/09/2016 | By means of which the Unique Regulatory Decree of the Mining and Energy Administrative Sector, 1073 dated 2015, was amended and modified with respect to adopting measures related to Processing and Selling minerals, and the Unique Regulatory Decree on the Environment and Sustainable Development, 1076 dated 2015, was amended and modified with respect to environmental licensing for processing plants. |
| Decree | 1102 | 27/06/2017 | By means of which the Unique Regulatory Decree of the Mining and Energy Administrative Sector, 1073 dated 2015, was amended and modified with respect to adopting measures related to Selling Minerals. |

| Mining Safety and Hygiene Regulations | | | |
|---|---|---|---|
| Decree | 2222 | 5/11/193 | By means of which the Open-pit Mining Works Safety and Hygiene Regulation was issued. |
| Decree | 35 | 10/01/1994 | By means of which provisions in terms of mining safety were stated. |
| Decree | 1886 | 21/09/2015 | By means of which the Underground Mining Works Safety Regulation was established. |
| Decree | 1949 | 28/11/2017 | By means of which Unique Regulatory Decree No. 1073 dated 2015 was modified and amended. It regulated the mechanisms for work under the protection of a title in small scale mining and made other determinations. |
| Resolution | 352 | 4/07/2018 | By means of which the criteria for evaluating the economic capacity of concession contract requests, assignment of rights and assignment of areas discussed in article 22 of Law 1753 dated 2015 were set. Resolution No. 381 dated November 27th, 2015 was revoked, and other provisions were made. |

# FROM A STATISTICAL MANAGEMENT MODEL TO A MONITORING MODEL BASED ON TECHNICAL EVIDENCE

Around 2011, the Ministry of Mines and Energy conducted a mining census aimed at learning about technical, socioeconomic, organizational and administrative conditions, and, in general, all aspects that in one way or another form a part of mining operations in each of the Provinces covered by the census. Relative to the characterization of illegal mining, as the document specifies, the methodological process consisted of obtaining information from different entities regarding the processes they undertook with respect to illegal mining. Subsequently, the illegal mines were located (using coordinates) with cartographic information provided by the Agustín Codazzi Geographic Institute – IGAC. Lastly, as part of the survey on Mining Production Units (UPM for the Spanish original), whether or not a mining title existed was determined to thus categorize the activity as illegal.

This exercise allowed quantifying and locating illegal mines by UPM in each mineral-producing Province that was surveyed, obtaining the total for this activity in 23 Provinces of the country. Although this work managed to obtain approximate basic information regarding the presence of illegal mines in these producing regions, it was not possible to develop a baseline for this problem based on those results, bearing in mind that the methodology failed to completely cover the national territory and failed to determine areas affected on a spatial level, as minimum components for characterizing the situation of this illegal activity in the sector.

Therefore, keeping the accelerated growth and expansion of this phenomenon to new regions in mind, government authorities were interested, generating special attention. For that purpose, as of 2014 the Ministry of Mines and Energy began taking actions to support the competent authorities in their efforts to control this problem area by formulating and executing the investment project “Controlling illegal exploitation Colombia” to identify areas affected by alluvial gold exploitation on land by adopting a national monitoring and follow-up system. The system was designed by the UNODC and the national government in 2015, and made it possible to continue establishing evidence of illegal mining and therefore a baseline, in order to prioritize target areas for intervention, optimizing control actions.

This monitoring system, which presents its results in this document, includes a series of pinpoint analyses of the dynamics of this scourge using machinery on land, such as areas affected in environmental and forest reserves, national natural parks, areas where mining is restricted or excludable, community councils, and other types of areas, based on the integration and crosschecking of information. Multitemporal analyses were also performed, determining the evolution of this activity in terms of stable and new areas, as well as studies to develop a baseline of evidence of gold exploitation on water using machines based on spectral indices, which began in 2016 with a case study developed for one part of the Apaporis River presented in the publication of results in 2018.

## Management in the Territory

Colombia's geographic, cultural and biophysical diversity are significant features in the territory's composition. These characteristics create a need to organize the country in such a way that any activity is formulated and performed in accordance with its particular realities, generating economic growth, progress and sustainability. On the other hand, the current issues in regions, such as poverty, the population's displacement, difficult access to markets and armed forces, among others, create a variety of conditions in each region that are sometimes suitable for establishing illegal activities, such and illegal mining.

Territorial management allows having a comprehensive outlook that facilitates locating specific activities, such as EVOA in this case, and also facilitates the Government's actions in terms of controlling, regulating and monitoring said activity. In this sense, a land-use planning model was designed that involves the geographic dimension of the different technical and environmental permits and other current provisions of the law that regulate the activity. In addition, it includes strategically and environmentally important categories that will facilitate monitoring the activity and decision-making with technical evidence in accordance with the particularities of each geographic space. The result is a useful tool for designing strategies aimed at planning the resource's use and controlling and monitoring the activity.

The methodology prioritizes regions according to the current regulations for mining in the country - Law 685 dated 2001, by means of which the Mining Code was issued. Regions are classified using 1 km2 grid areas as a basis. Each grid is assigned a single category depending on its location, jurisdiction in special management areas and other factors. According to regulations, there are several essential regional institutions for mining. Some are exclusive, such as National Natural Parks, and others, such as urban perimeters, have restrictive conditions.

In the combined national figures, 50% of the regions are in an exclusive category and 3,4% are in a restrictive category. In terms of other categories, such as environmental categories, 5.6% are not included in the regulation. The remaining 533,392 km2 have no associated category. However, 5% of them are under some area covered by the current legal framework. The national outlook on exclusion and restriction and its distribution in Colombia is presented below.

### Excludable Mining Areas

These are established in the National System of Protected Areas. These areas make up the National Natural Park System, Regional Natural Parks, Forest Reserve Areas, páramo (highland) ecosystems and the wetlands included in the Ramsar Convention. National Natural Park areas and regional Natural Parks cannot be authorized for mining exploitation. However, in the case of forest reserve areas, mining processes may be carried out for the mining authority to authorize performing these activities in a restricted manner.

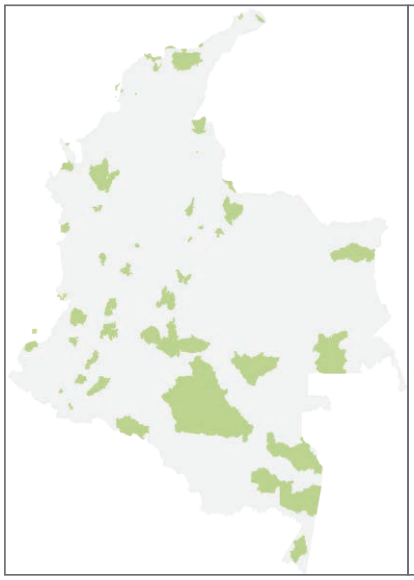
*Excluded Mining Areas*
*In accordance with the Mining Code, art. 34, no exploration or exploitation work or projects may be performed in areas declared and delimited according to the current regulations as protected areas and areas for developing renewable natural resources or the environment.*

In Colombia, 12%[2] of the territory has National Natural Park (PNN) jurisdiction, but the percentage reaches 50% of the country's total area when all special management institutions are added to this figure. The spatial distribution of areas excludable from mining in Colombia is presented below.

**Figure 2.** National distribution of excludable mining areas

**National Natural Park**

(26% of all excludable mining areas)



Includes National Natural Parks, Unique Natural Areas, Flora and Fauna Sanctuaries and Natural Monuments.

**Regional Natural Park**

(1% of all excludable mining areas)

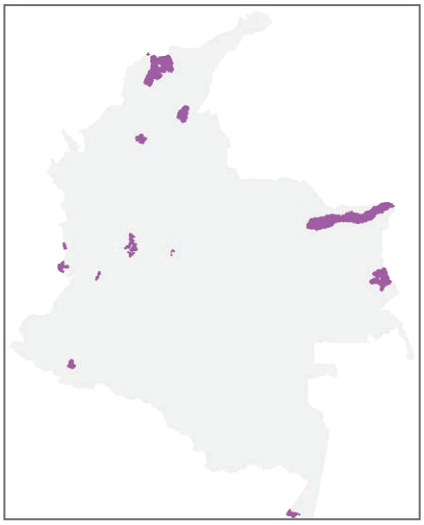
**Forest Reserve Area**

(67% of all excludable mining areas)

Includes forest reserve areas by secondary law, areas for the protection and development of renewable natural resources, urban wetland areas, protective national, regional and productive forest reserves, and protected marine areas.

**Ramsar Sites**

(3% of all excludable mining areas)

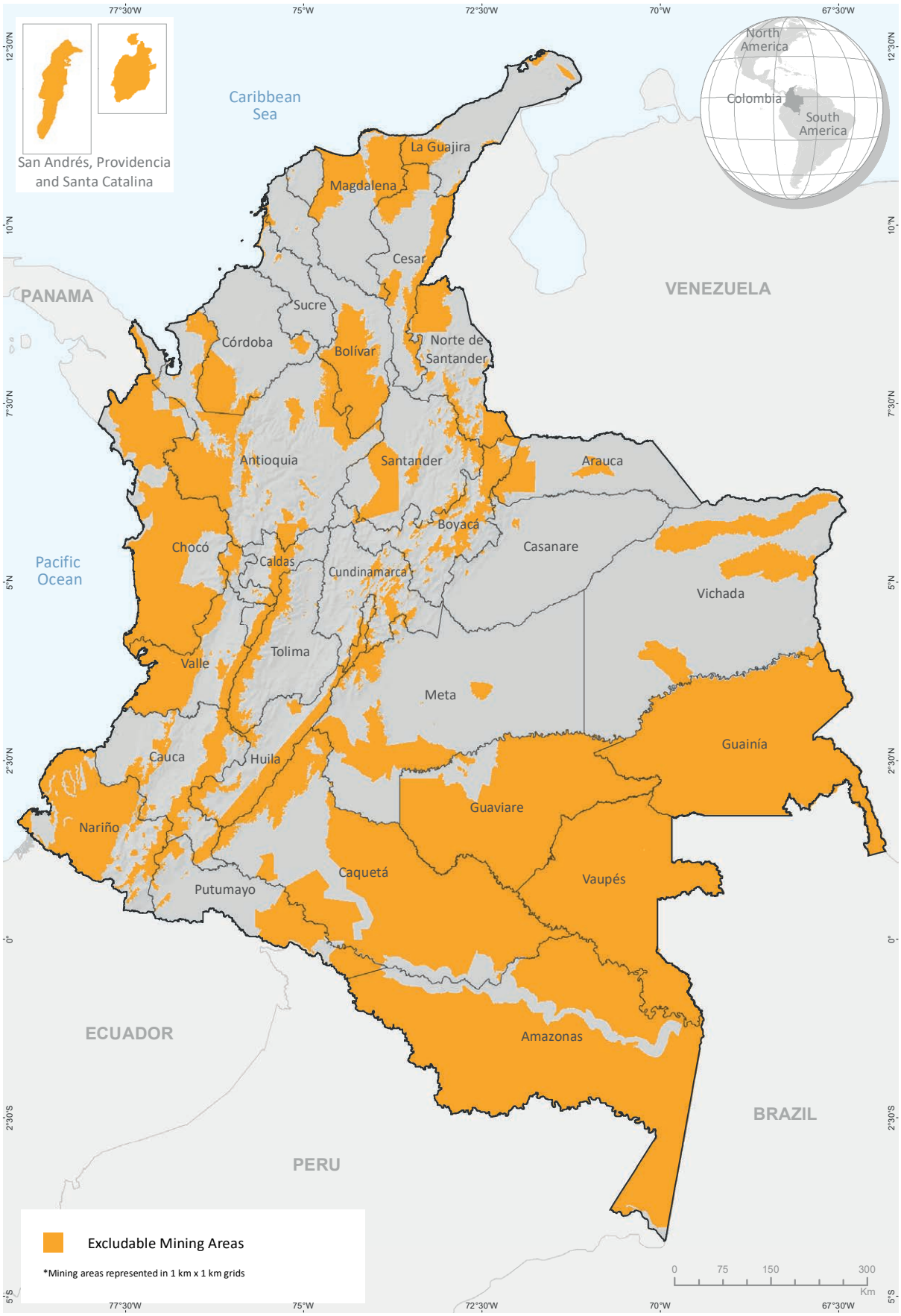


**Páramo Areas**

(3% of all excludable mining areas)

2 The percentage is calculated based on the SIMCI project's framework of areas.

## Map 1. Excludable mining areas in Colombia, 2018.




Source: Government of Colombia – Monitoring system supported by the UNODC
The borders, names and titles used in this map do not represent the United Nation's recognition or acceptance.

## Restricted Mining Areas

These are the areas established in the Mining Code (art. 35), and include urban perimeter areas in cities or towns, areas occupied by rural constructions[3] under their owners' consent; areas defined as special archaeological, historical or cultural interest areas, beaches, low tide areas, river channels used by public transportation companies, areas occupied by a public work or ascribed to a public utility, as long as it is not incompatible with the activity, and areas defined as indigenous, black or mixed community mining areas, as long as the corresponding community authorities did not exercise their preferential right to obtain the mining title to explore and mine within the term indicated to them.

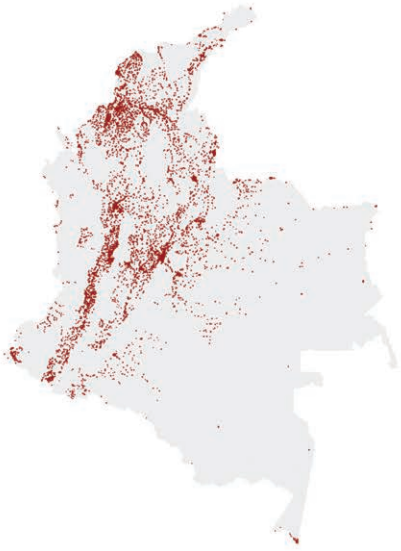
In national figures, 3.2% of Colombia has some restriction to mining. The urban perimeter of cities or towns[4] category makes up 50% of the total area with restrictions. Public utility areas make up 25% of it, and mining areas in indigenous and black community reserves make up 24% of it. Finally, areas of archaeological interest and low tide areas are the remaining 1% of restricted areas in the country.

3 There was no access to primary information on the areas occupied by rural constructions.
4 The geographic land cover of populated centers corresponds to: official information of the Agustín Codazzi Geographic Institute, map scale 1:100,000.

**Figure 3.** National distribution of restricted mining areas

**Urban perimeter of cities or towns**

(50% of all restricted mining areas)



**Mining areas in indigenous and black community reserves**

(24% of all restricted mining areas)

**Areas occupied by a public work**

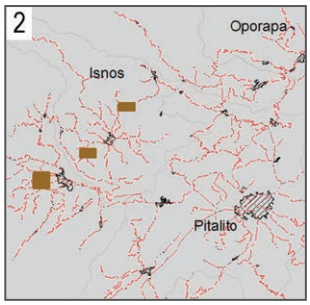
(25% of all restricted mining areas)

**Areas defined as special archaeological, historical or cultural interest areas or low tide areas**

(0.1% of all restricted mining areas)



Tierradentro Archaeological Park - sites: Alto de Segovia, Alto de San Andrés, Alto del duende, El Tablón, Alto del Aguacate

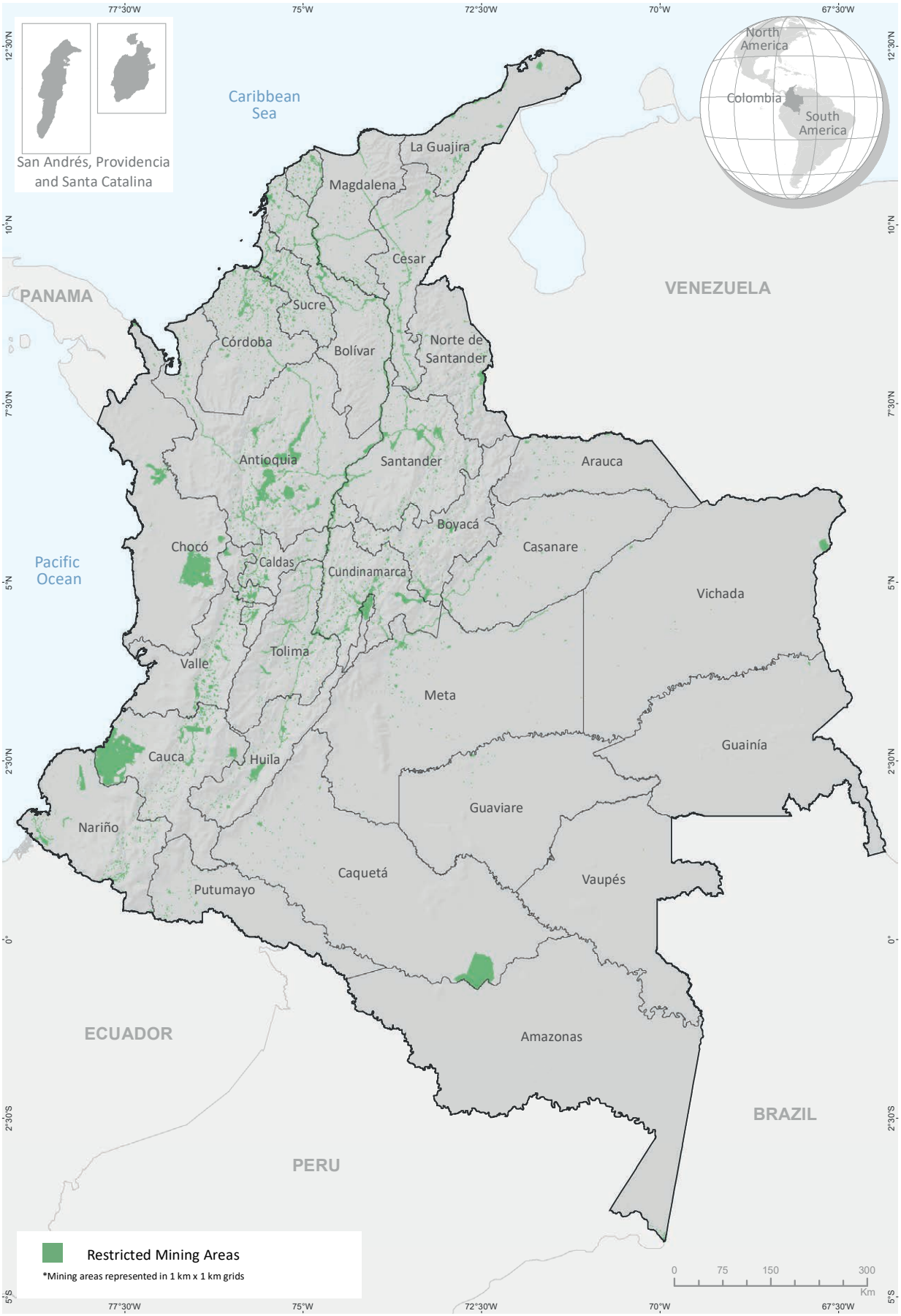



San Agustín Archaeological Park Sites: Alto de las Piedras, Alto de los Ídolos


Agualinda - Los Vados Archaeological Area


Beach and low tides areas - Puerto Brisa S.A.

## Map 2. Restricted mining areas, 2018.




Source: Government of Colombia – Monitoring system supported by the UNODC
The borders, names and titles used in this map do not represent the United Nation's recognition or acceptance.

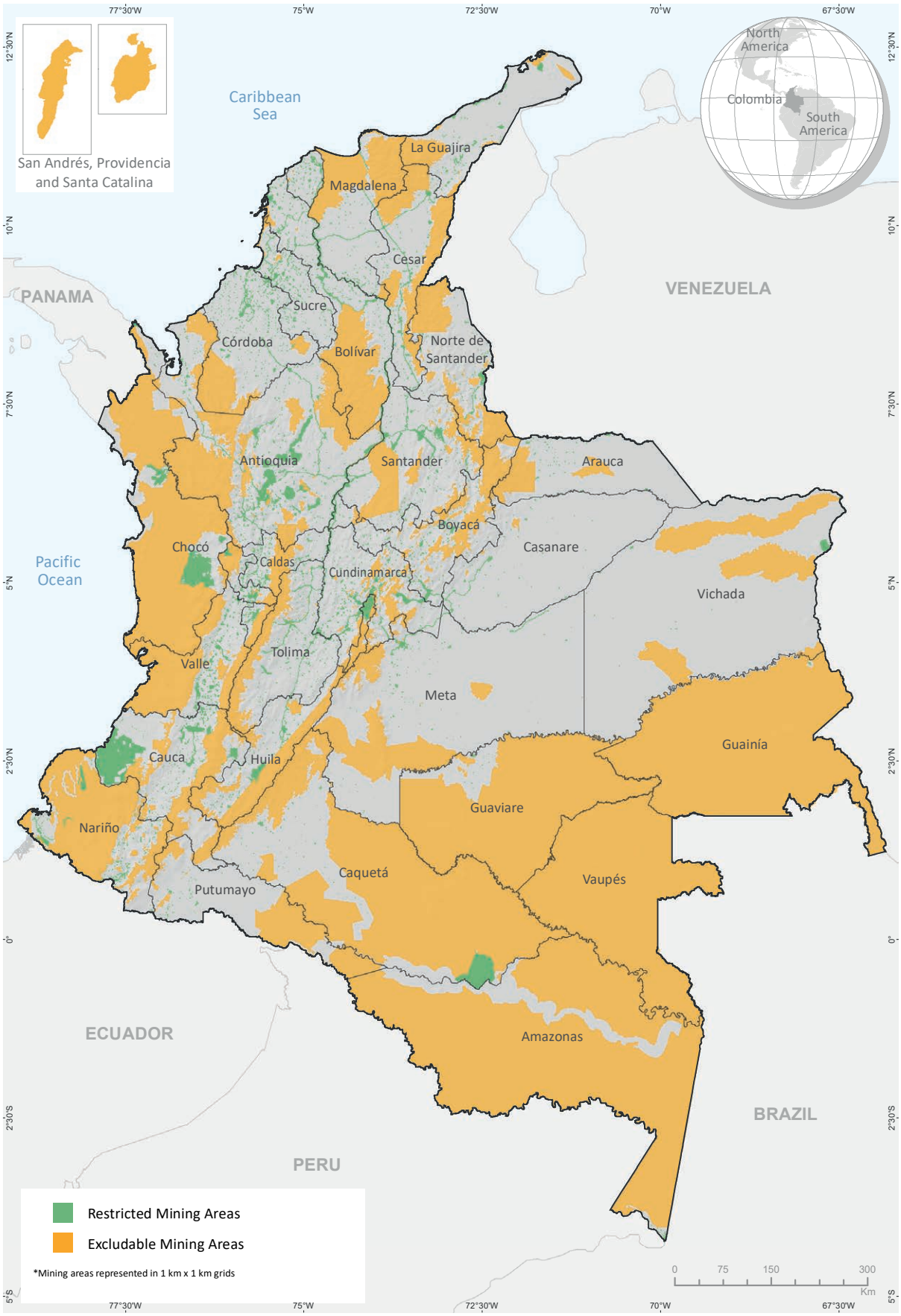
Areas with excludable and restricted mining were integrated into 1 km2 grids by means of a ranking. One grid can include more than one category (for example, PNN and community mining areas at the same time), but this grid must be ranked as exclusion by National Park in the combined national figures. According to the above, the types of the base of the pyramid lose territory if they are within a higher level of the pyramid. The developed ranking is presented below.

**Figure 4.** Ranking model for the integration into the UNODC's grid framework.


**Table 4.** Distribution of the territory in accordance with the management model.

| Name | Territory ($Km^2$) | Percentage with Respect to the National Territory |
|---|---|---|
| Excluded Mining Areas | 572,507 | 50.0 % |
| Restricted Mining Areas | 38,594 | 3.4 % |
| Free Awarded or Requested Areas | 25,170 | 2.2 % |
| Free Areas | 508,222 | 44.4 % |
| **Total** | 1,144,493 | 100 % |

## Map 3. Excludable mining areas and restricted mining areas in Colombia, 2018.




Source: Government of Colombia – Monitoring system supported by the UNODC
The borders, names and titles used in this map do not represent the United Nation's recognition or acceptance.

## Areas covered by the current legal framework

The methodology used to detect EVOA does not seek to characterize the legality of alluvial gold exploitation. However, the Colombian regulatory framework gives mining certain particularities and scopes that must be observed in order to obtain a territorial vision of this phenomenon. This scope seeks for the competent institutions in charge of formulating public policy and handling, managing and controlling resources to have objective information that allows them to improve the characterization of the phenomenon and, because of that, the comprehensive view of the affected territory, to focus on the different enabled interventions in accordance with the territories' particularities.

The research covers the relationships between EVOA and areas covered by the current legal framework[5], which count as official sources of the National Mining Agency – ANM and the National Authority for Environmental Licenses – ANLA. The ANM is the institution in charge of managing State-owned mineral resources efficiently, effectively and transparently by encouraging, promoting and granting titles, and following up on and controlling mining exploration and production to maximize the sector's contribution to the country's comprehensive and sustainable development [1]. In this context, the study has official information from the ANM that refers to Protection of Titles, Contract Proposals, Formalization Requests and special reserve areas.

When it comes to the ANLA, it is the institution in charge of making sure projects, works or activities subject to environmental licensing, permits or proceedings comply with environmental regulations in order to contribute to the Country's environmental sustainable development (Decree 3573) [2]. Therefore, there is information on environmental licensing. However, it is necessary to note that the ANLA's System has not been duly updated by the other institutions with the power to grant environmental licenses. In this sense, the resulting information and geographic analyses must be interpreted prudently.

***Environmental Licensing Competencies/ Jurisdiction***

*In the framework of the current regulations for exploiting metallic minerals and precious and semi-precious stones, environmental licensing falls upon the competency of the National Authority for Environmental Licenses – ANLA when the total projected removal of useful and sterile material is greater than or equal to two million (2,00,.000) tons a year and the competency of Regional Autonomous Corporations, Sustainable Development institutions and the environmental authorities created by means of Law 768 dated 2002 when the total projected removal of useful and sterile material is less than two million (2,000,000) tons a year. (Decree 1076 dated 2015). In every case, the granted environmental licenses must be reported to the ANLA's general System.*

### *Environmental Licenses*

Authorizations granted by the competent environmental authority by means of an administrative order to a person to execute a project, work or activity that, in accordance with the Law and regulations, can seriously deteriorate renewable natural resources or the environment, or introduce considerable or noticeable modifications to the landscape. They establish the requirements, obligations and conditions that the Environmental License's recipient must meet to prevent, mitigate, correct, compensate and manage the authorized project, work or activity's environmental effects (Decree 1753 dated 1994, article 2).

5 For the purposes of this study, areas covered by the current legal framework are understood to be any aspect of exploitation regulations with geographic attributes and regulated conditions that can be ascribed to a territory.

### *Exploration and Exploitation Titles (i.e. "Amparo de títulos")*

The Mining Code defines mining titles as documents in which the right to explore and mine the soil or subsoil is granted. Mining titles are classified as: i) Exploration and exploitation licenses, ii) mining contributions, and iii) mining contracts [3].

### *Special Reserve Areas*

These are areas where there is traditional, informal mining. These areas, by request of a mining community, have been delimited so that no new proposals on all or some of the minerals located in said areas are temporarily accepted.

Special Reserve Areas (AREs) are delimited and declared to prepare geological mining studies that allow identifying areas' potential for developing strategic mining projects for the country. The National Mining Authority finances said studies.

In the event the studies demonstrate geological mining potential, a special concession contract is entered into with the benefitting mining community. Otherwise, a reconversion project is proposed, which consists of offering the community a process for coordinating with competent authorities to seek labor reconversion for miners and environmentally and socially restructure said area [4].

### *Contract Proposals*

The requests presented by individuals to the State to enter into a mining concession contract to execute exploration studies, work and projects on state-owned minerals in places where no mineral deposits and/ or reserves have yet been mined [5].

### *Formalization Requests*

Requests made by persons mining state-owned minerals without a mining title registered in the National Mining Registry, who started mining the mineral deposits and/ or reserves before August 17th, 2011 [6].

### *Law 685 dated 2001*

The formalization of mining exploitation by means of concessions to miners who are mining state-owned resources without a title registered in the National Mining Registry is contemplated in this framework. While the formalization request presented by those mining state-owned minerals without a mining title registered in the National Mining Registry has not been resolved by the delegated, competent mining authority, exploitation may not be suspended, the mined resources may not be confiscated and the legal actions discussed in article 338 of Law 599 dated 2000 (Code of Criminal Procedure) may not be taken. The above in notwithstanding the actions that are applicable in light of the current environmental regulations [7].

### *Decree 0933 dated 2016*

On the other hand, under the provision of Law 1382 dated 2010[6], article 12 contemplated formalization by means of a concession to the miners, groups and traditional mining associations with operations on state-owned property who do not have titles registered in the National Mining Registry, as long as the requested area is free to be contracted out and they can accredit to have continuously operated since before Law 685 dated 2001 came into effect, completing the form and content requirement. However, it is worth mentioning that, as of 2016, the valid processes under this modality were suspended and persons requesting formalization can no

6 Law 1382 dated 2010 ammended Law 685 dated 2001 and granted a term of two years for traditional miners to request their formalization. They were then granted a mining concession contract as a result of a procces to verify the traditionality of their mining. Said regulation was regulated by Decree 1970 dated 2012.

longer mine. In turn, the title-holders on concession contracts, where it may apply, must interpose the respective administrative safeguards in order to prevent illegal exploitation in their contracted area.

## Monitoring Model

In order to improve their understanding of alluvial gold exploitation, the Ministry of Mines and Energy and the United Nations Office on Drugs and Crime joined forces and knowledge to develop a monitoring model that allows establishing the magnitude of the problem, focus interventions and follow up on them based on the study of the phenomenon's geography.

The basic element of monitoring is detecting evidence of alluvial gold exploitation (EVOA). This is done with remote sensing tools that allow identifying landscape alterations that occur as a consequence of alluvial gold exploitation.

In the case of exploitation using machinery on land (EVOA on land), said alterations correspond to a loss of plant cover and soil, changes to the terrain and the formation of types of landscapes with mines and settling ponds that have such dimensions that they are visible to the naked eye. In the case of exploitation with machinery on water (EVOA on water), alterations refer to temporary changes in the natural flow of river sediment where the activity was performed. These changes are associated to removing the materials deposited in the riverbed while exploitation is ongoing.

*Concepts:*

*EVOA on land: a footprint or sign detected by digitally interpreting and processing satellite images that is characterized by an alteration to the landscape in alluvial regions.*

*EVOA on water: a footprint or sign detected by spectral indices in satellite images that is characterized by an alteration to the suspended sediment in the body of water.*

In both cases, remote sensing applications allow building a layer of EVOA, covering the entire national territory[7], based on which it is possible to locate and quantify the alterations that correspond to a specific moment in time. That is to say, it is possible to incorporate a geographical dimension into the alluvial gold exploitation analysis, not only to measure magnitudes, but also to target them, based on detecting EVOA.

One of the main advantages of having a national layer of EVOA lies in the possibility of using the geographic information systems to integrate information. The document emphasizes three large groups of information: the administrative records on mining (particularly those that refer to the mechanisms authorized by regulations), illicit crops and territory conditions, particularly in terms of the degree of restriction on mining (excludable and restricted areas).

It is important to mention that the database feeds off of the geographic information that has been developed in the framework of monitoring illicit crops and incorporates additional specialized information on mining. The integration is based on the framework of SIMCI areas, a system of 1 km * 1 km grids that facilitates integrating and analyzing geographic information.

7 This study includes detecting alerts due to EVOA on water in five important rivers located in the Amazon and Orinoco regions. However, the model applies to rivers in the entire national territory with a minimum width of 45 meters in accordance with the methodological scope in terms of pixel size.

Integrating geographic information is useful not only because of the possibility of adding information on other dimensions, but also due to the opportunity there is to know the full story. In this sense, a historical series with great potential for monitoring the phenomenon is developed. The baseline of EVOA on land in Colombia corresponds to 2014. It was first updated in 2016, and now the status corresponding to 2018 has been presented. Creating a historical series is a fundamental element for monitoring. Not only is this to focus actions on affected areas, but also to identify the way territories evolve after an intervention.

Studying the phenomenon based on geography allows understanding the phenomenon's particularities according to the territories and proposes designing public policy strategies that consider both the phenomenon's characteristics and those of the affected territories.

The government of Colombia has several tools for facing the issue of unauthorized alluvial gold exploitation. Selecting the best tool to solve the problem depends on the territory's condition. For example, formalization tools can only be used outside of excludable areas. The monitoring model seeks to offer policy and strategy designers elements to improve their efficiency and efficacy.

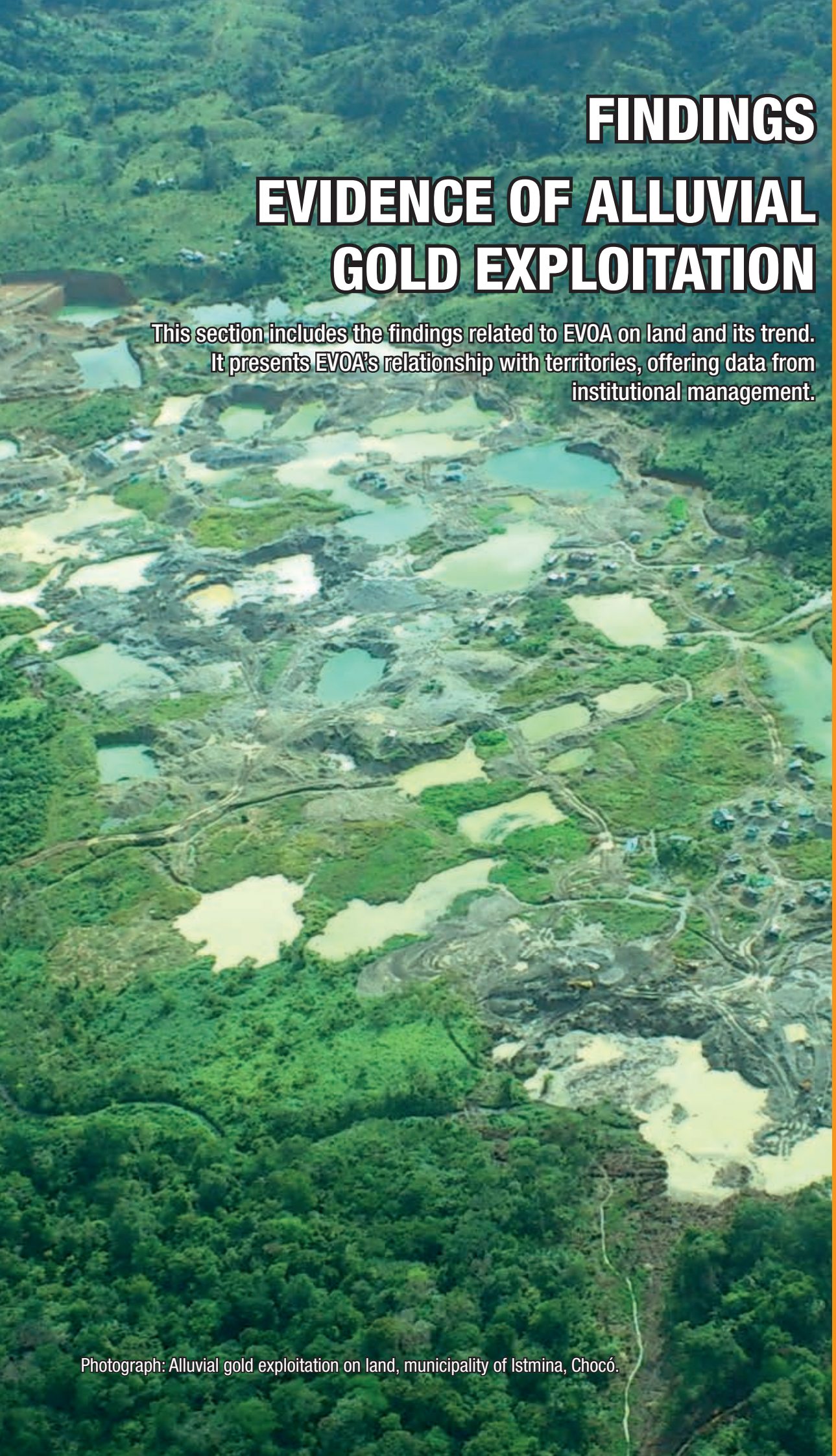
It is important to mention that public policy applications do not restrict direct action on EVOA; they restrict the integration of mining into development and land-use planning. Programs related to health, the environment, best mining practices and controlling illegal activities can improve their targeting strategies based on incorporating the geographic component that EVOA detection offers and is available through the monitoring system. In this sense, one of the challenges towards the immediate future is facilitating access to information.

SECTION II

# FINDINGS

# EVIDENCE OF ALLUVIAL GOLD EXPLOITATION

This section includes the findings related to EVOA on land and its trend. It presents EVOA's relationship with territories, offering data from institutional management.



Photograph: Alluvial gold exploitation on land, municipality of Istmina, Chocó.

This chapter covers the findings identified from monitoring the entire national territory for EVOA on land and the EVOA baseline on water identified for five rivers (Putumayo, Caquetá, Apaporis, Guainía and Amazonas). In this sense, it is necessary to highlight the reading and interpretation of the results for EVOA on water, since the study exclusively addresses the mentioned rivers[8]. The first part develops findings regarding EVOA on land for 2018 and continues with the findings regarding EVOA on water for identifying the negative effects on the study framework[9] in the national territory.

## EVOA and Territory

Observing territories' particularities contributes to improving knowledge on the dynamics within them and targeting efforts. Above all, it contributes to designing specific strategies for facing problems in these territories. The results for areas excludable from mining, restricted mining areas and free areas are presented in accordance with the classification for territory management.

### Excludable Mining Areas

Areas in which the Law[10] expressly states that mining exploration or production work cannot be performed are considered excludable areas. These territories correspond to areas declared and delimited in accordance with the current regulations as protected areas and areas for developing renewable natural resources or the environment and correspond to: The areas that make up the National Natural Park System[11], regional natural parks, other areas of the SINAP National System of Protected Areas[12], protective forest reserve areas, natural resource or environmental protection or development areas, páramo ecosystems, and wetlands designated within the Ramsar Convention's list of wetlands of international importance[13]. It is worth indicating that no EVOA was identified in Regional Natural Parks and Páramo Ecosystems.

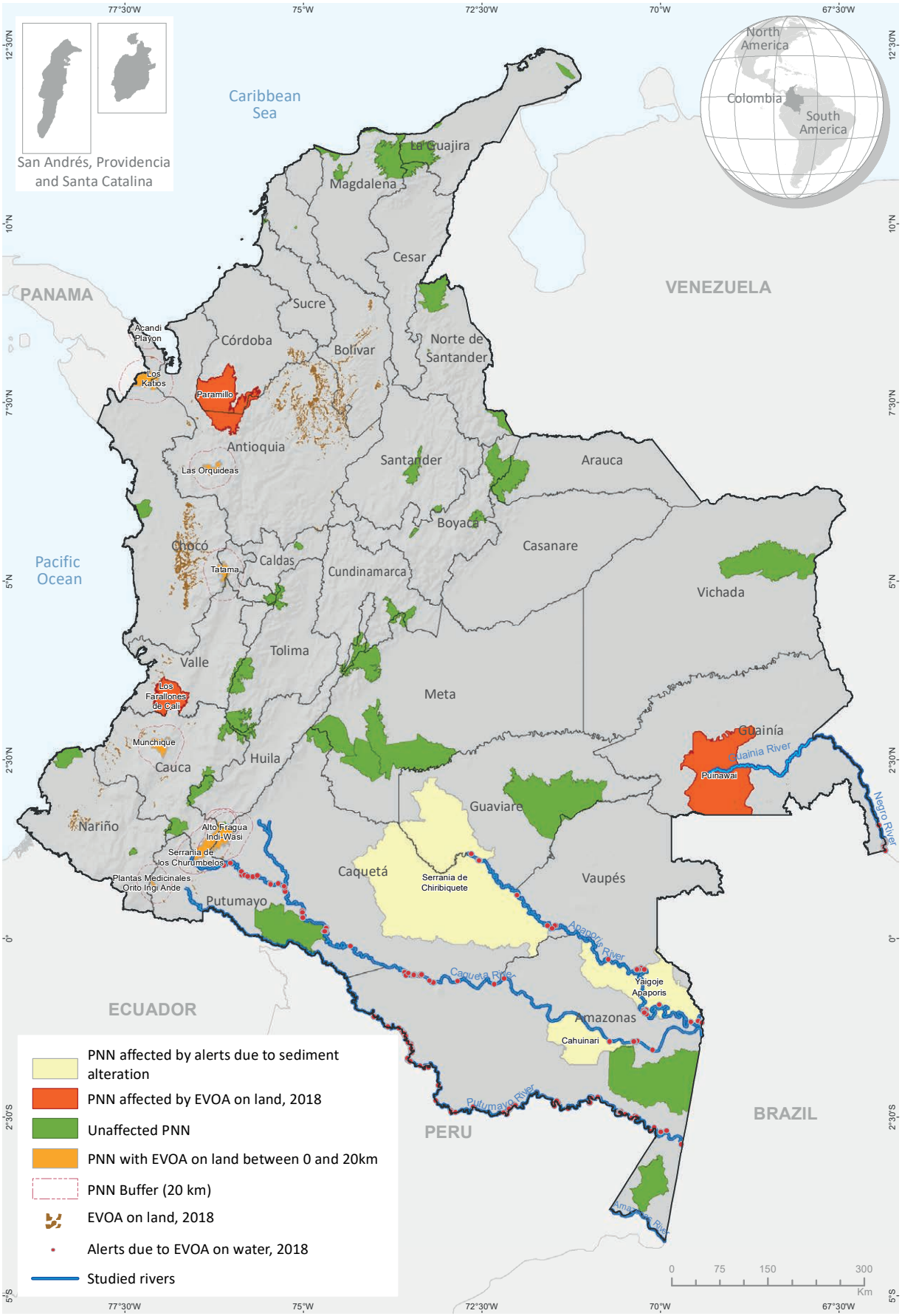
As of 2018, 47,670 ha of EVOA on land were detected in these areas. This figure corresponds to 52% of the total amount identified for this period[14]. The most affected category corresponds to Forest Reserve Areas, in whose territories 44,567 ha were identified. In other SINAP protected areas, 4,746 ha of EVOA were found in the category of Integrated Management Regional Districts, and 263 ha in Protective Forest Reserve areas. On the other hand, 544 ha were detected in RAMSAR wetlands and, finally, 126 ha of EVOA on land were identified in National Natural Park territories, along with alerts due to EVOA on water.

### National Natural Parks

The objective of national parks is to protect natural biodiversity, the underlying ecological structure and the environmental processes on which it is supported. At the same time, they seek to promote education and recreational use through a special management regime [8]. However, the destruction of these protected areas has increased at an alarming rate over the last few years due to various sources of pressure, among which mineral production, such as gold, coal, copper, silver, zinc and clay stand out.

8 The EVOA monitoring system is projected to extend the study to other rivers affected by alluvial gold exploitation starting in 2019.
9 The framework of study is made up of 100% of the national territory for EVOA on land, and five rivers located in the Colombian Amazon and Orinoco regions for EVOA on water.
10 Article 34 of the Mining Code, Law 685 dated 2001.
11 The geographic coverage of National Natural Parks corresponds to: official information from the Special Administrative Unit of the System of National Natural Parks (UAESPNN), 2017.
12 The geographic coverage of the National System of Protected Areas, SINAP, corresponds to official information from the UAESPNN, 2017.
13 In the case of a complete overlap with a concession contract proposal, these excludable mining areas will cause the request to be rejected. In the case of a partial overlap, they will cause the requested area to be cropped in order to only grant the area that does not overlap with excludable mining areas.
14 One same territory can be in two or more categories of areas declared and delimited in accordance with the current regulations as protected areas and areas for developing renewable natural resources or the environment.

## Map 4. National Natural Parks and EVOA, 2018.




Source: Government of Colombia – Monitoring system supported by the UNODC. For PNN: National Natural Parks.
The borders, names and titles used in this map do not represent the United Nation's recognition or acceptance

EVOA on land in the National System of National Natural Parks (SNPNN), independent of its magnitude, creates alerts not only because of exploitation and the territory's vulnerability to the phenomenon, but also because of the environmental effects that impact the ecosystems. These alerts are a call for competent institutions to design strategies and public policies to protect these areas with such great biodiversity and environmental service offers.

EVOA on land was detected in three of the 59 National Natural Parks in 2018, which adds up to 126 hectares and represents 0.14% of the total detected area in the nation. It is worth highlighting that the area increased by 15 ha (13%) since 2016. The Puinawai[15] Natural Reserve continues recording the largest impact, with 75 hectares with EVOA, mainly in Serranía de Naquén. This protected area represents 59% of the total detected EVOA in the SNPNN.

It is evident that exploitation is exerting strong pressure on these territories when considering the proximity of EVOA on land to PNN, which further aggravates their environmental outlook. The following table presents PNN with EVOA on land in three ranges of proximity: a) within the parks, (b) less than 10 km from their limits, and (c) between 10 km and 20 km from their limits.

**Table 5.** EVOA on land detected in PNN, 2018.

| National Natural Park | EVOA on land in PNN (ha) | EVOA on land up to 10 km from PNN (ha) | EVOA on land up to 20 km from PNN (ha) |
|---|---|---|---|
| Puinawai | 75 | 0 | 0 |
| Paramillo | 50 | 135 | 583 |
| Los Farallones de Cali | 2 | 393 | 96 |
| Los Katíos | 0 | 0 | 83 |
| Munchique | 0 | 27 | 437 |
| Las Orquídeas | 0 | 6 | 26 |
| Serranía de los Churumbelos | 0 | 133 | 228 |
| Plantas Medicinales Orito Ingi Ande | 0 | 0 | 22 |
| Tatamá | 0 | 0 | 35 |
| Acandí Playón | 0 | 0 | 62 |
| Alto Fragua Indi-Wasi | 0 | 0 | 19 |
| Total | 127 | 694 | 1,591 |

The results show that, in comparison with 2016, three additional parks are at risk of being affected by EVOA on land less than 10 km away from them, and five more parks are at risk when the category from 10 to 20 km is included. It is worth highlighting that EVOA on land in areas of influence between 10 and 20 km from PNN increased by 7% with respect to the areas detected in 2016. This increase corresponds to 106 ha.

15 A word in the Puinave language that means "Mother of humanity."

An alert was set off in PNN Paramillo when an increase of 31% in EVOA on land detected in its areas of influence increased from 547 ha in 2016 to 718 ha in 2018, mainly located in the Quebradona gorge of the Tarazá River - Man River's sub-basin in the municipalities of Cáceres and Tarazá, Province of Antioquia. Minor increases in EVOA on land occurred in the areas of influence of Munchique (9%) and Serranía de los Churumbelos (4%) Parks with respect to 2016.

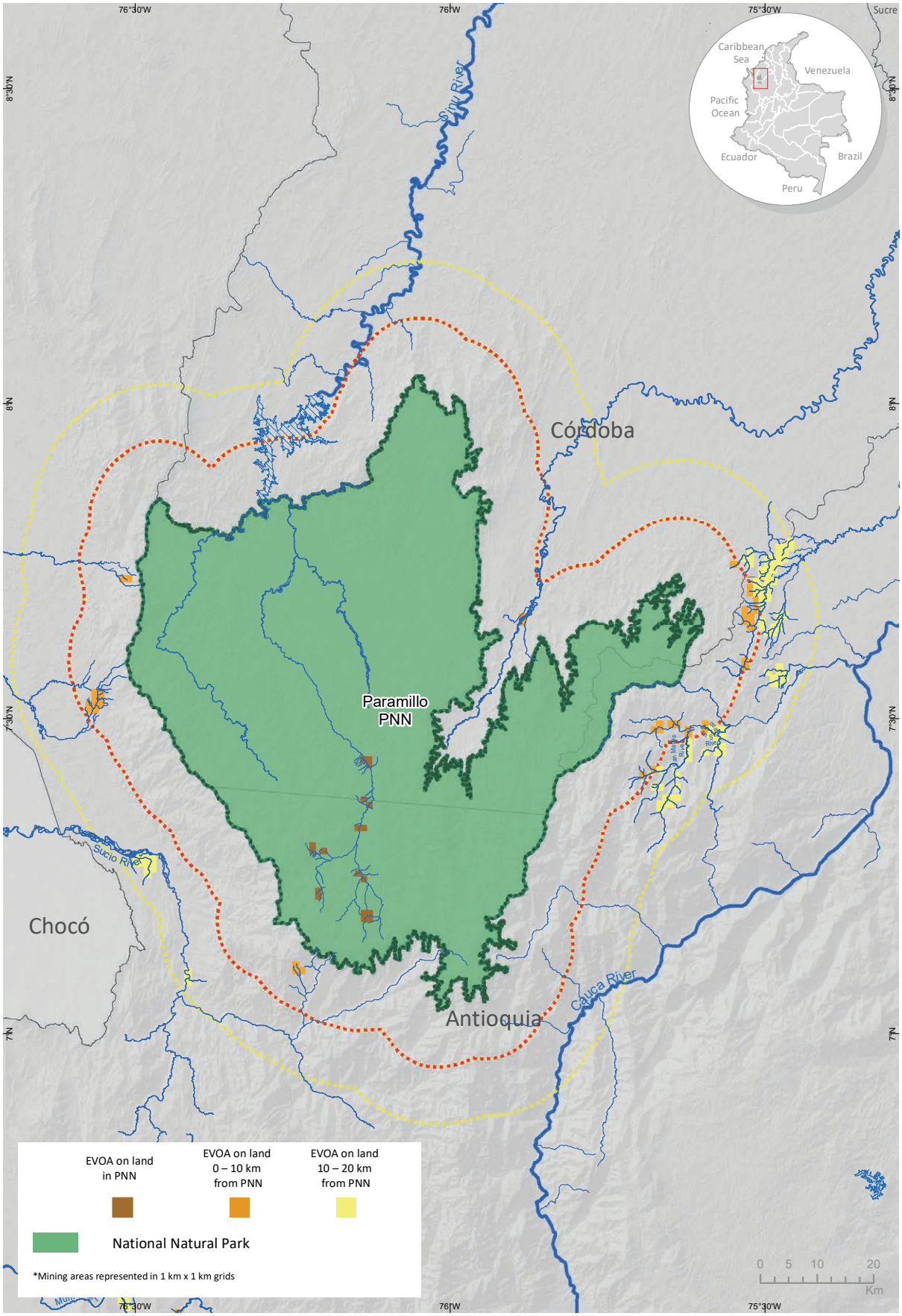
In this way, and in accordance with the studies carried out in 2014 and 2016, it can be observed that the PNN vulnerability associated with EVOA on land does not only depend on its distance from the park, but also on the connectivity[16] between rivers affected by EVOA. Vulnerability increases in the Farallones de Cali, Munchique and Serranía de los Churumbelos parks because they are directly connected to the inside of parks by means of some rivers or their tributaries, as presented in the following table:

**Table 6.** River connectivity between detected EVOA on land and PNN.

| National Natural Park | River Connectivity | NOMSZH[17] Sub-basin |
|---|---|---|
| Munchique | Micay River and tributaries, Chuaré River. | San Juan del Micay River. |
| Los Farallones de Cali | Anchicayá River | Anchicayá. |
| | Mallorquín River, Cajambre River, Guapi River, Juan López Gorge, Don Carlos Gorge. | Cajambre - Mallorquin – Raposo Rivers. |
| Serranía de los Churumbelos | Mandiyaco River, Caquetá River and tributaries, Pacayaco and Santa Lucía Gorges. | Alto Caquetá. |

16 Information obtained through the mining community in the framework of this study indicates that the axis of exploitation and operations is concentrated in rivers, framed within the natural limits of river basins.
17 NOMSZH: Name of Sub-basin, IDEAM.

## Map 5. EVOA on land in PNN areas of influence, 2018.




Source: Government of Colombia – Monitoring system supported by the UNODC. For PNN: National Natural Parks.
The borders, names and titles used in this map do not represent the United Nation's recognition or acceptance.

Moreover, alerts due to EVOA on water were identified in three Natural Parks: Serranía de Chiribiquete, Yaigojé Apaporis and Cahuinarí. EVOA on water in these protected areas generates environmental impacts that have not been sized yet: alterations to riverbeds and river dynamics, loss of streams, sedimentation and clogging, which increase water turbidity, loss of aquatic habitats, interruptions of ecological processes and water pollution due to using chemical substances, among other impacts. The following table summarizes the alerts found in the areas:

**Table 7.** Alerts due to EVOA on water identified in PNN, 2018.

| National Natural Park | Affected Body of Water | Sub-basin |
|---|---|---|
| Yaigojé Apaporis | Apaporis River | Lower Apaporis River |
| Cahuinarí | Caquetá River | Lower Caquetá River |
| Serranía de Chiribiquete | Apaporis River | Upper Apaporis River |

The highest concentration of EVOA on water is in PNN Yaigojé Apaporis along the Apaporis River, where this body of water is the limit between the Provinces of Vaupés and Amazonas, at key points close to the outlets of the Taraira River south of the park and Pira Paraná River north of this protected area.

Yaigojé Apaporis is known as a protected area that, because of its great biological wealth, generates global benefits for humanity in terms of climate regulation processes. In addition, this National Natural Park is made up of a "System of Sacred Sites" that are connected through cultural expressions and geographic spaces such as ranges, rapids and lakes, which are the pillar with which indigenous people of the Yaigojé Apaporis Reserve manage their natural resources and territory [9].

Due to the presence of commercially significant minerals, such as gold, this protected area has constantly been threatened by extractive industries. Gold exploration and exploitation affect both this area's ecological balance and cultural traditions and sacred sites.

Furthermore, a significant concentration of alerts due to EVOA on water have been discovered in Cahuinarí National Natural Park along the Caquetá River, close to the municipality of La Pedrera, Province of Amazonas, at key points close to the outlet of the Bernardo River.

Cahuinarí Park is a transitory ecosystem between Amazonian low plains and the forests of the Upper Negro River. It is an attraction of the Amazon region due to its natural wealth and the majesty of its rivers and gorges. The park has geological formations and several types of soils that give the region's watercourses and lakes special characteristics. They are natural breeding grounds for species, such as the Arrau Turtle (Podocnemis expansa)[18], which is currently in danger of extinction [10] because of the destruction of its habitat and mercury pollution due to gold extraction, among other causes.

Finally, though at a lower concentration, alerts due to EVOA on water were identified at Serranía de Chiribiquete National Natural Park in the upper basin of the Apaporis River, mainly

18 Considered the largest fresh water turtle in the world.

in the Palogordo sector, where this body of water becomes the limit between the Provinces of Caquetá and Vaupés.

Serranía de Chiribiquete National Natural Park is Colombia's largest national park, with 4,268,095 protected hectares, and was the first place in the country to be recognized by UNESCO as a mixed (cultural and natural) heritage site[19]. Wildlife and plants in this natural landscape have been able to adapt to the environment's extreme conditions, and endemism has occurred due to its isolation, much of which is yet unknown to science. Serranía de Chiribiquete Park has been catalogued as one of the few pure and uncharted places on earth. However, deforestation and gold exploitation are pressure factors that have threatened this protected area in recent years.

### *Other Protected Area Categories Registered in the RUNAP*

In addition to the National Natural Park System, there is a great variety of protected area categories that are a part of the National System of Protected Areas - SINAP[20]. These areas are registered in the Unique National Register of Protected Areas – RUNAP, and are therefore geographically defined and designated, regulated and managed in order to achieve specific conservation objectives.

4,746 ha of EVOA on land were detected in 2018 in the Integrated Management Regional Districts[21] category registered in the RUNAP:

**Table 8.** EVOA on land detected in other RUNAP categories, 2018.

| Name of Protected Area | EVOA on Land (ha) |
|---|---|
| Integrated Management District of Natural Resources of the Ayapel Wetlands System | 3,796 |
| Ciénagas El Sapo y Hoyo Grande Integrated Management Regional District[22] | 943 |
| Cacica Noría Integrated Management Regional District[23] | 7 |

The most highly affected area is the Integrated Management District of Natural Resources of the Ayapel Wetlands System, where 80% of all the EVOA on land detected in protected areas is concentrated – 3,796 ha that represent 3% of this District's total area. This system is located in the Province of Córdoba, in the upper and middle section of the San Jorge River. Its basin is part of the Atlantic plain in the north of Colombia and is a part of the macrosystem of wetlands and the Momposina Depression's flood plains, which covers areas of the Provinces of Córdoba, Sucre, Magdalena and Bolívar [11].

19 The Serranía de Chiribiquete National Natural Park's registration as a mixed heritage site (cultural and natural) on UNESCO's World Heritage List, carried out during the 42nd session of the organization's World Heritage Committee in Manama, Bahrain in the Middle East on July 1, 2018, highlights the park's global importance. Not only does it preserve natural values – it also holds exceptional cultural values, making it the 36th site in the world to belong to this category.

20 A set of protected areas and the social actors, strategies and management instruments that coordinate them to contribute to complying with the country's conservation objectives as a whole. It includes all public, private or community governance protected areas and all those that are managed by national, regional or local institutions (Article 2.2.2.1.1.3 of Decree 1076 dated 2015).

21 A geographic space in which landscapes and ecosystems maintain their composition and function even if their structures have been modified, and whose associated natural and cultural values are within the human population's grasp, destined to sustainable use, preservation, restoration, knowledge and usufruct (Article 14 of Decree 2372 dated 2010).

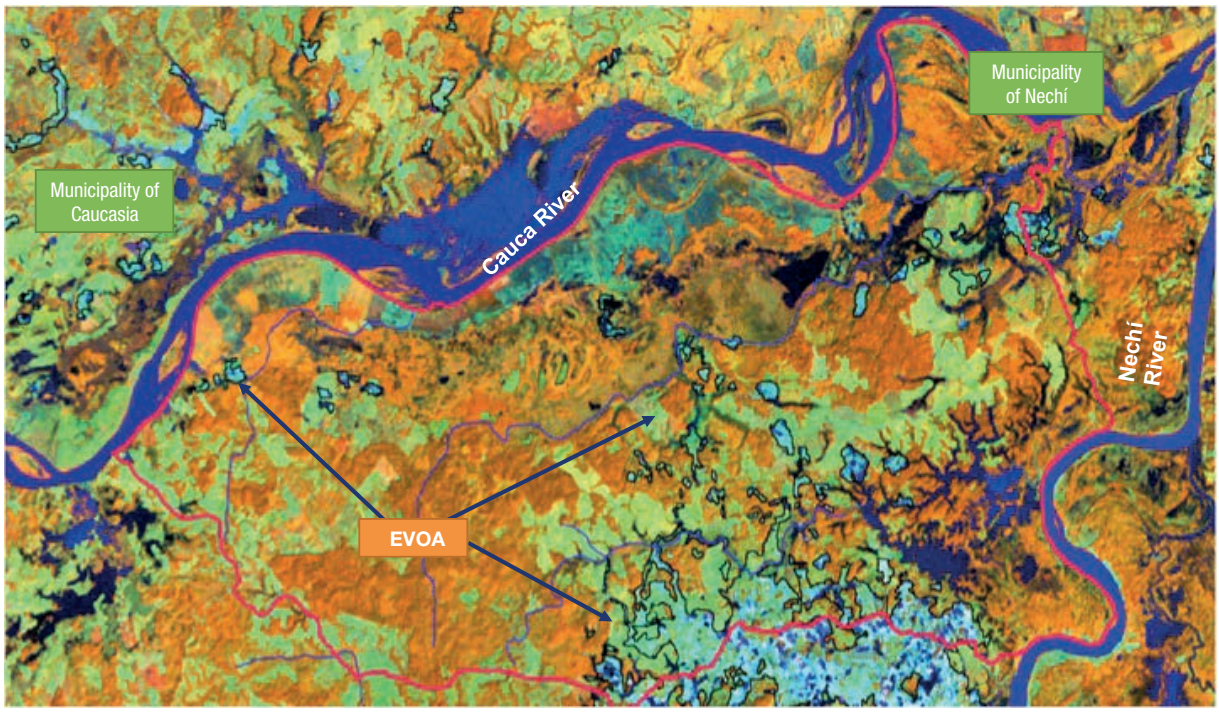
22 Declared as a protected area on October 26, 2017 by means of Resolution 508 of the Board of Directors of CORANTIOQUIA.

23 Declared as a protected area on November 29, 2016 by means of Agreement 480 of the Board of Directors of CORANTIOQUIA.

This area is of great ecological interest because it has different aquatic and land biotopes, holds an enormous amount of biological diversity and supports a series of environmental services, which make it the natural capital of the region and the country [12]. The increasing negative impacts due to gold exploitation are a call to target and manage these territories whose ecological balance is being affected by exploitation, weakening the very essence of a protected area.

Furthermore, 943 ha of EVOA on land were identified in the Ciénagas El Sapo y Hoyo Grande Integrated Management Regional District, a protected area that was declared in October, 2017. These are two ecosystems that regulate the flow of the Nechí and Cauca Rivers, have a high level of diversity in terms of species of fish and have become one of the most ecologically and socially important wetlands in the lower Cauca River valley of Antioquia [13].

**Figure 5.** Ciénagas El Sapo y Hoyo Grande Integrated Management Regional District (red line). Negative impacts due to EVOA on land (black line). Landsat 8 Image (RGB 564).




*Sitios Ramsar*

The Ramsar Convention on Wetlands is an intergovernmental treaty whose mission is "the conservation and wise use of all wetlands through local, regional and national actions and international cooperation, as a contribution towards achieving sustainable development throughout the world". In January, 2013, 163 nations adhered to the Convention as Contracting Parties, and there were over 2,060 wetlands throughout the world, with a total surface area of greater than 197 million hectares designated to be included on the Ramsar List of Wetlands of International Importance [14].

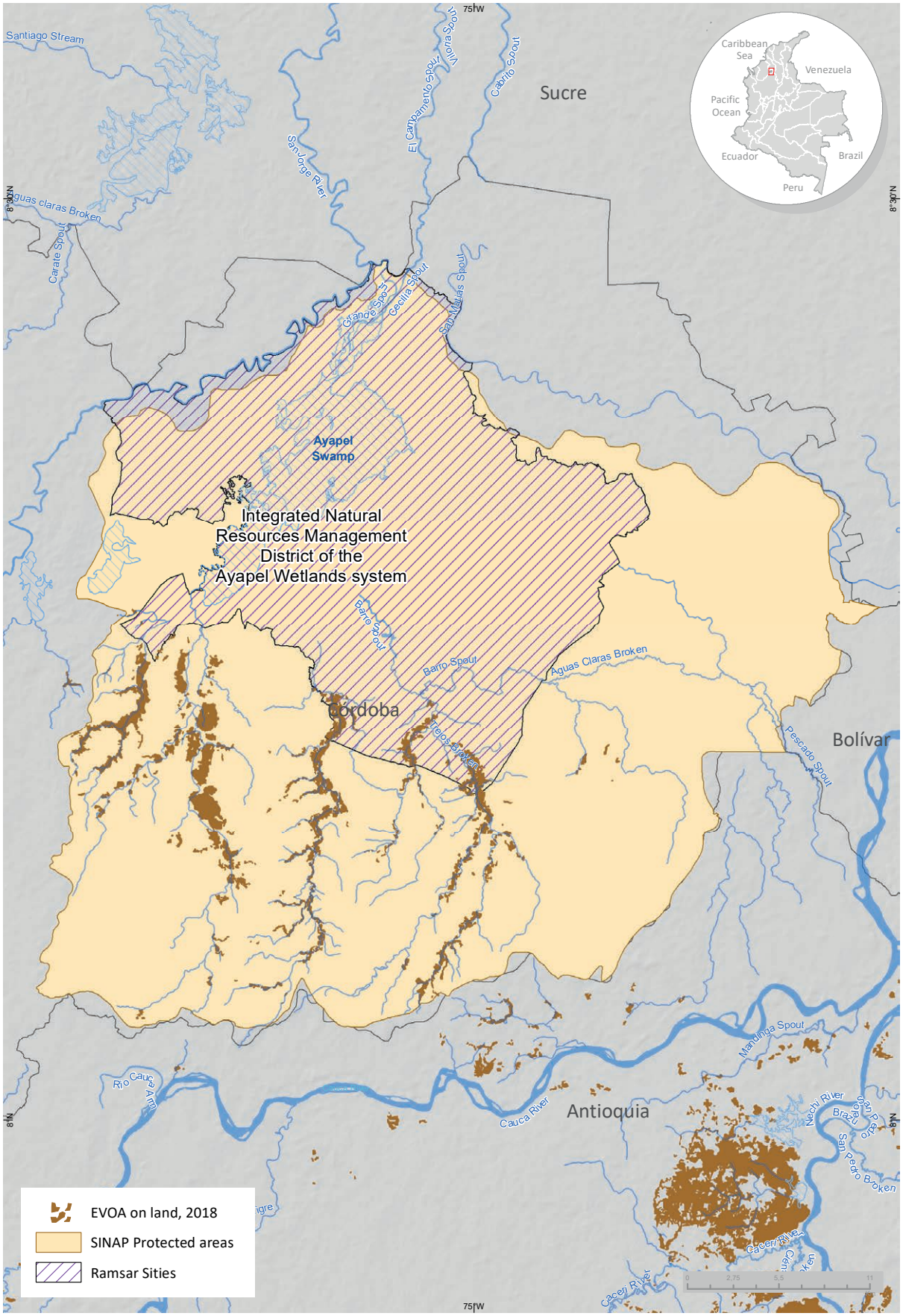
*Wetlands are highly productive ecosystems due to their natural dynamic and functional structure, which allows them to offer a hábitat that is suitable for biological diversity and configure an environment with significant services for human communities [49].*

Colombia has been a part of the Ramsar Convention since January 1997 when the Congress of the Republic of Colombia approved the "Ramsar Convention on Wetlands of International Importance especially as Waterfowl Habitat." In light of this decision, the country is responsible for managing the wetlands in its territory. Including a wetland on the list of Ramsar Sites represents the Government's commitment to adopt the necessary measures to ensure its ecological characteristics are maintained.

Colombia currently has 12 places designated as Ramsar sites. One of them is affected by gold exploitation: the Ayapel Swamp System[24], where 544 ha of EVOA on land were identified in 2018. Indiscriminately taking advantage of this wetland system's resources and the way gold extraction activities have expanded in the region continuously threaten this ecosystem's sustainability and the well-being of those who depend on it [15].

24 Declared a Ramsar Site on February 2, 2018.

**Map 6.** EVOA on land detected in the Integrated Management District of the Ayapel Wetlands System (SINAP Area and Ramsar Site), 2018.




Source: Government of Colombia – Monitoring system supported by the UNODC. For protected areas: National System of Protected Areas (SINAP).
The borders, names and titles used in this map do not represent the United Nation's recognition or acceptance.

### *Forest Reserve Areas*

Law 2 dated 1959 on the Nation's forest economy and conservation of renewable natural resources is the instrument by which the government created seven forest reserve areas [16]: Cocuy, Sierra Nevada de Santa Marta, Central, Serranía de los Motilones, Magdalena River, Pacific and Amazon. Zoning and structuring these areas facilitate environmental planning and orientation for the various productive sectors in the country [17].

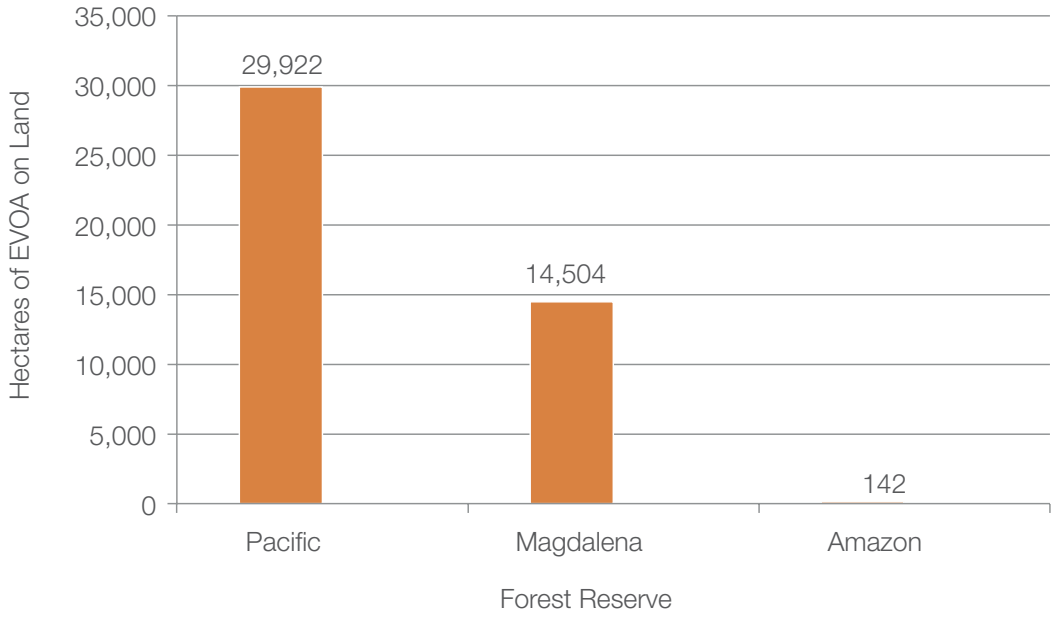
*The forest reserve areas established in Law 2 dated 1959 are not protected areas even though they include special management and protected areas, such as Indigenous Reserves, Black Community Territories and areas of the National System of Protected Areas – SINAP. In addition, the Ministry of Environment and Sustainable Development may redefine their borders and subtract, zone, recategorize, integrate and define their uses, except for Protective National Reserve areas [16].*

*Substraction processes may be advanced within Forest Reserve Areas for the mining authority to authorize developing activities in a restricted manner.*

48% (44,567 hectares) of all EVOA on land in the country is in Forest Reserve Areas, which is at a similar proportion with respect to the figures presented in 2016. The Pacific Forest Reserve is most greatly affected, with 67% of the area reported for this figure. This means approximately a third of all national EVOA on land is in this area.

The Magdalena River Forest Reserve registers 33% of all detected EVOA on land in forest reserve areas (16% of the national total). Moreover, the Amazon Forest Reserve reports less than 1% of the detected amount under this arrangement[25]. It is worth noting that the Central Forest Reserve was not affected by EVOA on land in 2018, compared to the 48 hectares that were reported there in 2016. This was mainly because of EVOA areas that are in the initial stages of plant succession.

**Figure 6.** EVOA on land in forest reserve areas, 2018.




25 The percentages presented for all of the reserve areas are rounded to the nearest integer, reason why the sum of all the figures in the text is not 100%.

The comparative analysis from 2014 shows that the phenomenon's behavior in Forest Reserves is relatively stable in terms of the proportion of the impact with respect to the national total, since EVOA on land in 2014 in these territories represented 50% of the total impact, and this figure's participation was 48% in 2018. The growth reported by the Magdalena River Forest Reserve (14% to 15% of the national total for 2014 and 2018, respectively) stands out, while the percentage decreased in the Pacific Forest Reserve (35% to 32% in 2014 and 2018, respectively). The Amazon Forest Reserve has no defined behavior in terms of the growth of its participation. However, with respect to the total EVOA on land, this area's data does not show a significant representation. The change in EVOA on land for 2014, 2016 and 2018 in forest reserve areas is presented below:

**Table 9.** 2014 – 2016 – 2018 EVOA on land in Forest Reserve Areas

| Forest Reserve Area (ZRF) | 2014 EVOA on Land (ha) | 2016 EVOA on Land (ha) | % of Change 2014-2016 | 2018 EVOA on Land (ha) | Total % of EVOA on Land 2018 | % of Change 2016-2018 |
|---|---|---|---|---|---|---|
| Pacific | 27,978 | 28,198 | 1% | 29,922 | 32% | 6% |
| Magdalena | 11,004 | 12,436 | 13% | 14,504 | 16% | 17% |
| Amazon | 57 | 153 | 167% | 142 | <1% | -7% |
| Central | 75 | 48 | -37% | 0 | 0% | -100% |
| Total ZRF | 39,115 | 40,835 | 4% | 44,567 | 48% | 9% |

98% of the detected EVOA on land in the Amazon Forest Reserve is mainly located in the Province of Guainía (98%).

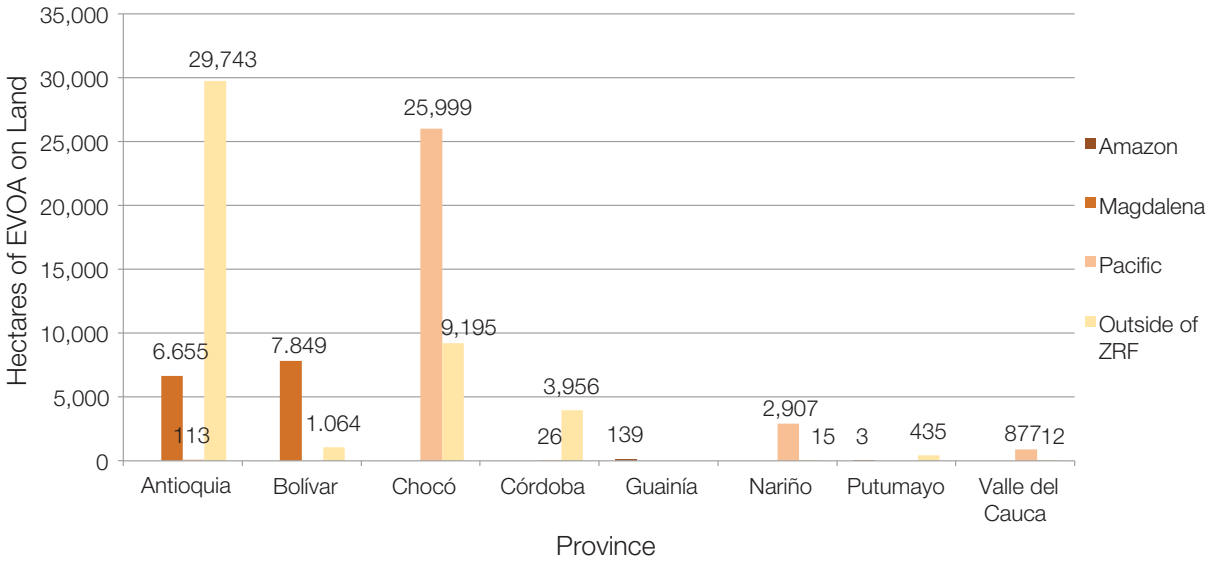
Furthermore, the phenomenon's distribution in the Magdalena River Forest Reserve mainly affects the Provinces of Bolívar and Antioquia with 54% and 46%, respectively.

*In accordance with the regulations that regulate zoning forest reserve areas, activities or projects that favor controlling degradation factors with ecological restoration, rehabilitation and recovery processes in areas where the ecosystem's function, structure and composition characteristics have been modified due to natural or human impacts must be prioritized [50]. In this sense, information on the impact of EVOA on land in forest reserve areas can be used as an input to developing new research that promotes technically feasible alternatives for implementing environmental public policy instruments.*

Finally, EVOA detection on land in the Pacific Forest Reserve is located in: Chocó, Nariño, Valle del Cauca, Antioquia and Córdoba. The first two have the largest participation in the area, with 87% and 10%, respectively. It is worth noting that 93% of detected EVOA on this reserve coincides with Black Community Territories.

Of the 30 municipalities with EVOA on land in the Pacific Forest Reserve, four of them located in Chocó make up 55% of the phenomenon in this area: El Cantón de San Pablo, Nóvita, Istmina and Río Quito. There are 15 municipalities in the Magdalena River Forest Reserve where EVOA has been detected, among which municipalities in Bolívar (Montecristo and Santa Rosa del Sur) and Antioquia (Zaragoza) stand out. These three make up 54% of the area. Finally, for the Amazon Forest Reserve, it has been reported that 98% of the EVOA on land is in two Provincial jurisdictions of Guainía (Pana Pana and Puerto Colombia).

**Figure 7.** Provincial participation of EVOA on land in Forest Reserve Areas (ZRF), 2018.




With respect to the phenomenon's dynamic in these areas, the greatest proportion of new EVOA on land was found in the Magdalena River Forest Reserve in 2018[26] in comparison with the detected EVOA in 2016 (9%), mainly in the basin of the Lower Nechí. On its part, the new EVOA on land in 2018 in the Amazon reserve (the lower Guainía and Cuiary River basins) and Pacific reserve (mainly the Beberamá River, Quito Rive, Tamaná River and Telembí river basins) was 6% and 5%, respectively, in comparison with the reported area in each region.

The greatest expansion[27] on EVOA on land under this figure in 2018 with respect to the EVOA detected in 2016 was mainly located in the Amazon Forest Reserve (23%) in the lower Guainía and Cuiary River basins. The expansion amounted to 20% in the Magdalena River Reserve and was mostly concentrated on the Nechí River basin, while the change in the Pacific Reserve (mainly the Beberamá River and Quito river basins) due to this concept was 17% for the same analyzed period.

In terms of EVOA in stages of plant succession[28] in these areas in 2018 with respect to 2016, the Central Forest Reserve achieved 100% abandonment of the phenomenon in the Samaná River basin, while the Amazon reserve (lower Guainía and Cuiary River basins) reported 36% on in this regard, and the Pacific (mainly the Beberamá River, Quito River and Telembí River basins) and the Magdalena River reserves (mainly the Nechí River basin) registered 15% and 13%, respectively, for plant succession.

***Concepts:***

*Stable area: area with permanent EVOA detected in the 2016 and 2018 studies.*

*New area: area with EVOA detected in 2018, when there was none in 2016.*

*Expanding area: area with EVOA detected in 2018 that has new mining areas and whose previously detected EVOA continues.*

*Area with signs of grasslands and pastures: areas with EVOA detected in 2016 that have herbaceous vegetation or low stover, characteristics of the initial stages of plant succession, in 2018.*

26 Completely new detected polygons that were not in the previous study.
27 Polygons that increased with respect to what was detected in the previous study.
28 Areas detected in the previous study that were not in the current study.

**Table 10.** EVOA Dynamic on Land in Forest Reserve Areas, 2016 - 2018.

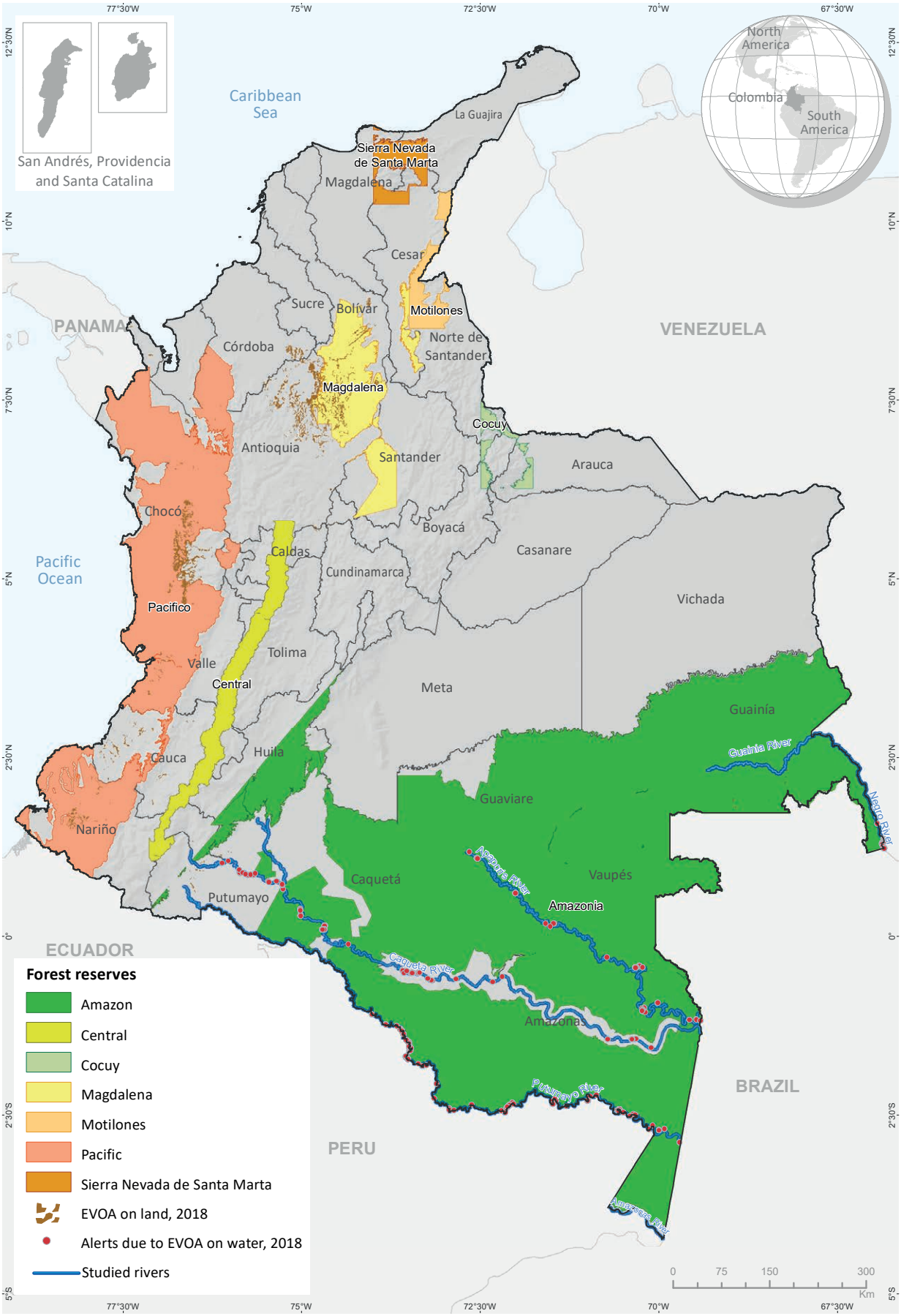
| Forest Reserve Area (ZRF) | Area with Signs of Grasslands and Pastures (ha) | Stable Area (ha) | Expanding Area (ha) | New Area (ha) |
|---|---|---|---|---|
| Amazon | 55 | 97 | 35 | 9 |
| Central | 48 | 0 | 0 | 0 |
| Magdalena | 1,564 | 10,872 | 2,500 | 1,132 |
| Pacific | 4,320 | 23,878 | 4,751 | 1,292 |
| Total ZRF | 5,987 | 34,848 | 7,286 | 2,433 |

With respect to detecting alerts due to EVOA on water, of the five studied rivers, the Putumayo, Apaporis, Caquetá and Guainía Rivers show these kinds of alerts and are located in the Amazon Forest Reserve. It is necessary to specify that this does not mean other rivers are not affected by EVOA on water in this Reserve, since there is only data for the five mentioned rivers.

A large part of the alerts due to EVOA on water on the Caquetá River are located in a 650 km section upstream from La Pedrera (Amazonas) that corresponds to a subtraction area of the Amazon Forest Reserve. For this reason, the reserve has been negatively impacted by this EVOA on the Caquetá River, only between Solano, Caquetá and La Maná (Solano - Caquetá) and a small section between Solita, Caquetá and El Gallinazo (Puerto Guzmán - Putumayo). The river has alerts outside of this forest reserve upstream from the latter section.

Even though alluvial gold exploitation with machinery on water does not generate a direct loss of forest cover, the competent institutions must pay special attention to this activity to take the corresponding measures at the Amazon Forest Reserve, since the natural balance has been disrupted as a consequence of altering sediment loads on the water currents that work as an axis of mobility and source of food for these ecosystems' wildlife.

## Map 7. EVOA Detection in Forest Reserve Areas, 2018.




Source: Government of Colombia – Monitoring system supported by the UNODC. For forest reserve areas: Ministry of Environment and Sustainable Development, 2017.
The borders, names and titles used in this map do not represent the United Nation's recognition or acceptance.

### *Protective Reserve Areas*

When it comes to EVOA on land in these types of areas of the SINAP, an impact of 263 hectares was observed in 2018 (0.3% with respect to the national total), which is 25 more hectares than in 2016 (a 10% increase). It is necessary to specify that only national areas (National Protective Forest Reserves) show negative impacts due to EVOA on land in this category, and the impact is in the same three Reserves.

76% of EVOA on land in these areas is in two reserves located in the jurisdiction of Buenaventura - Valle del Cauca (Anchicayá River RFPN and Escalarete River and San Cipriano River RFPN), while the remaining 24% is in the municipality of Acandí - Chocó (Darién RFPN).

**Table 11.** EVOA on land in National Protective Forest Reserves.

| National Protective Forest Reserve (RFPN) | 2016 EVOA on Land (ha) | 2018 EVOA on Land (ha) |
|---|---|---|
| Darién | 45 | 62 |
| Musinga Carauta Area | 0 | 0 |
| Anchicayá River | 169 | 176 |
| Escalarete River and San Cipriano River | 25 | 26 |
| Total RFPN | 239 | 263 |
| Percentage Compared to the National EVOA | 0.3% | 0.3% |

## Restricted Mining Areas

The Colombian Mining Code includes eight types of restricted mining areas[29], in which exploration and exploitation mining work and projects can be carried out with the specific restrictions of each operation. These territories consist of: areas within the urban perimeter of cities and towns, areas occupied by rural constructions, areas defined as areas of archaeological interest, beaches, low tide and watercourse areas, public utility areas, indigenous mining areas, black community mining areas and mixed mining areas.

29 Article 35, Law 685 dated 2001.

## Map 8. EVOA in restricted mining areas, 2018.


Source: Government of Colombia – Monitoring system supported by the UNODC
The borders, names and titles used in this map do not represent the United Nation's recognition or acceptance.

### *Mining Areas*

Areas located in territories recognized by law as belonging to ethnic communities with the autonomy to make decisions on how to take advantage of their natural resources are among restricted mining areas, as is the case for Indigenous Reserves and Black Community Territories. In accordance with the above, the conditions for a third party to perform mining operations without it harming these groups'[30] cultural, social and economic values have been established, as long as the respective ethnic groups have not exercised their preferential right to explore and mine in their territories.

The ethnic groups in the territory can request an area to be declared an Indigenous, Black Community or Mixed Mining Area, as the case may be. This is for them to have the right to priority over third parties in being awarded a concession contract aimed at exploitating minerals. It is necessary to mention that awarding a exploitation area does not grant permission for mining, which is obtained by fully meeting the requirements and technical and environmental proceedings required by the competent authorities on this matter.

*11,825 ha affected by EVOA on land were detected in restricted mining areas outside of excluded mining areas, which is 13% of the national total. 64% of EVOA on land in these areas is located in Mining Areas (7,606 ha), 28% in the perimeters of urban centers (3,331 ha) and 8% in public utility areas (888 ha).*

88% of EVOA in Mining Areas (6,719 ha) is concentrated in 21 black community mining areas, and only 1% in indigenous reserve mining areas. The remaining 11% can be located in mixed mining areas[31]. Four of the five Black Community Mining Areas are located in Chocó (Condoto, Unión Panamericana, Alto San Juan and Novita). The remaining mining area is in Cauca (Negros Unidos Parte Alta Sur del Río Saija).

With respect to alerts due to EVOA on water, only one alert was identified for the Caquetá River close to the Mining Area of the Monochoa Indigenous Reserve.

Paying special attention to EVOA on land identified in these areas declared as mining areas is recommended for the respective follow-up and taxation, reason why declaring an area to be a mining area does not grant permission for exploitation mining.

### Free Areas

The areas that are not included in the two previous categories, Excludable Mining Areas and Restricted Mining Areas, are classified for this study as Free Areas. Requests to obtain exploitation mining permits can be made in these areas (Mining Title, i.e. "Amparo de Títulos" and Environmental License). However, in the event these areas are on ethnic territories, the community must be consulted before any environmental licensing takes place. In this case, the community can request the area to be declared as a mining area and have priority over any third party for being granted the corresponding permission. If the community does not request it to be declared a Mining Area, permission may be granted to a third party that has fulfilled all the requirements, without it harming these groups' cultural, social and economic values[32].

In accordance with the above, this chapter considers these ethnic territories that can include more than one category in the same territory.

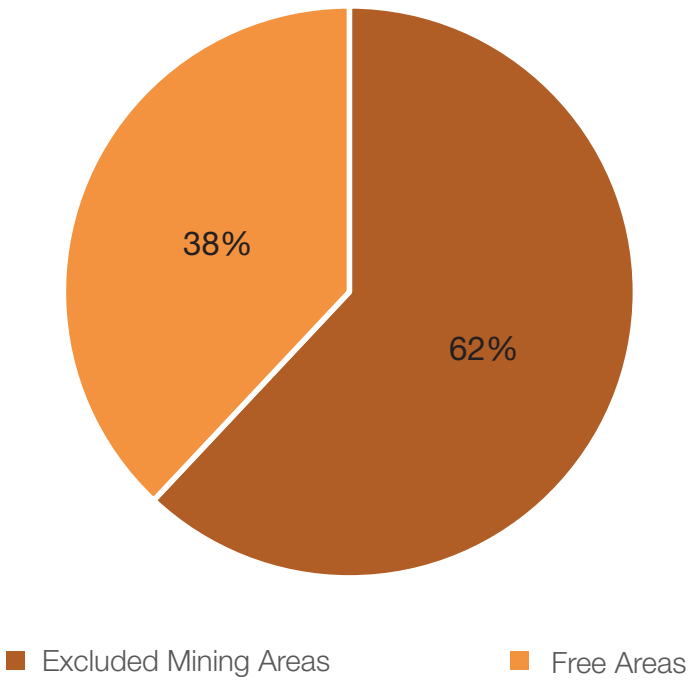
30 Chapter XIV, Law 685 dated 2001.
31 There was no official geographic information on Mixed Mining Areas when this study was performed. For this reason, the indicated 11% may belong to this category.
32 Chapter XIV, Law 685 dated 2001.

*Special Management Territories*

*Indigenous Reserves*

724 hectares with EVOA on land were registered in 2018 in Indigenous Reserves[33] (0.8% with respect to the national total). Of these, 62% are located in excludable mining areas, for which reason the remaining 38% are in free areas (274 ha).

**Figure 8.** Distribution of EVOA on land in 2018 in Indigenous Reserves



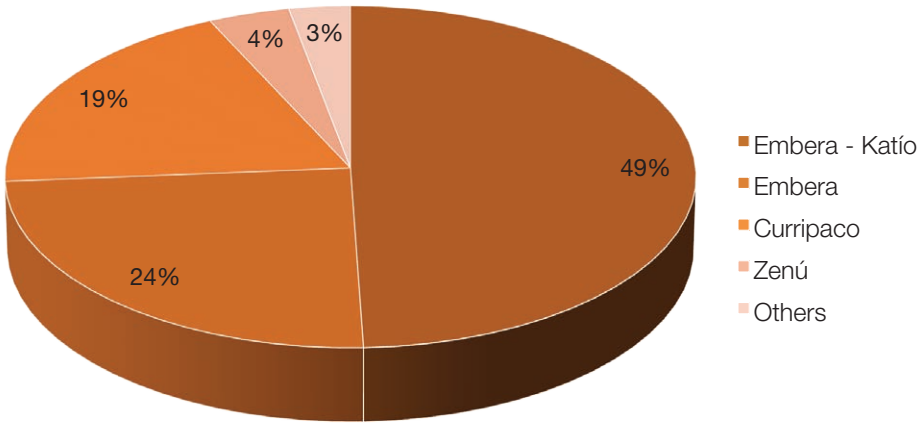

In the country, this phenomenon has affected 24 reserves. The Province with the largest amount of EVOA on land in reserves is Chocó, with 40% (293 ha) of the impact on these territories (11 reserves). It is followed by Guainía, with 139 ha in two reserves, Cauca, with 124 ha in three reserves, and Antioquia, with 119 ha in six reserves (the last three add up to 53% of the total percentage of EVOA on land in Indigenous Reserves). On its part, Córdoba (one reserve), Valle del Cauca (one reserve) and Nariño (two reserves) complete the list of Provinces affected by EVOA on land in Indigenous Reserves, with 7% (51 ha) of the total impact on these territories.

The 24 Indigenous Reserves with EVOA on land in 2018 correspond to six ethnic groups or indigenous communities. 73% of this impact (532 ha) is concentrated on the territories of the Embera and Embera – Katío ethnic groups. With respect to 2016, there was a reduction of approximately 100 hectares, only in the reserves of the two mentioned groups. The remaining 27% of EVOA on land in these territories (192 ha) is located in the reserves of the Curri-

33 The geographic coverage of Indigenous Reserves corresponds to information reported by the IGAC in 2015.

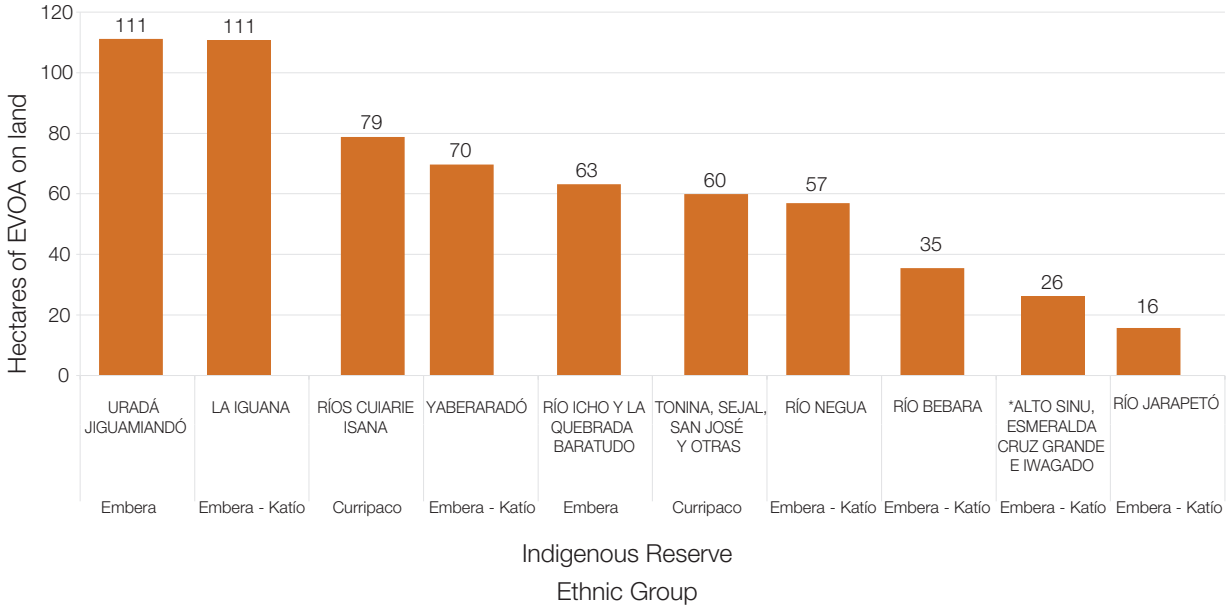
paco, Zenú, Eperara Siapidara, Awá and Wounaan ethnic groups. Consequently, although the surface area affected by EVOA on land in these territories decreased and the percentage with respect to the national total is low, the issues indigenous communities have suffered because of the phenomenon's impact, especially in the Pacific Region, have harmed the quality of life in these reserves.

**Figure 9.** Distribution of EVOA on land in Indigenous Reserves by ethnic group




The 10 reserves that have been most affected by EVOA on land make up 87% of the phenomenon (628 hectares) and are located in the Provinces of Chocó (four reserves), Antioquia (two reserves), Guainía (two reserves), Córdoba and Cauca (one reserve each). Something that stands out with respect to 2016 is the fact that the "La Iguana" Reserve in Cauca is no longer in first place on the list of the reserves that were most affected by the phenomenon, since the "Uradá Jiguamiandó" Reserve in Chocó went from second place to sharing first place for this figure[34].

**Figure 10.** Indigenous Reserves most greatly affected by EVOA on land in 2018.




34 The difference in surface detected with EVOA on land in these reserves in 2018 is less than 1 hectare. They are considered to have the same area for the purposes of decimal approximation.

When it comes to alerts detected due to EVOA on water in Indigenous Reserves, there are 14 reserves being directly affected[35] by this phenomenon on the Putumayo, Caquetá, Apaporis and Guainía Rivers. 13 ethnic groups inhabit the areas in which the alerts are located (Andoque, Bora, Cocama, Cubeo, Curripaco, Inga, Makuna, Matapi, Ocaina, Tanimuka, Ticuna, Witoto and Yucuna). With respect to the indirect effect[36] of these alerts, there are six reserves of the Inga, Muruy, Paéz and Witoto ethnic groups close to these detected areas located on the middle basin of the Caquetá River.

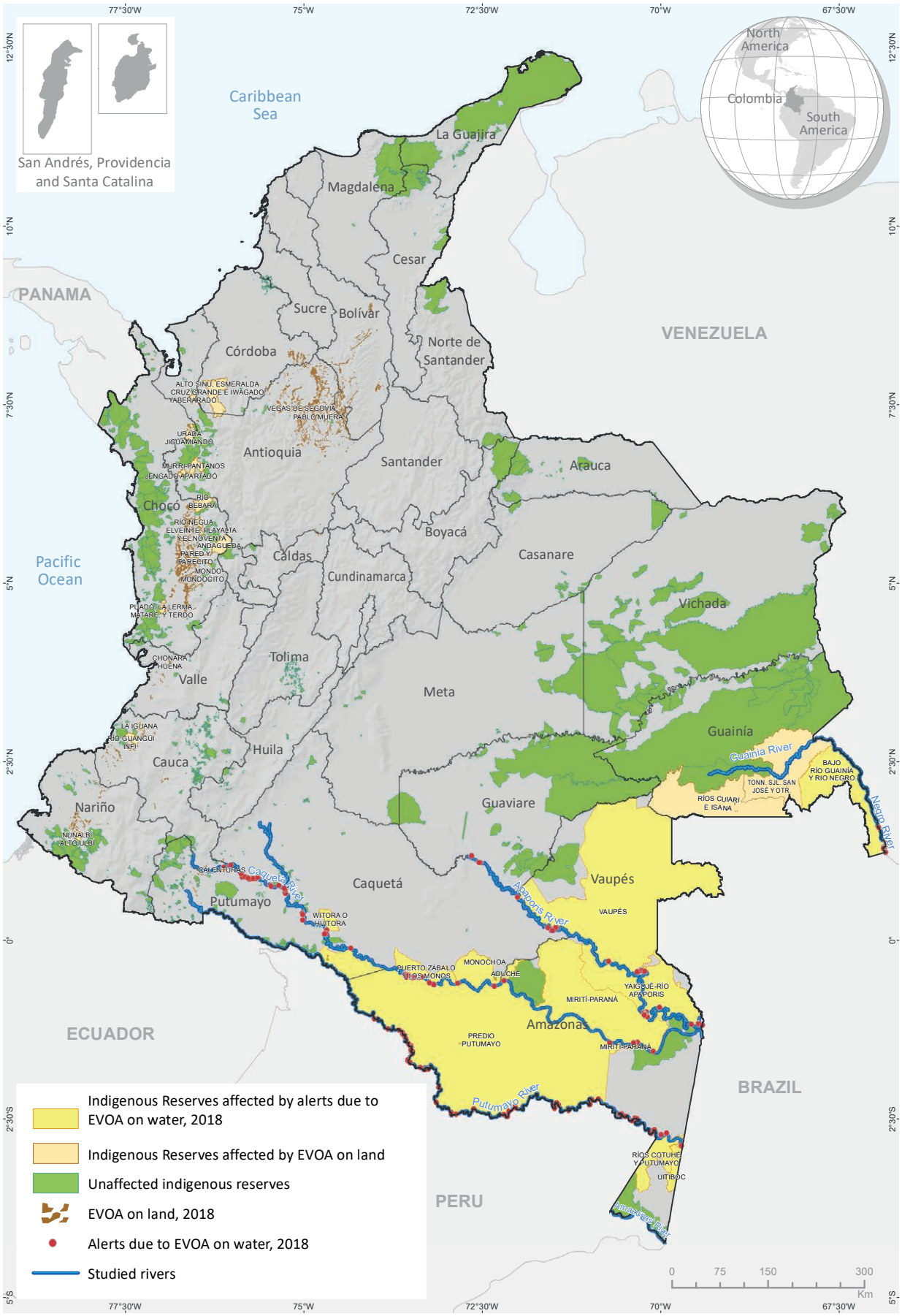
It is worth highlighting that the alerts due to EVOA on water for the Guainía River are located in the area of influence of the Indigenous Reserve (Lower Guainía River and Negro River), since other rivers generally affect three or more reserves. Most of the 14 reserves had alerts due to EVOA on water on just one river, except for the Predio Putumayo Reserve (impact on the Putumayo and Caquetá Rivers) and the Miritíi-Paraná Reserve (alerts for the Caquetá and Apaporis Rivers).

When it comes to the impacts of EVOA on water on the indigenous communities of the Colombian Amazon, the main concern is the high levels of biotransferred mercury that deteriorate these communities' health by bioaccumulating in the human body. Scientific research [18] [19] has demonstrated that the indigenous communities that inhabit the lower basin of the Caquetá River, mainly the Witoto ethnic group, have had the highest recorded levels of mercury since they started being recorded in Colombia. This alters the nervous system and vital organs' normal behavior, and a high mercury content in pregnant women can be transmitted to the fetus with cerebral repercussions. This situation can even put these communities' existence at risk, since mercury at considerable levels directly affects the quality of sperm.

It is also important to highlight that the alerts due to EVOA on water in the affected reserves (directly or indirectly) provide signs of these communities' exposure in terms of food safety [20] and the availability of access to water. In addition to the negative impacts of mercury mentioned above, altering the normal load of sediment in rivers affects the offer of aquatic wildlife and therefore reduces the nearby communities' fishing possibilities in these rivers, forcing them to move from the places where they traditionally fished to other places where they can find food more easily. Moreover, this also impacts water turbidity levels, which reduces the physical quality of the water they collect for human consumption and agriculture.

35 The detected area spatially overlaps with the reserve's area and/ or the analyzed river is the reserve's border.
36 The detected alert does not spatially overlap with the reserve's area or with the reserve's border where the studied river is located. However, the reserve is very close downstream of the detected area or to the referenced tributary.

## Map 9. EVOA on Indigenous Reserves, 2018.

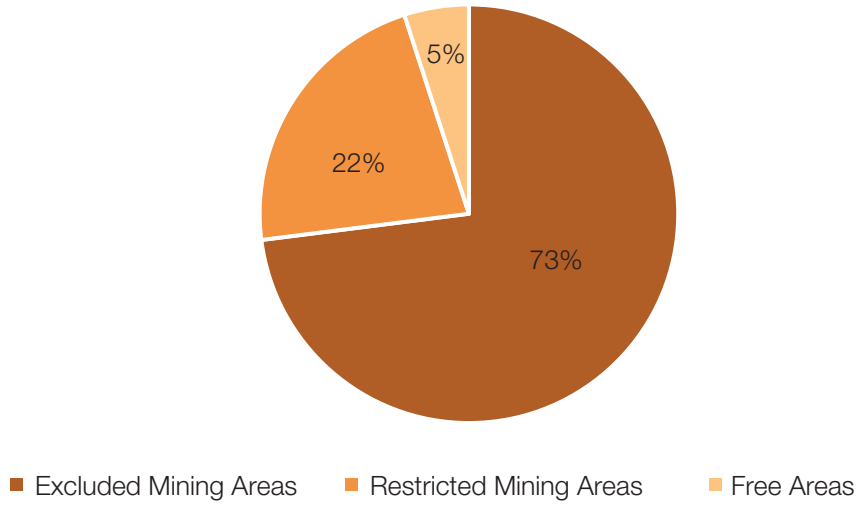



Source: Government of Colombia – Monitoring system supported by the UNODC. For indigenous reserves: Geographic Information System for Zoning and Land-use Planning (SIGOT).
The borders, names and titles used in this map do not represent the United Nation's recognition or acceptance.

*Black Community Territories*

37,973 hectares of EVOA on land[37] were detected in 2018 on Black Community Territories[38], which is to say 41% with respect to the national data. Of these, 73% are located in Excludable Mining Areas, 19% in Black Community Mining Areas, 3% in other Restricted Mining Areas and 5% in Free Areas (1,785 ha). It is worth highlighting that, even when mining is performed in free areas, it still does not mean operations have the technical and environmental licenses to legally exploit the mineral.

**Figure 11.** Distribution of EVOA on land in Black Community Territories

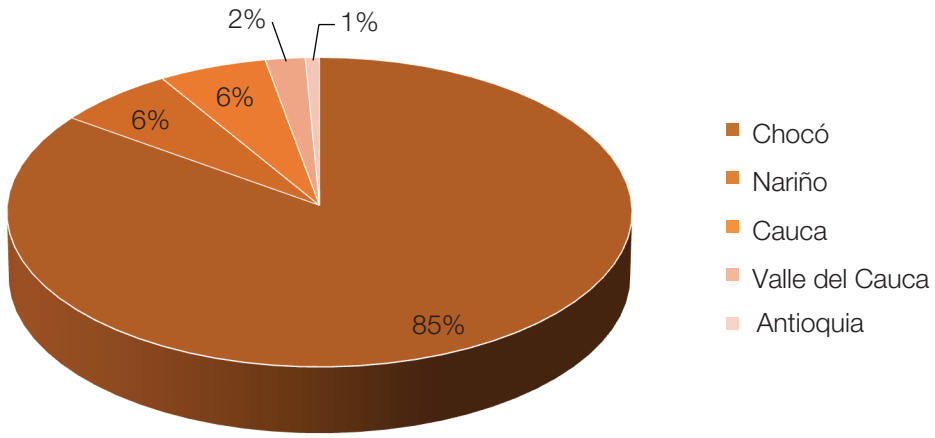



These figures call attention to the need to design strategies and public policies surrounding this situation, taking into account these territories' particularities.

Even though the figure increased by 8,489 hectares with respect to 2016, these territories' level of participation within the total reported amount went down 3% with respect to the previous study (44% in 2016)[39]. 76 Community Councils, 49% of all the Community Councils in the country, have EVOA on land. Black Community Territories in Chocó are the most affected, with 85% of the total EVOA in these territories. This represents 35% of the national total and is distributed in 18 of the 27 Community Councils of the Province. The remaining 15% of EVOA on land in these territories is distributed among another 59 Community Councils[40] located in Nariño, Cauca, Valle del Cauca and Antioquia.

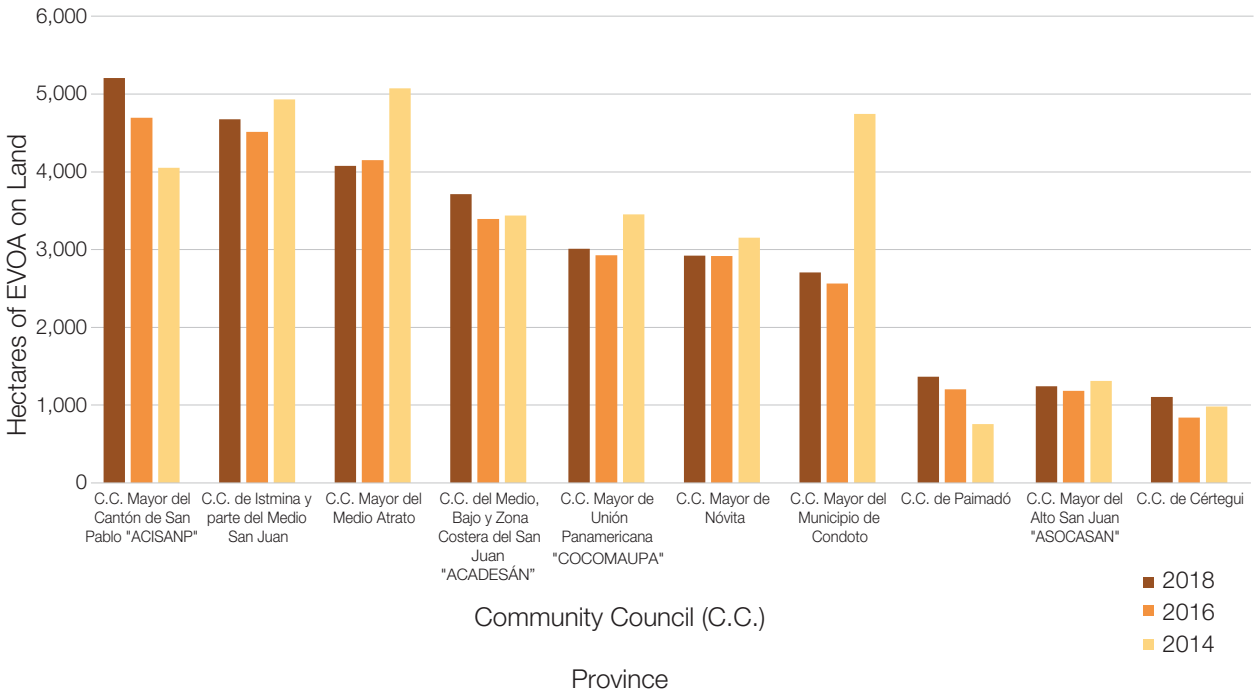
37 The geographic coverage of Black Community Territories corresponds to the geographic demarcation reported by the IGAC in 2018.
38 DECREE 1754 dated 1995, Article 3. Definition. A black community can be a Community Council, which, as a legally established entity, is the highest internal management authority in Black Community Territories, in accordance with the constitutional and legal injuntions that govern them and all others each community's own legal system assigns to it. In the terms of clause 5, article 2 of Law 70 dated 1993, a black community is a set of Afro-Colombian families that have their own culture, share a common history and have their own traditions and customs within a rural-urban relationship, who reveal and preserve a consciousness and identity that distinguish them from other ethnic groups [51].
39 This figure has been adjusted to the data obtained after updating the layer of borders of Black Community Territories and integrating them into the SIMCI framework of areas for this study. The figure reported in 2016 was 34,858 hectares in these territories (42% of national EVOA).
40 The Consejo Comunitario Mayor del Medio Atrato (Community Council of the Middle Atrato Valley), is the only place affected by EVOA on land that shares its area with two Provinces (Antioquia and Chocó). However, 99% of the phenomenon in this territory is in Chocó.

**Figure 12.** Distribution of EVOA on land in Community Councils by Province




79% of the affected area in these territories is focused on 10 Community Councils in the Province of Chocó, which is 13% of all affected Councils. This shows that close to one third of EVOA on land in the country is located in said territories.

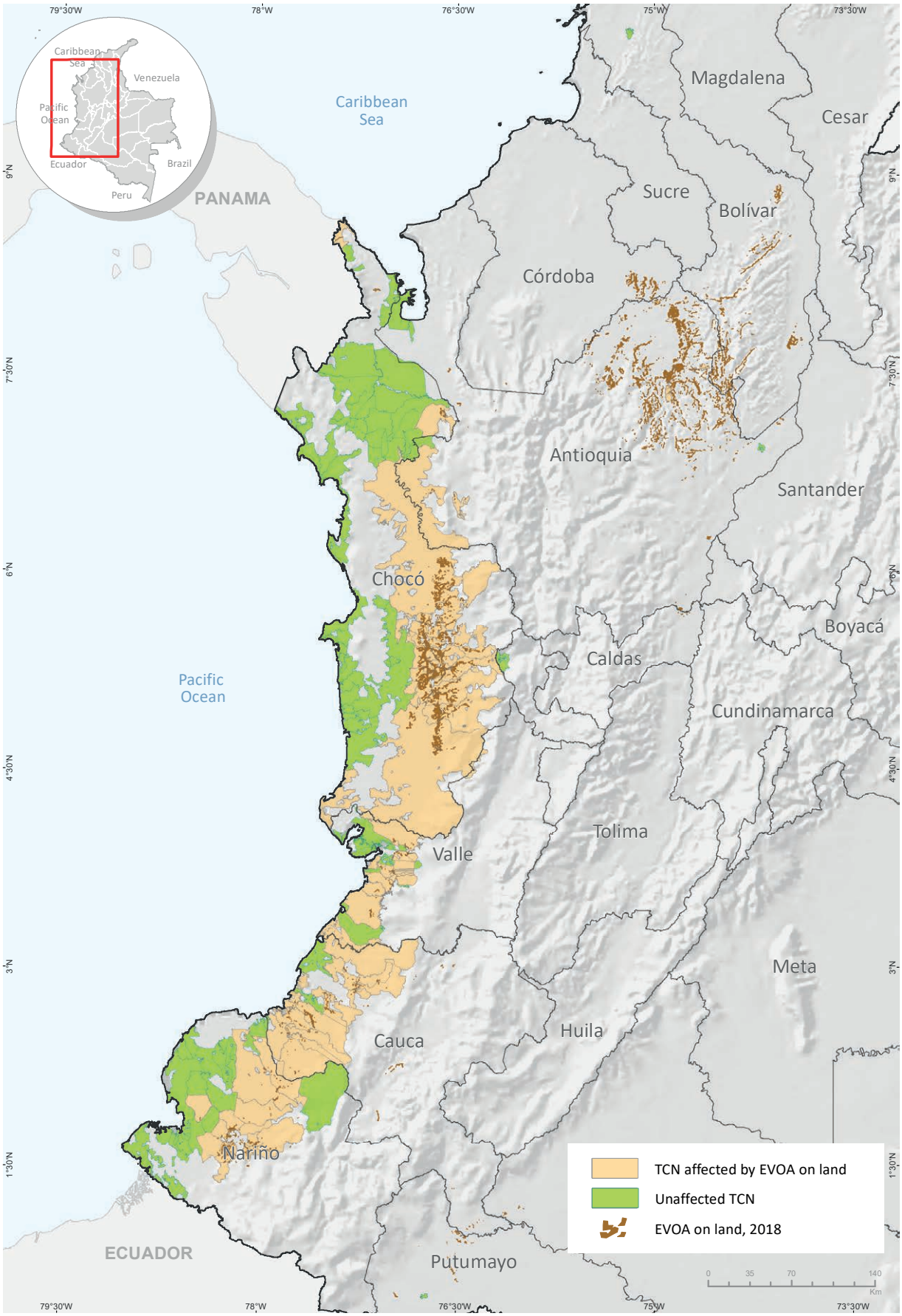
**Figure 13.** Community Councils most affected by EVOA on land in 2014 – 2016 – 2018.



In this sense, it is worth mentioning that the environmental and mobility issue generated by the negative impact of alluvial gold exploitation in their territories is added to the high socioeconomic vulnerability to which Black Communities are exposed in their territories as a consequence of losing plant cover, the flow and accumulation of large volumes of sediment, negative impacts on water quality and watercourse diversion to rivers, which are these territories' main axis of mobilization.

**Figure 14.** Effects on environmental conditions and navigability due to EVOA on land within the "La Cuenca del Río Iscuandé" Community Council, Nariño

## Map 10. EVOA on land in Black Community Territories, 2018.




Source: Government of Colombia – Monitoring system supported by the UNODC. For TCN: Geographic Information System for Zoning and Land-use Planning (SIGOT).
The borders, names and titles used in this map do not represent the United Nation's recognition or acceptance.

### *EVOA on land, Provinces*

The results of detecting EVOA on land indicate that, as of 2018, 52% are found in excludable mining areas, 13% in restricted mining areas, and 35% in areas where exploitation is permitted within the regulatory framework. In this context, and in accordance with the previous findings, it is noteworthy that more than half of the EVOA detected is located in regions where, as a function of the protection and conservation of the nation's environmental assets, exploitation is not permitted.

**Table 12.** Territory and EVOA on land, 2018

| Province | 2018 EVOA on Land | | | |
|---|---|---|---|---|
| | Hectares | % in Excludable Mining Areas | % in Restricted Mining Areas | % in Free Areas |
| Antioquia | 36,447 | 25 | 7 | 68 |
| Chocó | 35,194 | 74 | 21 | 5 |
| Bolívar | 8,913 | 89 | 0 | 11 |
| Córdoba | 3,982 | 14 | 0 | 86 |
| Cauca | 3,004 | 2 | 52 | 46 |
| Nariño | 2,921 | 99 | 1 | 0 |
| Valle del Cauca | 889 | 100 | 0 | 0 |
| Putumayo | 437 | 1 | 11 | 88 |
| Others | 259 | 54 | 0 | 46 |

***Concepts:***

*Affected municipality:*

*a municipality where EVOA on land and on water has been detected by remote sensing.*

*EVOA on land: a footprint or signal detected by digitally interpreting and processing satellite images, characterized for altering the landscape of alluvial lands.*

*EVOA on water: a footprint or signal detected by spectral indices in satellite images, characterized for altering the suspended sediments in a body of water.*

In the combined national figures, Chocó is the Province with the highest concentration of EVOA in Excludable Mining Areas, with 28%. It is followed by Antioquia and Bolívar, with 10% and 9%, respectively. Meanwhile, in terms of Provinces, Valle del Cauca and Nariño stand out, where 100% and 99% of the identified EVOA are in excludable mining areas, respectively.

With respect to Restricted Mining Areas, Chocó is once again the Province with the most EVOA. It has 9% of the combined national and 21% of all Provincial EVOA. In Cauca, 52% of EVOA is in restricted areas located on Black Community Territories.

### *Province Statistics for EVOA on Land*

11 of the 32 Provinces in the country have EVOA on land, with a total of 92,046 hectares, which is 10% more than what was detected in 2016. 78% of EVOA on land in the country is in two Provinces - Antioquia (40%) and Chocó (38%).

Antioquia is the Province with the most detected EVOA on land and has gone from second place in terms of impact in 2016 to first place in 2018. On its part, Chocó, which was first place for detected evidence in the last two studies (2014 and 2016), has moved to second place in 2018, although it has registered a 7% increase in detected area.

*Alluvial gold exploitation in Colombia includes two methods of exploitation depending on the location of the deposit: in alluvial landscapes close to old or current riverbeds (EVOA on land) or directly on the active riverbed of rivers (EVOA on water).*

*Detecting EVOA on water allows geographically locating the warning. However, due to the nature of the evidence, dimensioning a unit of area is not feasible. In this sense, EVOA on water has a territorial impact approximation on a municipal location scale. It is not relevant to the impact of movement in water.*

**Table 13.** EVOA on land by Province

| Province | 2014 EVOA on Land | 2016 EVOA on Land | 2018 EVOA on Land | | |
|---|---|---|---|---|---|
| | Hectares | Hectares | Hectares | % of the National Total | % of Change between 2016-2018 |
| Antioquia | 26,264 | 30,897 | 36,447 | 40 | 18 |
| Chocó | 36,185 | 33,024 | 35,194 | 38 | 7 |
| Bolívar | 7,410 | 7,820 | 8,913 | 10 | 14 |
| Córdoba | 3,545 | 3,592 | 3,982 | 4 | 11 |
| Cauca | 1,408 | 3,702 | 3,004 | 3 | -19 |
| Nariño | 1,676 | 2,677 | 2,921 | 3 | 9 |
| Valle del Cauca | 1,570 | 1,023 | 889 | 1 | -13 |
| Putumayo | 365 | 537 | 437 | 0 | -19 |
| Others | 515 | 348 | 259 | 1 | 48 |
| Total | 78.939 | 83.620 | 92.046 | 100 | 10 |

The greatest increase with respect to what was detected in 2016 occurred in the Province of Antioquia (18%). The main increases of above 40% occurred in the municipalities of Frontino (49%), Remedios (48%) and Vigía del Fuerte (46%). Of the Province's 125 municipalities, 20% are affected by EVOA on land. In second place for the increase from 2016 is the Province of Bolívar (14%), with 14 of its 46 municipalities being affected by EVOA (30%). The municipalities that are most affected by EVOA on land are Montecristo, Santa Rosa del Sur and Simití. However, the municipalities of Barranco de Loba (121%), San Martín de Loba (100%) and

Norosí (91%) show the largest increase. Third place in the expansion of the area with EVOA is Córdoba, with an 11% increase focused on the municipalities of Ayapel, La Apartada and San José de Uré.

In accordance with the above, the impact due to EVOA on land covers 100 municipalities (9%) of the country's[41] 1,122[42] municipalities. 20% of Antioquia's 125 municipalities are affected, and it is first place for the amount of affected municipalities, at 26. EVOA is concentrated in 10 municipalities: Zaragoza, Nechí, Cáceres, El Bagre, Remedios, Segovia, Tarazá, Anorí, Caucasia, and Amalfi, which contribute 95% of the Province's EVOA on land and 38% of all national EVOA.

**Figure 15.** Exploitation of alluvial gold in land, Municipality of Cáceres in the province of Antioquia

41 The spatial files of municipalities and other administrative units were updated in 2017. According to the above, the data on the dynamic in some municipalities can differ from those published in previous studies.
42 Colombia is divided into 1,101 municipalities, 20 Provincial townships and the Islands of San Andrés and Providencia. For the report, they are assumed to be 1,122 municipalities.

## Map 11. EVOA Detection in Colombia, 2018.


Source: Government of Colombia – Monitoring system supported by the UNODC
The borders, names and titles used in this map do not represent the United Nation's recognition or acceptance.

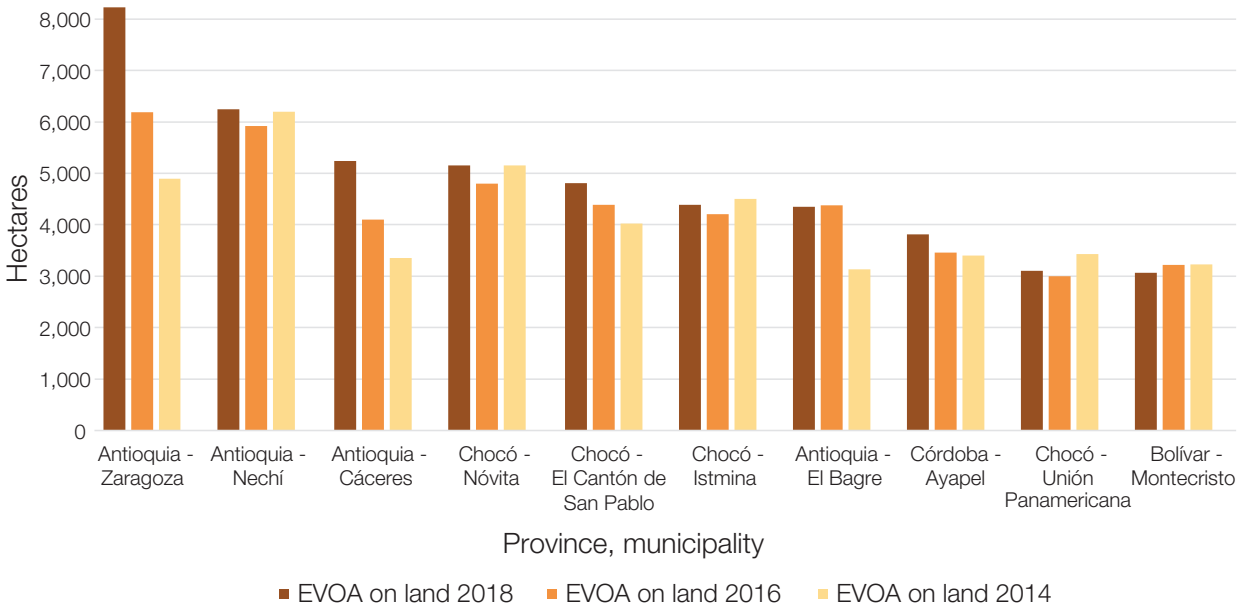
**Figure 16.** Left, EVOA on water. Cáceres - Antioquia, right, EVOA on land and on water. Puerto Guzmán-Putumayo. Photographs taken by UNODC during flyover for verification

In Chocó, 22 of its municipalities, which are 73% of the Province's municipalities, report EVOA. EVOA is focused on 12 municipalities: Nóvita, Cantón de San Pablo, Istmina, Unión Panamericana, Río Quito, Condoto, Quibdó, Medio Atrato, Cértegui, Medio San Juan, Tadó and Atrato. 92% of all detected EVOA in the Province is in these municipalities, which amounts to 35% of the total EVOA detected in the country. There is a high concentration of EVOA. 53% of national detected EVOA is located in 10 municipalities in the Provinces of Antioquia, Chocó, Córdoba and Bolívar.

**Figure 17.** EVOA on land, Chocó. Photographs taken by UNODC during flyover for verification.

Antioquia and Chocó each add 4 municipalities to the list, with 26% and 20% of the affected national area, respectively. Zaragoza, Nechí and Cáceres, in the Province of Antioquia, are the municipalities with the most reported area, at 8,229 ha, 6,248 ha and 5,240 ha, respectively. This represents 21% of the national total. They are followed by Nóvita, El Cantón del San Pablo and Istmina in Chocó, with a participation in the national total of 16%. The municipalities of Ayapel in Córdoba and Montecristo in Bolívar are on this list as well. All of these municipalities, except for Ayapel and Unión Panamericana, are also affected by coca crops.

**Figure 18.** Historical record of the 10 municipalities most affected by EVOA on land, 2018.




It should be pointed out that, of these 10 municipalities, Zaragoza and Cáceres in Antioquia are the ones that report the greatest increase in areas detected with EVOA with respect to 2016, with 33% and 28%, respectively. On the other hand, a decrease in detected areas of 1% was recorded in Bagre, in Antioquia.

*In accordance with the above, the negative impacts from EVOA cover 115 municipalities (10%) of the country's 1,122 municipalities. 99 municipalities have EVOA on land, while only 15 municipalities have EVOA on water and 1 municipality, Puerto Guzmán in Putumayo, has both kinds of exploitation.*

## Alerts due to EVOA on Water

Now, the findings from detecting EVOA on water in the five studied rivers, the Putumayo, Caquetá, Apaporis, Amazonas and Guainía Rivers, generated alerts in the Provinces of Caquetá, Putumayo, Amazonas, Guainía and Vaupés. It is worth mentioning that the Inírida River in the Province of Guainía, municipality of Puerto Inírida, also generated alerts in 2014. Likewise, alerts due to EVOA on water were detected in the study performed in 2016 on the Apaporis River, municipalities of Pacoa and Solano. This section of the Apaporis River has maintained its level of impact with respect to 2016 due to this kind of exploitation.

**Table 14.** Provincial impact due to EVOA on water

| Province | Affected Municipality | River with Detected EVOA on Water, 2018[43] | River with Detected EVOA on Water, 2016 | River with Detected EVOA on Water, 2014 |
|---|---|---|---|---|
| Amazonas | El Encanto | Putumayo | | |
| | La Chorrera | Caquetá | | |
| | La Pedrera | Apaporis, Caquetá | | |
| | Puerto Alegría | Putumayo | | |
| | Puerto Arica | Putumayo | | |
| | Tarapacá | Putumayo | | |
| | Puerto Santander | Caquetá | | |
| Caquetá | Solano | Apaporis, Caquetá | Apaporis* | |
| | Curillo | Caquetá | | |
| | Solita | Caquetá | | |
| Guaviare | Miraflores | Apaporis | | |
| Putumayo | Puerto Guzmán | Caquetá | | |
| | Puerto Leguízamo | Caquetá | | |
| Vaupés | Taraira | Apaporis | | |
| | Pacoa | Apaporis | Apaporis* | |
| Guainía | La Guadalupe | Guainía | | |
| | Puerto Inírida | | | Inírida* |

*Evidence detected in previous studies.

On the other hand, the Provinces of Putumayo, Caquetá and Guainía reported both kinds of exploitation. The Province of Putumayo, which has EVOA on land in the municipalities of Puerto Guzmán, Puerto Caicedo, Orito, Mocoa, Villa Garzón and Puerto Asís, has increased its level of impact with the addition of the municipality of Puerto Leguízamo, which is presenting alerts due to EVOA on water. The municipality of Puerto Guzmán registers both kinds of exploitation. Both impacts due to EVOA on water can be found on the Caquetá River.

*14 of the 32 Provinces had EVOA in both of its modalities. Caquetá, Putumayo and Guainía had EVOA with both types of exploitation. On the other hand, Amazonas and Vaupés only had EVOA on water.*

*The results of EVOA on water must be read cautiously because the study for this modality was only performed on five rivers. (Amazonas, Putumayo, Caquetá, Guainía and Apaporis).*

43 The Study only contemplates five rivers, the Putumayo, the Caqueta, the Apaporis, the Guania and the Amazon rivers.

Caquetá, which has EVOA on land at San José del Fragua, also has EVOA on water in other municipalities, specifically Solano, Solita and Curillo. Alerts due to EVOA on water were mainly detected on the Caquetá River, with the exception of Solano, which has alerts for the Apaporis River.

Finally, the Province of Guainía shows negative impacts due to both EVOA on land in the municipalities of Paná Paná and Puerto Colombia and EVOA on water in the municipality of La Guadalupe on the Guainía River. In 2014, there was EVOA on water on the Inírida River in the jurisdiction of the municipality of Inírida.

## Dynamics of the Phenomenon, 2016-2018

The study indicates that the area affected by EVOA in the 2016 to 2018 period from 2014 to 2018 is 104,619 ha. However, 76% of the affected national area is concentrated in Chocó and Antioquia, each one contributing 38% to the total national territory affected by EVOA on land.

The affected area is made up of stable areas, new areas, expanding areas, and areas with signs of grasslands and pastures.[44]

68% percent of the affected land is in stable areas in the 2016 to 2018 period, and of that area, 40% is concentrated in the Province of Chocó and 38% in the Province of Antioquia. It is those same Provinces, however, that have the greatest increase in new areas and areas in expansion, with 30% and 44%, respectively.

15% of the EVOA on land in 2016 has shown signs of grassland and pastures in 2018, characteristic of the initial stages of plant succession. 33% percent is concentrated in Chocó and 30% in Antioquia, indicating a high level of activity in the search for an investigation of new exploitation sites. It must be taken into account, however, that in those stages, the requirement for germplasm or genetic material to begin the succession process is less demanding in terms of diversity and wealth of species in comparison with the higher stages of plant succession. Successfully concluding the succession process will depend, therefore, among other things, on the quantity, viability, and diversity of the germplasm, as well as on the physical and chemical conditions of the soil [21]. It is therefore not possible to definitively ensure that the areas in this category are moving toward a recovery of the original conditions of forest cover.

***Concepts:***

*Affected area, 2014-2018: The geographic sum of EVOA detection in 2014, 2016 and 2018*

*Stable area: area with permanent EVOA detected in the 2014, 2016 and 2018 studies.*

*New area: area with EVOA detected in 2018, when there was none in 2016.*

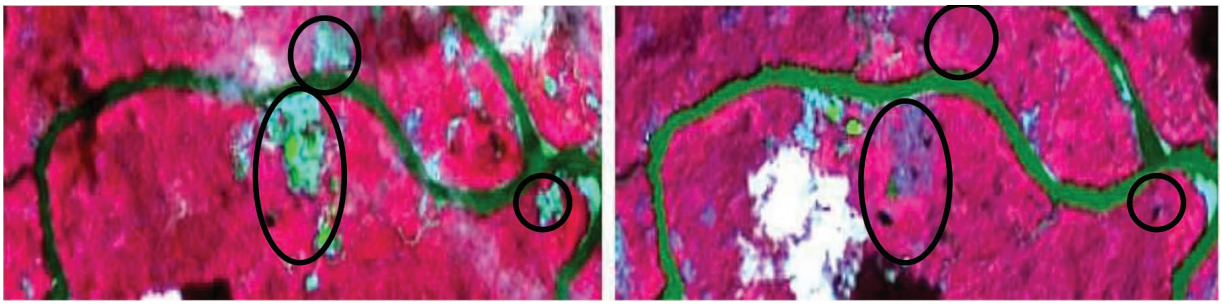
*Expanding area: area with EVOA detected in 2018 with new exploitation areas and previously detected EVOA that has continued.*

*Area with signs of grasslands and pastures: areas with EVOA detected in 2016 with herbaceous vegetation or low stover in 2018, ca characteristic of the initial stages of plant succession*

*Area without information: areas with EVOA detected in 2016 that are under cloud cover during the study period.*

44 The category of grasslands indicates that there is a spectral response related to emerging plant succession. However, this does not imply that the succession process will continue to maturity, for which this category must be considered with caution.

**Figure 19.** RGB 547 Landsat 8 Image. Black circles with EVOA, April 2014 on left. Black circles with areas with pastures and low stover, January 2017 on right



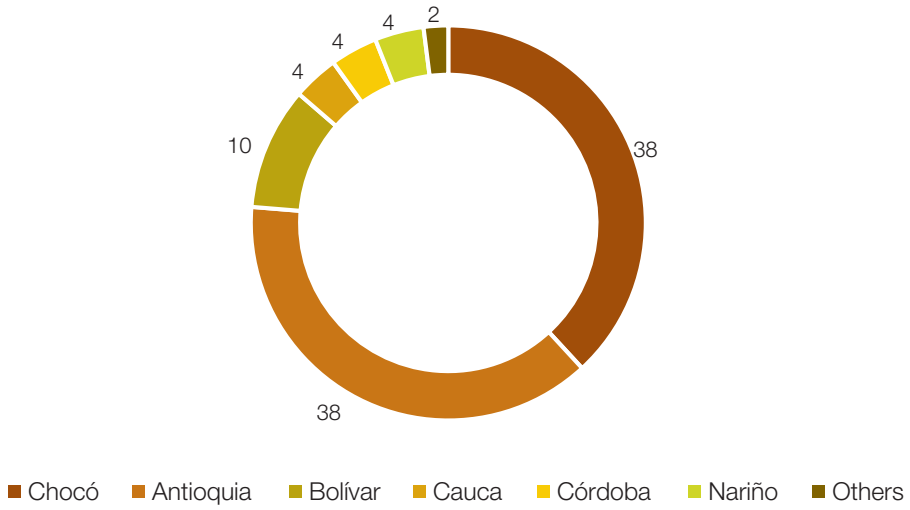
New areas and expanding areas grew 13% compared to 2016. 84% percent of these areas are concentrated in Antioquia (44%), Chocó (31%) and Bolívar (10%).

**Table 15.** Area in hectares affected by EVOA on land, 2016-2018.

| Province | EVOA on Land, 2018 | Stable Area, 2016-2018 | New Area, 2018 | Area in Expansion, 2018 | Area with Signs of Grasslands and Pastures | Affected Area, 2016-2018 | % of Affected Total |
|---|---|---|---|---|---|---|---|
| Chocó | 35,194 | 28,910 | 4,930 | 1,354 | 4,113 | 39,306 | 38 |
| Antioquia | 36,447 | 27,147 | 6,997 | 2,303 | 3,749 | 40,196 | 38 |
| Bolívar | 8,913 | 6,750 | 1,504 | 658 | 1,070 | 9,983 | 10 |
| Cauca | 3,004 | 2,292 | 567 | 145 | 1,411 | 4,415 | 4 |
| Córdoba | 3,982 | 3,125 | 497 | 361 | 467 | 4,450 | 4 |
| Nariño | 2,921 | 1,657 | 975 | 289 | 1,020 | 3,941 | 4 |
| Valle del Cauca | 889 | 720 | 118 | 51 | 303 | 1,192 | 1 |
| Putumayo | 437 | 302 | 89 | 46 | 235 | 672 | 1 |
| Caquetá | 50 | 18 | 8 | 24 | 37 | 88 | <1 |
| Guainía | 139 | 95 | 35 | 9 | 22 | 161 | <1 |
| Others | 70 | 33 | 14 | 27 | 145 | 215 | <1 |
| Total | 92,046 | 71,049 | 15,734 | 5,264 | 12,572 | 104,619 | 100 |

The following chart illustrates the percentage distribution among Provinces of areas affected by EVOA during 2016 - 2018:

**Figure 20.** Area affected by EVOA on land, 2016-2018.




Caquetá and Caldas are the Provinces reporting the greatest percentage for detection of new areas with respect to their total areas for the Province, 48% and 35%, respectively, although their participation in the total detected area for the entire nation is less than 1%. They are followed in order by Putumayo, Nariño and Córdoba. On their part, Nariño, Guainía and Putumayo reported an increase in expanding areas of more than 20% of their total areas for their Provinces for 2018.

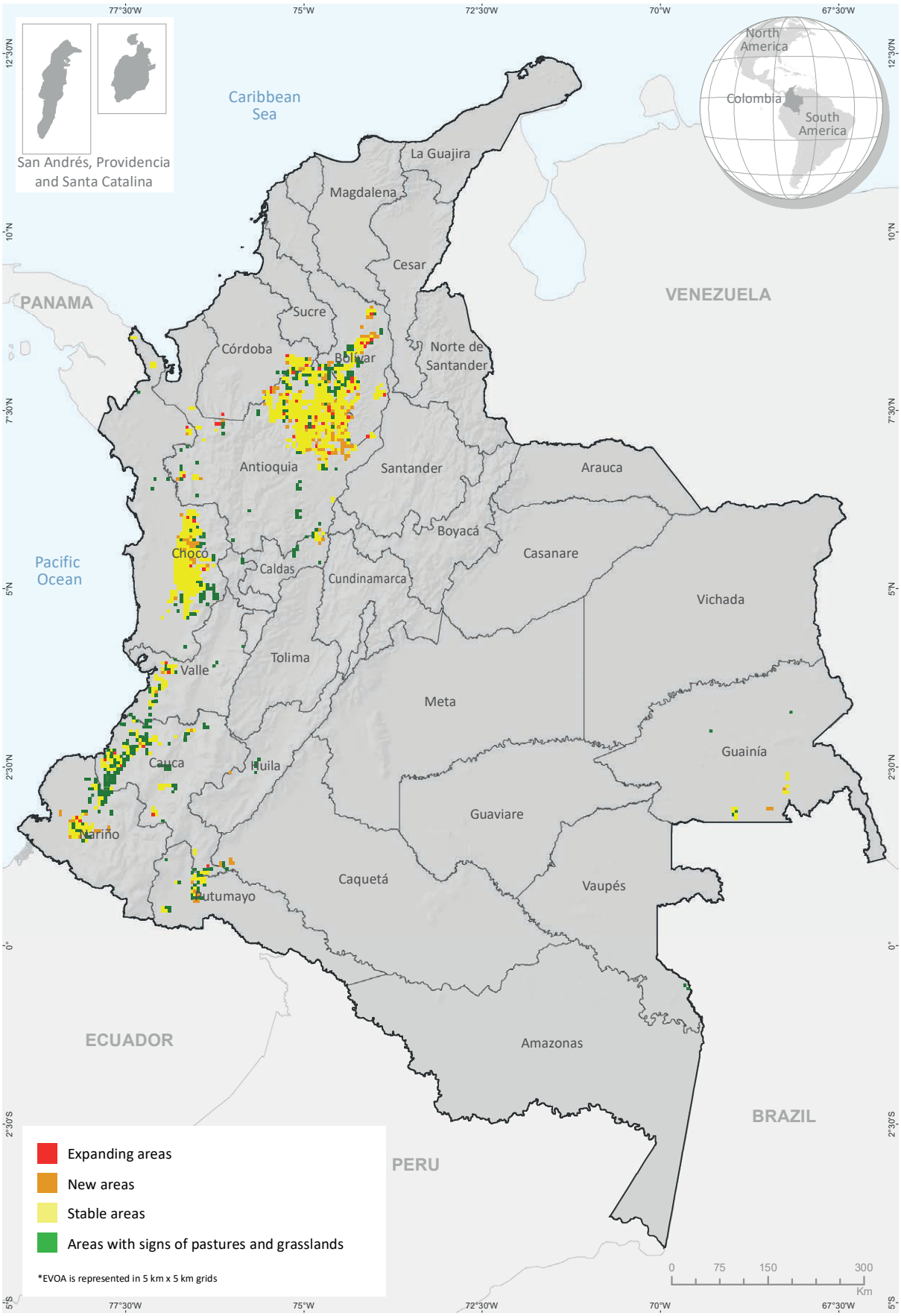
In the Provinces of Putumayo and Nariño, at the same time they reported a combined increase of more than 50% for new areas and expanding areas, they also experienced an increase in area planted with coca crops (18% and 7%, respectively)[45]. Those Provinces contain 44% of the nation's territory planted with coca crops. Even though they have only 4% of the EVOA detected in 2018, this should be an alert to the nation because we see a dynamic of two illegal phenomena being activated, directly associated with the vulnerable conditions in those regions.

It is also interesting that the recent field confirmations demonstrated that the process to remove material to reach alluvial deposits is no longer superficial. It has given way to deeper excavations to reach older alluvial deposits. The following photo shows the magnitude of the depth obtained by the machinery, a factor that takes on great importance after evaluating the surroundings, in that this is taking place just a few meters from the wall of the riverbed, leaving a very thin layer to contain the river.

45 Between 2016 and 2017, Putumayo increased from 25,162 ha to 29,589 ha and Nariño grew from 42.697 ha to 45.735 ha.

**Figure 21.** Aerial reconnaissance photographs showing the depth of the exploitation. a) Deep excavation a short distance from the wall of the riverbed. b) Shallow excavation

## Map 12. Territory with EVOA, 2016 - 2018[46].



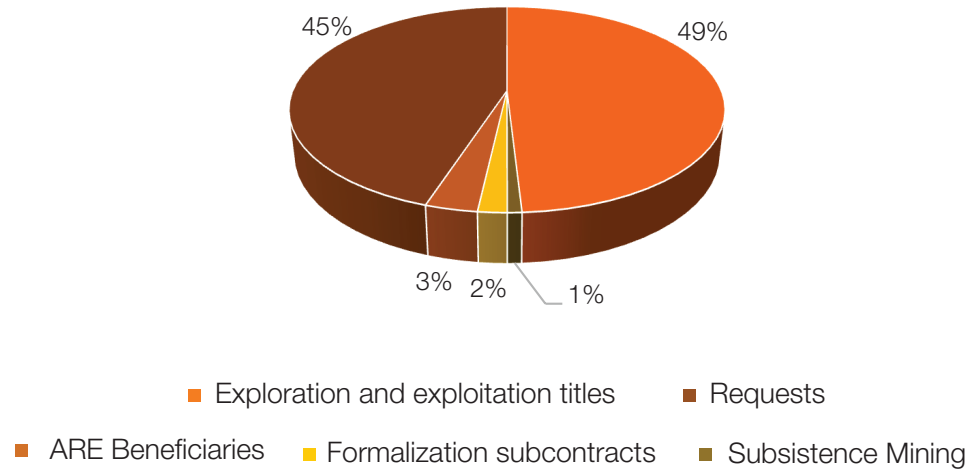

Source: Government of Colombia – Monitoring system supported by the UNODC
The borders, names and titles used in this map do not represent the United Nation's recognition or acceptance.

46 The affected territory was calculated using 5 km grids.

## EVOA and National Production

Another element to consider in terms of the impact on national territory from EVOA in either of its modes is the reported national production[47]. As of September 2018, the overall reported production was 49% coming from mines with mining exploitation titles, 3% coming from subcontracts for mining formalization, 2% from beneficiaries of Special Reserve Areas, 1% from areas with requests for formalization, and 45% coming from subsistence mining (gold panners)48. It is noteworthy that the production reported by subsistence miners is almost as high as production reported by mining exploitation title-holders, which by their very nature have infrastructure and specialized machinery supporting a profitable productive model, in either small, medium, or large-scale mining, which is the opposite of the case with subsistence mining.

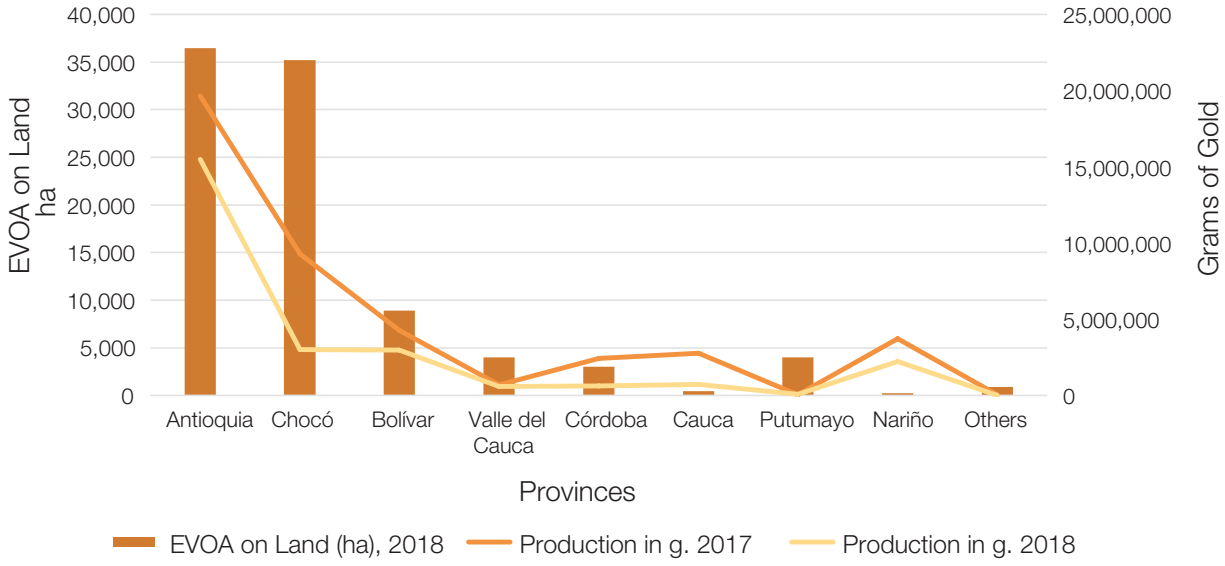
**Figure 22.** Distribution of domestic production reported by the mode of the producer.




Upon expanding the dimensions of the study of the data by looking at gold production by Province [22] and EVOA, we observed that the overall production reported for 2018 went down by 40% with respect to 2017[48], producing 42,878,674 grams of gold in 2017 versus 25,685,136 g in 2018. Cauca and Nariño are the Provinces with EVOA on land that reported a reduction of more than 70%.

47 National production does not differentiate by exploitation reserve or type of mining operation. In this sense, it includes both production from primary and secondary reserves and both gold from veins and alluvial gold.
48 As of August, 2018, 4,236 scrap dealers and 62,232 gold panners were registered.

**Figure 23.** EVOA on land and reported gold production[49] 2017-2018.




Antioquia is in first place for both percentage of EVOA on land and reported production for 2018 (15,492,230 g). It recorded, however, 20% less than the immediately prior year. It is estimated that two thirds of the gold from Antioquia comes from alluvial deposits and a third from vein deposits.[50] [23] Chocó is in second place in terms of EVOA on land and in reporting production, with 22% of the total national production for 2017 and 12% in 2018. Like Antioquia, it recorded a reduction in the total reported production (68%).

Interestingly, although Antioquia and Chocó report a similar area for detection of EVOA, Chocó has a significant negative difference in its reported production compared to the Province of Antioquia, going down 24 percentage points in 2017 and 48 points in 2018, although there is an increase in detections of EVOA on land. In addition, although Nariño reported an increase of 9% in EVOA detected on land, it reported a 74% reduction in production for 2018.

Valle del Cauca reports an 89% increase in production. Its share of the total for the nation, however, is less than 1%. Guainía, with EVOA detected on both land and also a strong presence of EVOA in the water, is one of the Provinces reporting production in 2018. But its share in the combined figure for the nation is less than 1%. Production from this Province is concentrated among subsistence miners. However, it is worth remembering that this region is part of the excludable mining areas. Lastly, Guajira and Huila, where the exploitation occurs in gold veins, increased their reported production for 2018.

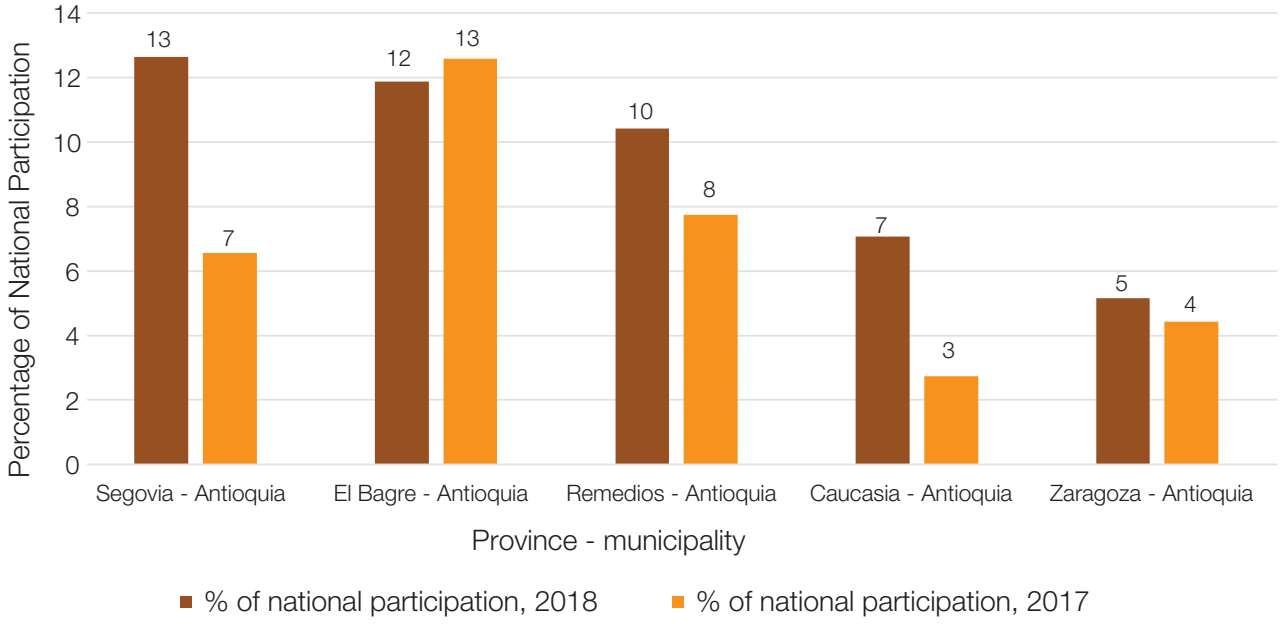
Looking at municipal production shows that 47% of the reported production in 2018 is concentrated in five municipalities of Antioquia: Segovia, El Bagre, Remedios, Caucasia

49 The report on national production was obtained based on royalty collections substantiated in the Basic Mining Form, which is a government taxation instrument in which title-holders indicate the volumes they produce per semester and year, among other figures. However, this information has not been completely consolidated by the mining authority.

50 The wealth of vein deposits in Antioquia is represented by the municipalities of Zaragoza, Segovia, Amalfi, Anorí, Remedios and Puerto Berrío. On the other hand, the main alluvial deposits are concentrated in Zaragoza, Remedios, Segovia, Puerto Berrio and Frontino [54].

and Zaragoza, while those same municipalities in 2017 produced only 34% of the total production reported. On this particular, the municipalities of Segovia and Caucasia reported a reduction of 6 and 4 percentage points, respectively, in the report in 2018 with respect to 2017.

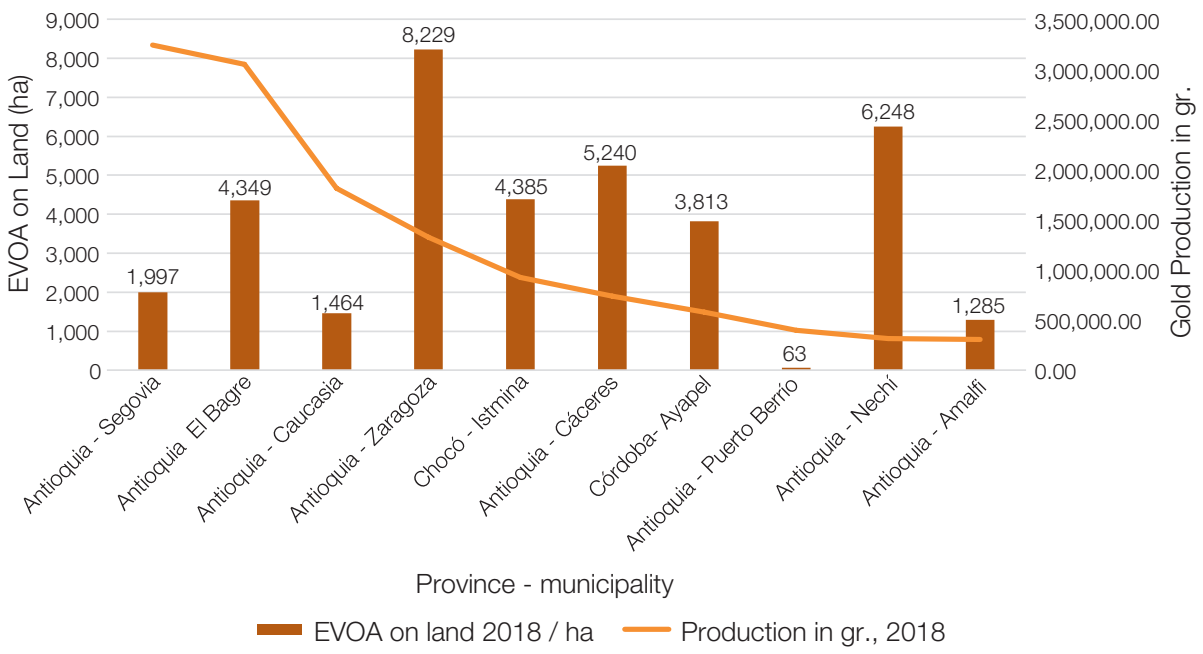
**Figure 24.** Municipal participation in gold production, 2017-2018.




Among the top five municipalities in terms of production in 2018, Remedios and Segovia do not spatially coincide with environmental licenses but do report production. Apart from those municipalities, Nechí is the only municipality with a spatial coincidence with environmental licenses, and it holds 17th place in national production. It is also second in EVOA detection.

Now, when we contrast the top 10 municipalities with the greatest production reported and the greatest detection of EVOA on land, only six of those municipalities are among the 10 municipalities with the greatest percentages of domestic production: El Bagre, Zaragoza, Istmina, Cáceres, Ayapel and Nechí. Segovia, in position 17 for detection of EVOA, is the municipality with the greatest percentage of production, with 21% of the Province's production and 13% of the nation's total production. Puerto Berrío is ranked 13th for percentage of national production but reports only 63 ha of EVOA on land. However, the region has vein deposits. Moreover, this municipality does not coincide with any of the areas covered by the current legal framework.

**Figure 25.** List of top 10 municipalities in national production and EVOA on land, 2018.




The municipalities of Nóvita and Cantón de San Pablo in Chocó and Montecristo in Bolívar, although they are among the top 10 municipalities for detection of EVOA, contribute only 1.3% of the nation's total production.

The Provinces of Amazonas and Vaupés, where EVOA is detected on water, do not record any percentage of national production, although Vaupés has two titles established for exploitation. Guainía reports production in 2018 of less than 0.5% of the nation's production.

In the case of Huila, Caldas, Tolima, Valle del Cauca, Risaralda and Santander, grouped in the category "Others," the available information shows that the majority of the exploitation is in vein deposits [24].

The fact that there is no strong connection between EVOA and share in the nation's production may have to do, among other reasons, with whether the production comes from vein deposits or alluvial deposits (see following graph), EVOA in water, differences in productivity, the fact that gold is not always registered in the exploitation area, or the fact that, as was confirmed based on the information obtained in the region, the gold may simply not be registered. In this respect, it is worth mentioning that miners interviewed by the UNODC in Cauca, Chocó and Guainía, reported that Medellín is the final destination of the gold they mine [25].

## Map 13. Density of EVOA on land, 2018.


Source: Government of Colombia – Monitoring system supported by the UNODC
The borders, names and titles used in this map do not represent the United Nation's recognition or acceptance.

## EVOA and areas covered by the current legal framework

The methodology used to detect EVOA does not make an attempt to characterize the alluvial gold-exploitation activity or its legal nature, but it does give information-based evidence to the competent institutions in charge of managing and controlling the resources that can strengthen the institution's work related to the framework of reference for this phenomenon and, therefore, for managing the resource and controlling illegal exploitation. For this purpose, observing EVOA and the areas covered by the current legal framework for gold exploitation described in the study (environmental licenses, exploration and exploitation titles - i.e. "Amparo de Títulos", contract proposals, special reserve areas, and requests for formalization both under Law 685 and under Decree 0933) allows gaining a regional view of the phenomenon.

The information related to exploration and exploitation titles, contract proposals, special reserve areas, and requests for formalization comes from the National Mining Agency – ANM, which is the institution in charge of managing the State's mineral resources efficiently, effectively, and transparently by fomenting, promoting, and granting titles, as well as monitoring and controlling mining exploration and exploitation, in order to maximize the sector's contribution to the country's comprehensive and sustainable development [2].

It should be emphasized, however, that since 2012, Antioquia, through the Office of the Secretary of Mines, is the only Province that operates as a mining delegation, with delegated functions for promoting and developing mining, issuing titles and engaging in mining audits, following the guidelines of the Ministry of Mines and Energy and intervening directly in the territory [24]. Consequently, the Secretary of Mines of Antioquia is the institution in charge of that Province's information related to these areas covered by the current legal framework.

For environmental licenses, the source of information is the National Authority for Environmental Licenses – ANLA, as the institution in charge of ensuring that projects, works, or activities subject to licensing, permits, or environmental procedures comply with environmental regulations in such a way that they contribute to the country's sustainable environmental development (Decree 3573) [3].

Although the study deals with these six areas covered by the current legal framework in a general manner, it is necessary to mention that a comparison between the EVOA detected and the information on these areas leads to a different interpretation, such as the one below:

1. Technical regulatory framework for beginning mining activities: implies meeting the requirements for obtaining a technical exploitation permit (mining title, concession contract). This procedure culminates with obtaining the environmental permit for exploitation or an environmental license. If these two permits are not obtained, any mining activity is illegal.

2. Now, although the environmental regulatory framework implies obtaining environmental permits before beginning to mine, it implies a series of environmental obligations, requirements, and conditions to which the title-holder makes a commitment in order to guarantee the proper environmental execution of the mining. This point is important because the magnitude and nature of the EVOA detected on land, regardless of whether or not it occurs under an area covered by the current legal framework, im-

ply a strong impact on the landscape that suggests the title-holder's failure to comply with these environmental obligations.

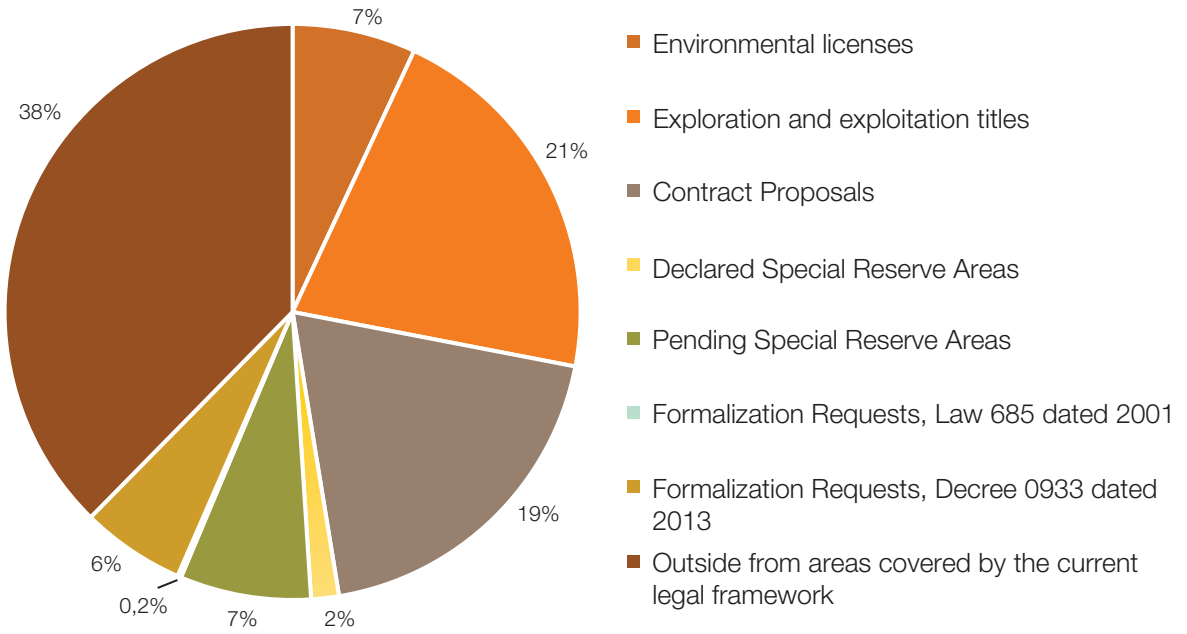
The areas covered by the current legal framework considered in the study have been structured as follows:

- Requests for Formalization, Law 685 of 2001: This area covered by the current legal framework is when a request has been made for formalization and permission has been given to engage in production using hand tools only. In other words, using heavy machinery is not permitted, and therefore any evidence of exploitation with heavy machinery is considered to be outside of the framework of the law.
- Requests for Formalization, Decree 0933 of 2013: This area covered by the current legal framework is when a request has been made based on Decree 0933 of 2013. Such areas have been suspended since 2016, and therefore no exploitation can take place. In this case, any evidence of exploitation with heavy machinery is considered to be outside the framework of the law.
- Special Reserve Areas (ARE): this area covered by the current legal framework refers to areas marked out by the ANM where a mining community has begun the process to obtain a concession contract. It should be emphasized that the exploitation must be performed using manual methods in these areas, and, therefore, any evidence of mining with heavy machinery is considered to be outside of the framework of the law. This area covered by the current legal framework includes both AREs that have been declared and those in the process.
- Contract proposals: this area covered by the current legal framework only includes areas for which a request has been submitted for a mining concession contract between the State and private parties. The very nature of this area areas covered by the current legal framework implies that no exploitation work will be done until the proposal produces a mining title ("Amparo de Título) and, subsequently, an environmental license. Therefore, any EVOA detected under this area covered by the current legal framework is considered to be outside the framework of the law.
- Exploration and Exploitation Titles (i.e. "Amparo de títulos"): this area covered by the current legal framework, although it consists of one of the two final requirements for exploitation under the framework of the law, still needs to receive the environmental permit provided for this study by the ANLA or by the competent environmental institution. It is important to point out that the ANLA's System has not been properly updated by the other institutions that have jurisdiction over environmental licensing. Therefore, the geographic information and analysis derived from these spatial comparisons must be interpreted with caution.
- Environmental licenses: To set up a mine and profit from it, the mine must have met two final requirements. It must have its mining title of exploitation and environmental license [25]. Therefore, this area covered by the current legal framework refers to having a mining title with its environmental license issued by the competent authority and is considered the only area covered by the current legal framework under which mining exploitation activities can take place in the framework of the law. However, in accordance with the previous point, these results must be interpreted with caution.

The model is based on a structuring and ranking of the information provided by the ANM[51], the Secretary of Mines of Antioquia and the ANLA[52] and subsequently a spatial superimposition with the EVOA.

The following chart illustrates the percentage relationship between EVOA and the related areas covered by the current legal framework.

**Figure 26.** National percentage distribution of EVOA with respect to different areas covered by the current legal framework, 2018.




For 2018, 38% of the areas with EVOA do not coincide with any area covered by the current legal framework. In addition, 34% coincide with areas covered by the current legal framework that do not permit mining exploitation, which means 72% of the exploitation activities detected as EVOA do not have any of the permits required for exploitation – one percentage point less than what was detected in 2016. The remaining 28% is distributed among environmental licenses, 7%, and exploration and exploitation titles, 21%.

In the category of areas covered by the current legal framework that do not have exploitation permits, 19% are under the name of "Contract Proposals." These proposals are concentrated mainly in Chocó (62%), which records an increase in this area covered by the current legal framework of 25 additional percentage points from what was seen in 2016, Antioquia (17%), 50% less than in 2016, Bolívar 10% and Córdoba 6%.

In these same categories, 9% of the EVOA coincided with Special Reserve Areas (7% in process and 2% declared): particularly under this area covered by the current legal framework, 67% of the detected evidence is located in Chocó and 75% of those areas are

51 The cut-off date of the ANM's information is November, 2018. The attached data table does not differentiate between exploitation methods or types of reserves. Because of this, the files represent all of the areas covered by the current legal framework regarding gold exploitation without differentiating between vein and alluvial gold exploitation.
52 The cut-off date of the information provided by ANLA is August, 2018.

in the municipality of El Cantón de San Pablo. Antioquia also has 29% of this area covered by the current legal framework in its territory.

With respect to requests for formalization, the EVOA detected under Law 685 of 2001 is less than 1% (0.21%) and specifically located in Chocó, mainly in the municipality of Unión Panamericana. Under Decree 0933 of 2013, the figure is 6%, a situation very similar to that which was recorded in 2016, and 47% of it is concentrated in Chocó, mainly in the municipalities of Unión Panamericana and Condoto; 20% is located in Bolívar, mainly in the municipality of Montecristo, and 20% in Antioquia, located mainly in the municipality of Cáceres.

Now, 21% of the detected area is under the mode of "Exploration and exploitation titlle," an area covered by the current legal framework that remains relatively stable with respect to 2016 and is once again concentrated in the Provinces of Antioquia (52%), Chocó (29%) and Bolívar (18%). With respect to 2016, there was a reduction in Antioquia, going from 56% to 52%, and an increase in Chocó, going from 20% to 29%, while Bolívar remained relatively stable.

Lastly, 7% of the EVOA was detected under the area covered by the current legal framework of environmental licenses, the only area that has both the technical permits and environmental permits for exploitation. 100% of them were located in the Province of Antioquia, in the municipalities of Caucasia, El Bagre, Nechí and Zaragoza. However, in accordance with the other regional authorities authorized to issue those permits' failure to update the ANLA's System, this data should be considered with caution.

*In the framework of the law (legal and environmental), having obtained the environmental license that establishes compliance with requirements, terms, conditions and obligations to prevent, mitigate, correct, and compensate the project's environmental effects is set as the final requirement to begin exploitation, among which the following are established a) serious deterioration to renewable natural resources, b) the environment, c) noticeable modifications to the landscape.*

*In this context, a national alert is generated because EVOA detected in the framework of this study, in terms of spatial overlap with or without areas covered by the current legal framework, is centered upon noticeable changes and modifications to the landscape, which are not harmonized with the essence of environmental regulations and show failures to follow up on and control exploitation.*

Nevertheless, in the legal and environmental framework established for beginning exploitation operations, this area covered by the current legal framework meets all the requirements. However, the EVOA detected is unbalanced in terms of complying with environmental management, follow-up, and control measures established by the competent authority for granting environmental licenses.

In addition, despite the geographic match, it is not possible to determine whether exploitation is being performed in a fully formal framework. There is another area covered by the current legal framework that describes a relationship between the formality of these titles and disturbances within them, called and Administrative Injunction.[53] For this study, it was not possible to access that information.

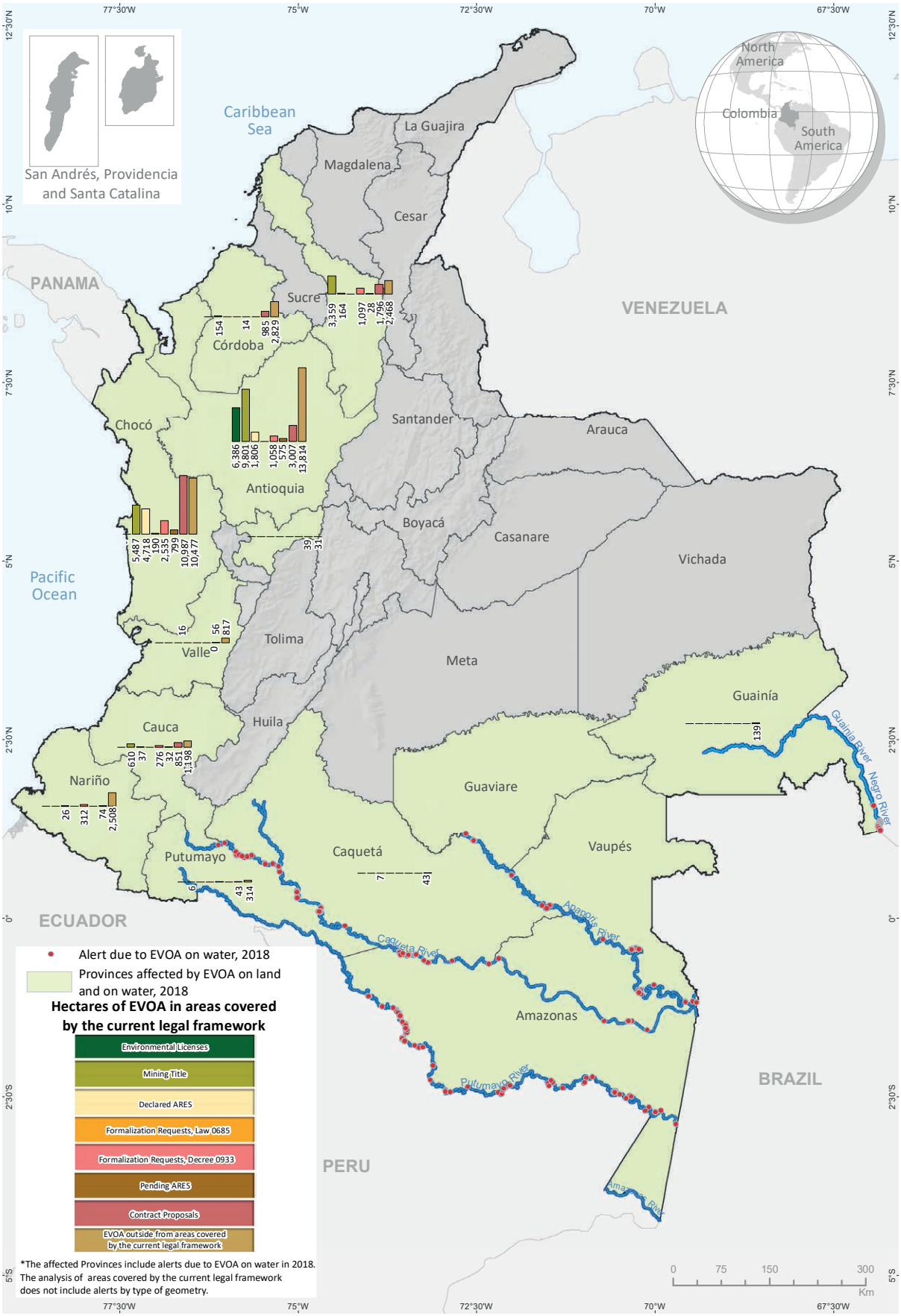
53 Administrative injunctions seek to prevent illegal mining, de facto occupation or any other disruptive current or imminent action against the right granted by the title. The nature of this guarantee of mining rights in light of disruptive actions or de facto occupation is reflected in a procedure provided by the legislator, in which it does not distinguish or articulate any sort of confrontation between the individual and the State, but a protection of a private subject's rights before another individual or group's disruptive actions, all of which makes this injunction a eminently policing process [55].

**Table 16.** Percentage Distribution of EVOA on land and areas covered by the current legal framework by Province, 2018

| Province | EVOA on Land (ha) | Outside from areas covered by the current legal framework | Contract Proposals | Special Reserve Areas - AREs | Formalization Law 685 of 2001 | Formalization Decree 0933 of 2013 | Exploration and exploitation title | Environmental License |
|---|---|---|---|---|---|---|---|---|
| Antioquia | 36,447 | 38 | 8 | 7 | 0 | 3 | 27 | 18 |
| Chocó | 35,194 | 30 | 31 | 16 | 1 | 7 | 16 | 0 |
| Córdoba | 3,982 | 71 | 25 | 0 | 0 | 0 | 4 | 0 |
| Nariño | 2,921 | 86 | 3 | 1 | 0 | 11 | 0 | 0 |
| Bolívar | 8,913 | 28 | 20 | 2 | 0 | 12 | 38 | 0 |
| Cauca | 3,004 | 40 | 28 | 2 | 0 | 9 | 20 | 0 |
| Valle del Cauca | 889 | 92 | 6 | 2 | 0 | 0 | 0 | 0 |
| Putumayo | 437 | 72 | 10 | 0 | 0 | 17 | 1 | 0 |
| Guainía | 139 | 100 | 0 | 0 | 0 | 0 | 0 | 0 |
| Caquetá | 50 | 86 | 0 | 14 | 0 | 0 | 0 | 0 |
| Caldas | 70 | 44 | 56 | 0 | 0 | 0 | 0 | 0 |
| Total | 92,046 | | | | | | | |

Although Antioquia has the greatest percentage of exploration and exploitation titles and environmental licenses, with 45%, the fact that there is evidence under these areas covered by the current legal framework could indicate failures to comply with the commitments and obligations acquired regarding managing and protecting resources. In Bolívar, like Antioquia, although 38% of the EVOA is under these areas covered by the current legal framework, the magnitude of the evidence produced by extreme changes in the landscape has produced an alert regarding the technical and environmental management being performed. Nevertheless, in light of the complexity of the dynamics and the parties involved in these types of exploitation operations in the region, it must be considered that there may be Administrative Injunctions under these areas covered by the current legal framework, indicating some type of illegal exploitation by third parties. It is worth reiterating that it was not possible to access information on Administrative Injunctions for this study.

## Map 14. Distribution of areas covered by the current legal framework by Province affected by EVOA




Source: Government of Colombia – Monitoring system supported by the UNODC. For areas covered by the current legal framework: Ministry of Mines and Energy, 2017
The borders, names and titles used in this map do not represent the United Nation's recognition or acceptance.

# INSTITUTIONAL MANAGEMENT

## Registration and Control of Subsistence Mining

Subsistence mining, in accordance with Article 2.2.5.1.5.3 of Decree 1666 dated October 21st, 2016, is mining performed by individuals or groups of people who are dedicated to open-pit extraction and collecting sand and gravel from rivers destined for the construction, clay, precious metal, precious stone and semi-precious stone industries with hand tools, without using any kind of machines to start up. Subsistence mining includes gold panners and scrap dealers.

In this context, and in order to facilitate institutionalizing mining and its users, the information system for managing proceedings before Resource Management, called SI.Minero, was provided to the public towards the end of 2010. As of 2014, it has provided a module for subsistence miners themselves to be able to carry out the registration and proceedings related to subsistence miners with the mayor's office support online [26].

SI.Minero is a standardized tool for controlling activities in all mining proceedings and audit services, which:

*__Gold Panning,__ a popular activity among the inhabitants of current alluvial territories, is performed by washing sands manually without any machines or mechanical equipment in order to separate and collect precious metals contained in said sand. Furthermore, collecting precious and semi-precious stones with similar methods to those this article mentions will also be allowed (155 of the Mining Code.)*

*__Scrap Dealing,__ contemplated in subsistence mining as collecting minerals in mining waste.*

- Facilitates registering subsistence miners before mayors' offices from any part of the country with only a computer and access to the internet.
- Allows generating strategies, programs and/ or projects that benefit subsistence miners in the country through consolidated information in a database [26].

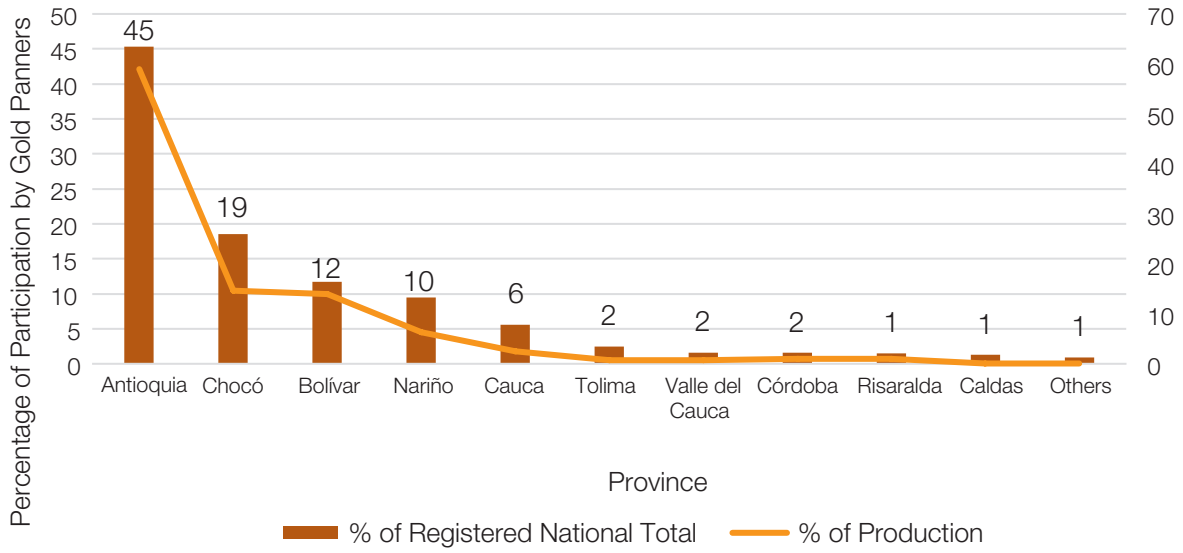
However, due to the heavy pressure illegal economies exert upon vulnerable populations with regard to gold extraction, the Ministry of Mines and Energy established the maximum volumes of monthly and annual production for subsistence mining by means of Resolution 40103 dated 2017. The following amounts are set for gold:

Table 17. Authorized gold production for subsistence mining in Colombia

| Mineral and/ or Materials | Average Monthly Amount | Maximum Annual Amount of Production |
|---|---|---|
| Precious metals (gold, silver, platinum) | 30 grams (g) | 420 grams (g) |

Although subsistence mining by its very nature does not have a strong impact on landscapes, this activity in some regions is linked to exploitation on land with machinery according to information obtained by the project on land. In these cases, agreements with the machine's owners and miners are established to allow them to pan for gold on the backhoe's worksite every now and then. On some occasions, subsistence communities follow behind the machines, taking advantage of the cleared ground to increase the probabilities of successfully finding gold. However, there is no evidence that this is normal in all of Colombia. Another recurring activity is ancestral sand washing practices in currents that have not been affected by exploitation on land with machinery.

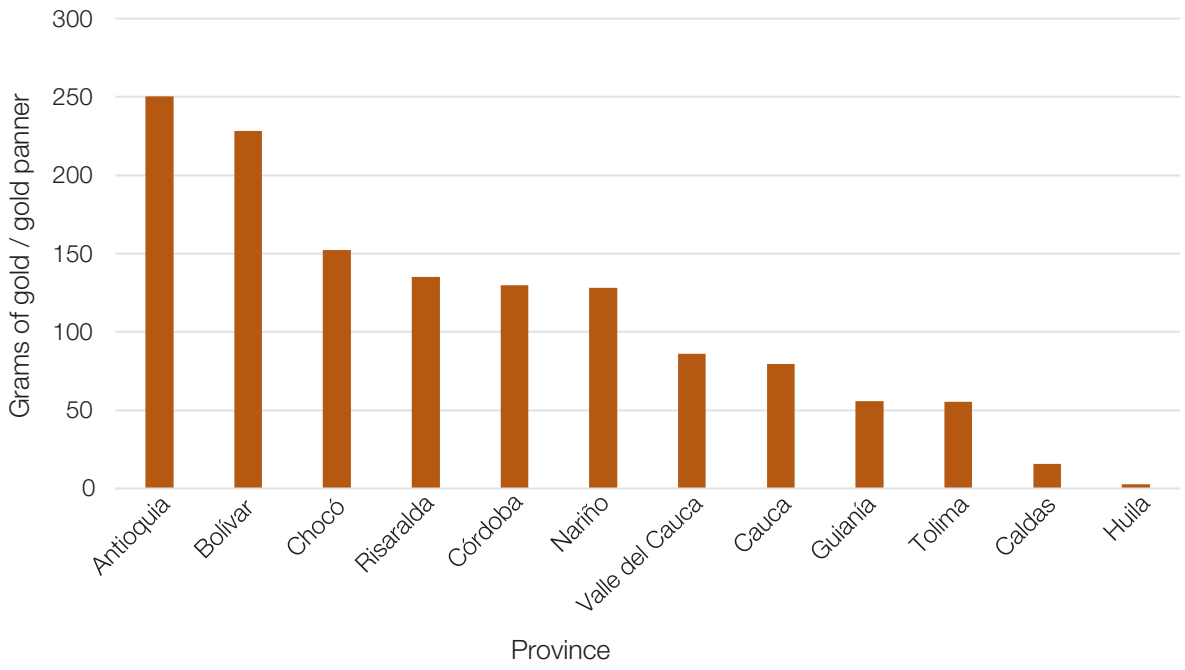
**Figure 27.** Percentage distribution of gold panners registered in SI.Minero, September, 2018.




45% of reported national production comes from subsistence mining, of which 44% comes from gold panners and 1% from scrap dealers. If the national consolidated figures on gold panners registered to date with production reports are considered, each gold panner reports approximately 200 gr. of gold every year. However, when focusing on Provinces, it can be observed that the gold panners that reported the most production are in Antioquia and Bolívar, and they have not as of yet reached their maximum of 420 gr. provided by the regulation.

It is noteworthy that the combined figures for production by gold panners competes with the combined report for small, medium and largescale mining title-holders despite the gap in infrastructure and specialized machinery, which allows efficiently exploitation of the resource at higher volumes and in less time compared to the manual methods employed by subsistence mining.

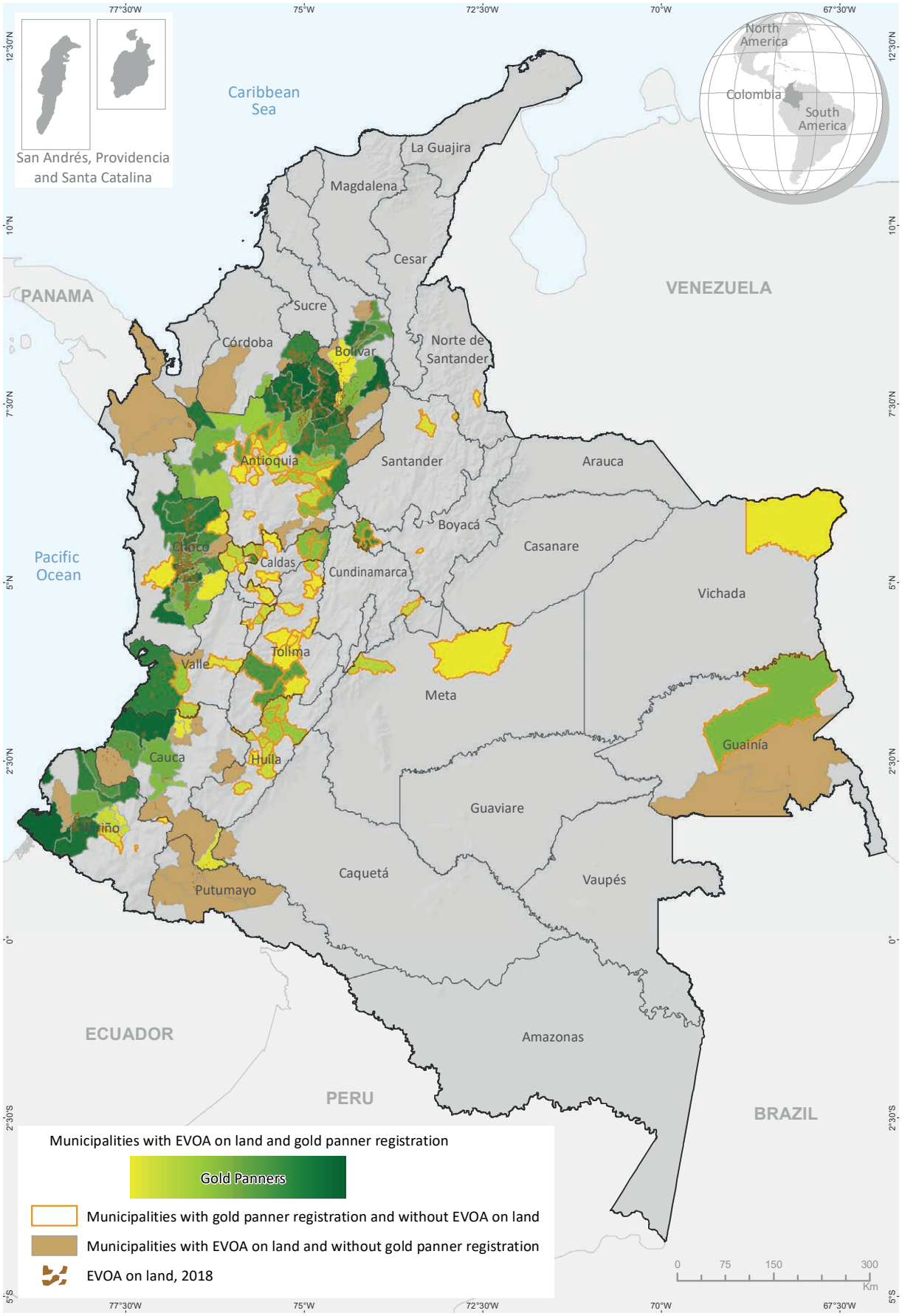
**Figure 28.** Distribution of average production in grams of gold by gold panners / Province




On the other hand, according to the records of SI.Minero, the Province of Antioquia sheltered 45% of the registered gold panners and reported 59% of national production reported for this kind of mining operation as of October, 2018, followed by Chocó with 19% and 15%, respectively. The same two Provinces in first and second place in EVOA detection are first and third place in reported production in 2018. It is worth mentioning that Provinces such as Huila, Guainía, Santander, Quindío, Meta, Boyacá, Vichada and Norte de Santander also reported registered gold panners, but the sum of their national percentage of participation is only 1%.

Caucasia has 21% of the gold panners registered in Antioquia, and it is followed by El Bagre, with 18%, Zaragoza, with 9%, and Segovia, with 7%, all of which are in the top 5 for production in 2018 and, except for Segovia, in the top 10 for detected hectares with EVOA for 2018. Chocó, Condoto, Istmina and Atrato have the highest proportion of gold panners in the Province, with 18%, 15% and 11%, respectively.

## Map 15. SI.Minero – gold panners and EVOA on land, 2018.




Source: Government of Colombia – Monitoring system supported by the UNODC. For gold panner registration: Ministry of Mines and Energy, 2017.
The borders, names and titles used in this map do not represent the United Nation's recognition or acceptance.

## Colombian Government Actions against Illegal Exploitation

The goal of the Colombian government's intervention in combating gold exploitation that has not been authorized under areas covered by the current legal framework is to intervene/destroy/shut down mines that are operating without a license and, in most cases, do not mitigate, prevent or repair the damage caused by exploitation.

In some cases, as a result of an administrative injunction, interventions can be performed in areas with mining titles protected under the regulations for responsible, technical, and environmental exploitation. These cases happen when illegal mining by a person who is not the title-holder of the license to exploit (Mining Title — i.e. "Amparao de título" and Environmental License) is identified and the actual title-holder resorts to this mechanism for an intervention.

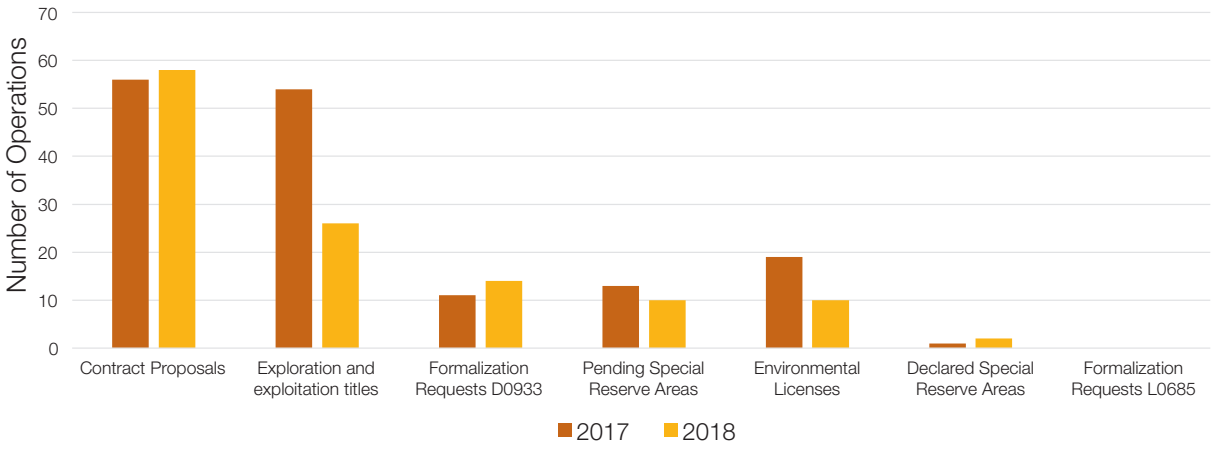
383 general intervention operations in gold mines were carried out in 2017, which comprised 1,950 operational results throughout the country. This was a 14% increase compared to the results from 2016. Control operations are the competency of the Directorate of Carabineers, assigned to the National Police. However, the National Army supports these operations with the Brigade against Illegal Mining. A general report of 391 general intervention operations was prepared in 2018, which comprised a total of 2,052 operational results. The National Army carried out 1,932 of them and the National Police carried out 117. This result meant a 2% increase in operations and a 5% increase in operational results compared to 2017.

Intervention operations are carried out in any territory with some type of exploitation that does not comply with the parameters that were established and agreed upon in the various areas covered by the current legal framework for gold exploitation.

Upon observing the total operations with respect to legal areas covered by the current legal framework[54], it was established that 40% of them in 2017 and 31% of them in 2018 were located in some area covered by the current legal framework. Contract proposals were the areas covered by the current legal framework with the highest recurrence with respect to interventions (42% of all interventions). According to regulations, all exploitation performed in a territory under this type of area covered by the current legal framework is illegal, since although this area is evidence of processing the respective licenses, and the operators have not yet been issued an authorization to exploit.

54 The areas covered by the current legal framework that were taken into account in the analysis are environmental licenses, exploration and exploitation titles, declared or pending special management areas, contract proposals and formalization requests L0685 or D0933.

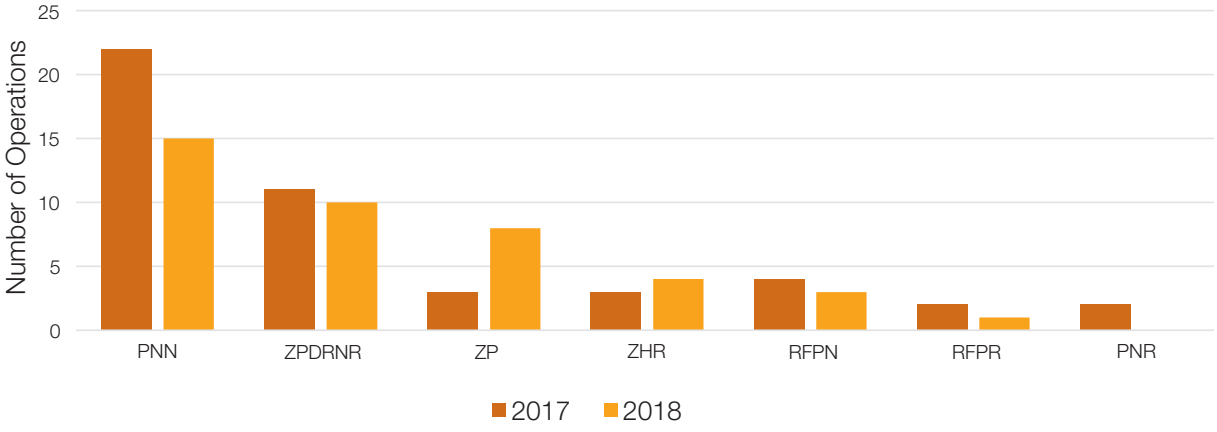
**Figure 29.** Number of intervention operations performed in areas covered by the current legal framework, 2017 - 2018.




Now, when it comes to exploration and exploitation titles and Environmental Licenses, the intervention can be associated with an administrative injunction. Of all interventions, 29% were spatially related to exploration and exploitation titles and 11% to environmental licenses. However, as mentioned before, information from areas with Administrative Injunctions is required to validate this fact. It was not possible to obtain said information.

There are areas in the national territory that are excludable from any type of mining. This topic was extensively covered in previous chapters. The following graph shows the distribution of operations in these areas.

**Figure 30.** Number of intervention operations performed in environmental exclusion areas, 2017 - 2018[55].




55 PNN: National Natural Park; ZPDRNR: Areas for the protection and development of renewable natural resources; ZP: páramo areas; ZHR: Ramsar Wetland Areas; RFPN: National Protective Forest Reserve; RFPN: Regional Protective Forest Reserve; PNR: Regional Natural Park.

Intervention operations have been concentrated in National Natural Parks (PNN), especially Farallones de Cali PNN, due to illegal gold vein exploration and exploitation. Operations have been identified in Paramillo (EVOA on land), Amacayacu (EVOA on water) and Puinawai PNN (EVOA on water), to a lesser degree. In addition, operations were identified in areas for the protection and development of renewable natural resources located in the lower Cauca River valley in Antioquia and in the south of Bolívar, which protect strategic ecosystems, such as the dry forest and Serranía de San Lucas.

Finally, it is important to mention that less than 30% of control operations performed between 2017 and 2018 occurred in territories with EVOA on land. With respect to the alerts defined for EVOA on water, operations in territories nearby the Caquetá and Guainía Rivers were recorded between 2017 and 2018. Other rivers that registered operations in their surrounding areas were the Guaviare, Atapabo and Inírida Rivers, not included in the baseline study performed for 2018.

The operations that do not coincide with EVOA on land or water are mainly related to gold vein exploitation (close to 30%), another portion is associated with arresting people who, while they are involved in mining, are not necessarily at the exploitation site at the time they were arrested and, lastly, there are standardization issues in the collection of information in the land that do not allow identifying the type of intervention being carried out or other aspects that facilitate analyzing information.

## Classifications of Control Operations

Operational results are classified by events that include arrests, combat, illegal deposits, destruction, illegal exploration and exploitation, asset forfeiture and seizure, which translate into the results of the action, which can be catalogued as arrests (in flagrante delicto, arrest warrant, others), destruction, seizure, immobilization and invasion.

Task forces of the Military Forces and National Police are in charge of carrying out intervention operations. In some cases, in accordance with the nature of the crime, the operations are carried out with other institutions, such as the Office of the Public Prosecutor of the Nation, Technical Investigative Force (CTI), Regional Autonomous Corporations, SIJIN, and others.

774 intervention operations on illegal exploration and exploitation were carried out between 2017 and 2018[56], which allowed reaching a total of 4,002 operational results. 31% of the consolidated results were registered in Antioquia, which was the Province most affected by EVOA in 2018, with 40% of the total EVOA identified in the nation. Chocó was the Province in second place in terms of impact due to EVOA, with 38% of the national total, and is also second place in control intervention, with 19.5%. In order, it is followed by Valle del Cauca and Putumayo, with 8% and 4% of interventions, respectively. However, the level of impact in these Provinces due to EVOA does not exceed 5% of the national total.

Bolívar and Nariño, Provinces that jointly had 13% of the impact due to EVOA in 2018, had operational results that did not exceed 5% of the executed total.

56 It is important to highlight that the databases provided by the Armed Forces and police for this analysis have not been standardized and, for this reason, it is not possible to have a reference of actions, such as type of exploitation of the intervention, in some cases.

The following are the municipalities with the greatest number of operational results, 24% of the national total, in order: Inírida (seizures, EVOA on water), Cali (arrests and destruction of machinery, gold vein exploitation), Ayapel (arrests, gold vein exploitation), Buriticá (seizures, gold vein exxploitation), Caucasia (arrests, EVOA on land), Amalfi (arrests and seizures, EVOA on land) and Buenaventura (arrests and seizures, EVOA on land).

Municipalities with gold vein exploitation and exploitation with machinery on land and on water were identified in this ranking. Some are considered municipalities with a significant participation in the impacts due to illegal exploitation, such as Cali and Buriticá. However, it is important to recognize that municipalities, such as Cali, Buenaventura and Caucasia, are also considered populated areas that act as epicenters for purchasing supplies/ elements/ machinery. These are transitional points and, therefore, points where machinery can enter the market, as well as places to sell the mined materials. With that in mind, there can be more arrests and operations, not only because of the production-sales ratio, but also because of the distribution-sales ratio in the most affected territories.

**Table 18.** Arrests and legal measures in control operations, 2018.

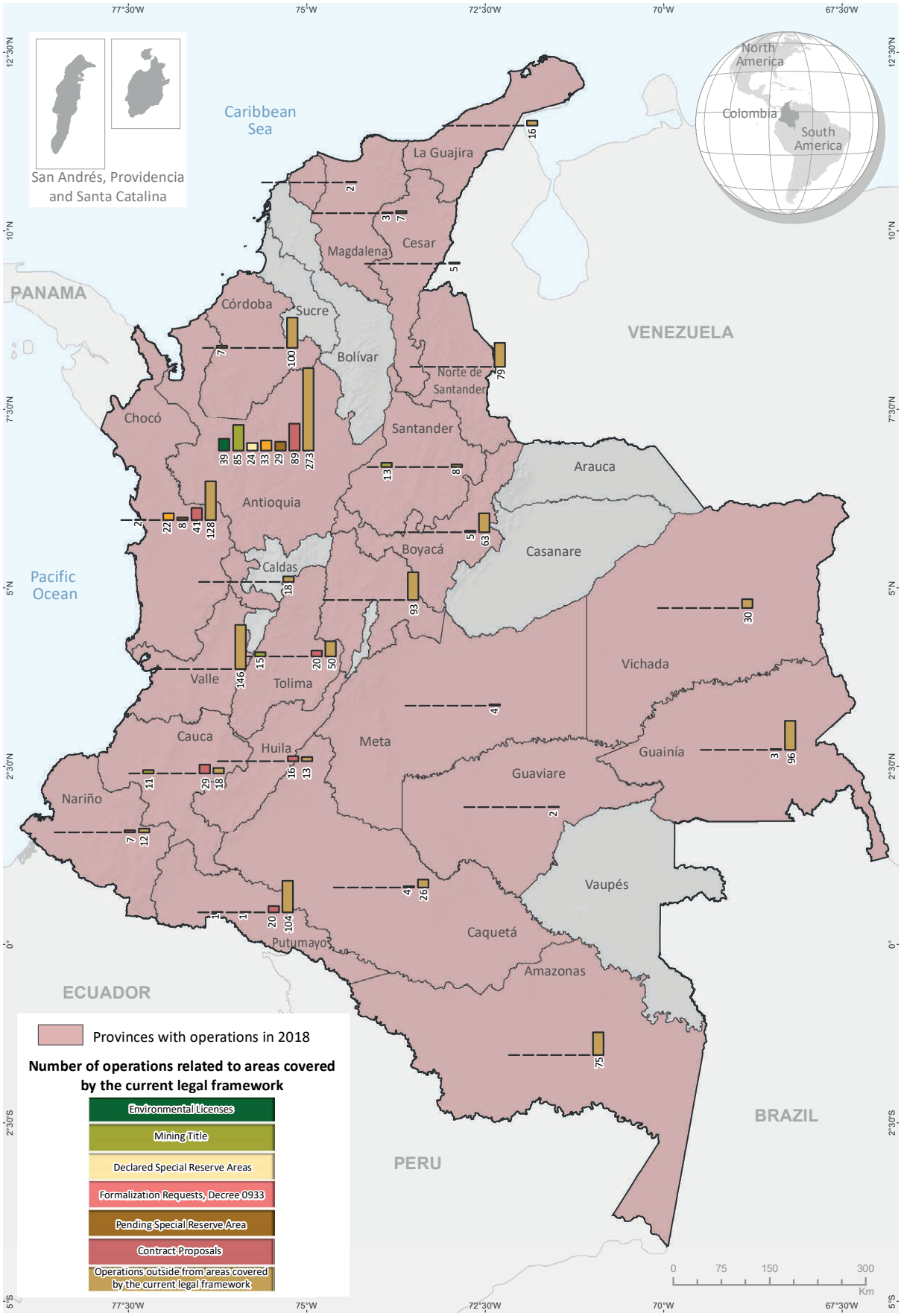
| ARRESTS DUE TO ILLEGAL RESERVE EXPLOITATION | 2018 |
|---|---|
| Electronic tag | 1 |
| Prison | 44 |
| House arrest | 56 |
| Freedom | 982 |
| Legal measures pending | 277 |
| **TOTAL ARRESTS** | **1,360** |

Of the reported operations, 43% (1,746 results) of them resulted in arresting people or crews, 95% of which were currently performing the offence. The north of the country, especially the lower Cauca River valley, has been established as the region with the most arrests, especially in Antioquia, which is followed by Córdoba, with 12% of total arrests. Provinces in the Colombian pacific region, Chocó and Valle del Cauca, are next, with a lower participation.

On the other hand, seizures of machinery, equipment, supplies or minerals are the second type of operational result with the largest participation, at 27% (1,154 results) of all the operational results. Again, Antioquia has positioned itself as the Province with the most seizures, with over 40% of the total. Chocó has a smaller proportion.

The destruction of machinery and instruments is the third control action that is most frequently observed in operational results. It mostly occurred in Antioquia and Caquetá, a Province where there have been reports of gold exploitation with machinery both on land and on water.

## Map 16. Distribution of operations and areas covered by the current legal framework by Province




Source: Government of Colombia – Monitoring system supported by the UNODC. For areas covered by the current legal framework: Ministry of Mines and Energy, 2017; for operations: Ministry of defense.
The borders, names and titles used in this map do not represent the United Nation's recognition or acceptance.

## Intervention Strategies to Minimize the Territory's Vulnerability

The previous chapter demonstrates that the strategies for combating illegal exploitation address different control methods and operations on land, which are aimed at stopping the activity. This has an impact on criminal networks and organizations. However, gold exploitation in the country has a historical background in which families and ethnic communities have traditionally worked by the exploitation of this resource for generations. In this sense, the Government, spearheaded by the Ministry of Mines and Energy as the governing entity of mining policy in the country, has established strategies for regulating these communities' legal framework without harming their cultural values.

This chapter covers two models: the first, which has been implemented since 2018 in the municipality of San José del Fragua, Caquetá, is aimed at organizing the community and regulating gold mining under the arrangement of Special Reserve Areas. A traditional mining community is participating in this model, with the Ministry of Mines and Energy and the United Nations Office on Drugs and Crime's assistance. The second model, with the participation of indigenous communities from the municipalities of Zaragoza, El Bagre and Segovia in Antioquia and the Secretary of Mines of Antioquia, and the United Nations Office on Drugs and Crime's assistance and advice, is aimed at regulating subsistence mining and empowering the indigenous community through a productive mining model.

### Integrating Mining into Land-use Planning and Regulating Gold Exploitation in San José del Fragua, Caquetá

In 2018, the Ministry of Mines and Energy and the United Nations Office on Drugs and Crime signed an international cooperation agreement that included providing assistance and support for institutional intervention in areas affected by EVOA with an additional characteristic, which was that the territory had to have traditional mining communities. The selected municipality was San José del Fragua in Caquetá, and it began with two main objectives:

- Implementing an information model for including the variable of mining in municipal land-use planning.
- Designing an information model to regulate gold exploitation activities, applied to the mining community.

The two processes were performed parallelly throughout 2018, with an extensive representation of local and regional authorities, civil society organizations and small-scale miners interested in beginning the regulation process. A summary of this intervention's results is presented below, beginning with a brief description of San José del Fragua.

#### *General Description of the Territory*

San José del Fragua is located in the southwest of the Province of Caquetá and is a transition area between the Eastern Mountain Range and the Amazon. It borders with Acevedo, Huila to the north, with Belén de Los Andaquíes, Albania and Curillo, Caquetá to the east; and Piamonte, Cauca to the south and west. The municipality has an approximate area of 1,304 km2 and it shares juris-

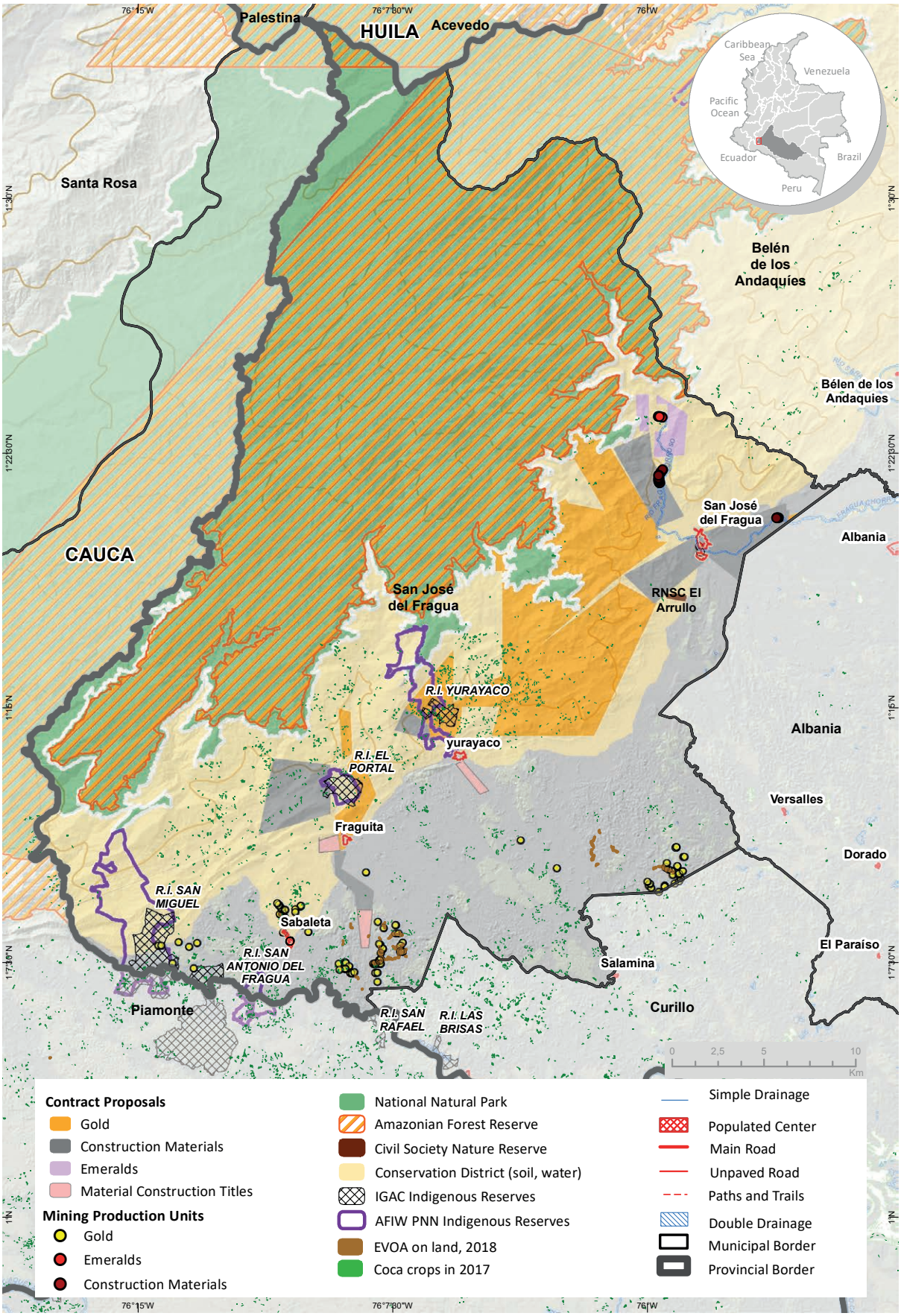
diction with the San Antonio del Fragua, San Miguel and Yurayaco indigenous reserves of the Inga ethnic group, as well as El Portal of the Paéz ethnic group.

In terms of hydrography, it is a part of the Caquetá River basin. The sub-basins of the Fragua Grande, Sabaleta, Fragüita, Yurayaco and Fragua Chorroso Rivers are in this territory. Physiographically, landscapes associated with the Eastern Mountain Range, foothills and Amazonian hills can be distinguished.

This municipality is the pivotal axis between Florencia, the Province's capital, and Putumayo and the boot of Cauca by way of the Marginal de la Selva Highway. The municipality's urban-rural connectivity is provided by third order connectors that are mostly unpaved. Parts of the Alto Fragua Indi Wasi, Serranía de los Churumbelos and Cueva de los Guácharos National Natural Parks are in the municipality.

The map below shows the municipality's main characteristics, as well as its issues, which include Alluvial gold exploitation (EVOA), coca crops and contract proposals in the framework of the Caquetá Soil and Water Conservation District (DCSAC)..

## Map 17. EVOA on land + Coca Crops + Contract Proposals in the framework of the DCSAC




Source: Government of Colombia – Monitoring system supported by the UNODC. For protected areas: National System of Protected Areas (SINAP); for titles and requests.
The borders, names and titles used in this map do not represent the United Nation's recognition or acceptance.

### *Demographic Dimension*

13,882 people inhabit San José del Fragua, which corresponds to 5% of the total population of the Province of Caquetá, of which 52.6% are men and 47.4% are women. The municipality has various ethnic groups (indigenous, black and raizal), which represent 4.91% of its total population. According to the DNP's population projection, 17.6% of men and 16.4% of women in the municipality were between the age of 0 and 14 years as of 2018. In addition, based on the DNP's rurality index, this municipality is classified as intermediate and, at the same time, is considered densely populated in comparison with the Province.

### *Socioeconomic Dimension*

The main economic activities that generate added value in San José del Fragua center on social and personal services, agriculture and livestock and, to a lesser degree, construction. When it comes to agriculture in the municipality, it was found that the various crops can be categorized as permanent, semi-permanent, transitional and annual. In addition, there is evidence that there have been illicit crops (coca) since 2000, which, as of 2017, occupied 1,414 hectares, representing 12% of the Province's production.

In terms of taxes, the IDF categorizes the municipality as vulnerable due to how dependent it is on transfers and royalties (88.3), low resource generation (40.4) and a low saving capacity (35.6). In addition to this, the Unsatisfied Basic Needs index for the municipality's inhabitants demonstrates a situation of poverty (under the evaluated criteria) and shows that the highest concentration of poverty is located in various areas of the municipal capital.

### *Safety Dimension*

Due to this municipality's geostrategic location, it is connected to the Provinces of Huila, Meta, Cauca, Guaviare and Vaupés. This characteristic, combined with the presence of various water sources and productive land for agriculture and livestock farming, in addition to the difficult access to the area due to a lack of infrastructure, allowed illegal armed groups to be established. Although the agreement to end the conflict with the FARC guerilla group was signed in 2016, a rearrangement of illegal groups and the appearance of illegal forces interested in controlling the territory and taking ownership of the area's illegal economies were identified.

As of 2018, San José del Fragua had 1,414 ha of coca crops and 49.7 ha affected by loss of land cover in riparian areas due to open-pit alluvial gold exploitation with machinery on land. Both illicit crop production and illegal gold extraction are associated with the presence of criminal organizations in the territory.

### *The main results are presented below:*

### *Implementing an Information Model for Including the Variable of Mining in Municipal Land-use Planning*

The information model developed in 2017 in the municipality of Guapi (Cauca)[57] for incorporating mining into the Land-use Planning Diagram (EOT) was implemented in the municipality of San José del Fragua. In this case, the EOT designed for the 2013 – 2024 period was used, keeping in mind the excludable mining areas that this EOT has established[58].

57 The developed information model can be found at: http://biesimci.org/Documentos/Documentos_files/Informe_Guapi_2017.pdf.
58 These areas correspond to: environmental protection areas; protected areas and transitional areas for springs; areas occupied by primary or secondary forests in environmental protection areas or riparian areas; urban soil and areas designated for that purpose; high risk and threat areas; economically and socially important areas due to agricultural production; areas with highly valuable landscapes; areas occupied by a public work or assigned to a public utility; and, finally, indigenous and afro-descendant territories.

The municipal mayor's office, civil society, government and non-government environmental authorities, the National Park unit and representatives of the Military Forces and Police (National Police, National Army), among other institutions, participated in this process. The municipality's strengths and weaknesses in terms of facing these kinds of mining locally were identified along with these institutions during meetings, as can be observed in the tables below:

**Table 19.** Local, regional and national strengths and weaknesses in facing mining in the municipality

| Aspect | Strengths | Weaknesses |
|---|---|---|
| Knowledge of local mining | Some mayor's office agencies' knowledge of mining regulations, such as the Secretary of Social, Agricultural and Environmental Development. | A lack of mining professionals in the municipality.<br>There are no institutions that are directly related to mining. |
| Regional institutions' participation | Knowledge of the related environmental regulations.<br>Institutional support in terms of the environment. | Interinstitutional coordination is weak and circumstantial.<br>A lack of institutional visibility from environmental institutions regarding the issue. |
| National institutions' participation | An increase in institutional presence associated with signing the peace agreement.<br>National Parks has environmental institutional presence for managing projects and spaces for arranging strategic actions and is a strong alliance with indigenous communities.<br>The Ministry of Mines and Energy has been working in the municipality in 2018. | PNN strengths are limited to park areas<br>The Ministry of Mines and Energy has mainly been present in the north. |

The following are the main recommendations from the analysis and discussion process, which incorporated the information related to the establishment proposal by the Caquetá Soil and Water Conservation District:

- In the case of local mining institutions, it is necessary to structure mining prevention and control measures in the entire territory. Strengthening local officials' knowledge on the issue of mining will be required to do so. Moreover, royalty resources must be prioritized in the development plan for mining issues and environmental work must be promoted as a complement, which must be taken into account for this issue. In addition, a district soil and water control and conservation committee must be formed for the Province of Caquetá.
- When it comes to regional institutions' participation, it is necessary to connect the Province's secretary of agriculture and mining to formalization processes as key institutions for supporting this process. Furthermore, the protection of the municipality's corridors, wetlands and all its environmental reserve areas must be clearly established as a protection mechanism from mining.

- In terms of connecting national institution's participation to this process, these institutions are required to show greater coordination with and proximity to the territory to efficiently support the formalization process.
- Lastly, it is necessary to quicken the Caquetá Soil and Water Conservation District's formalization process, survey the baseline of water in the Province, promote developing sustainable production models and request mining moratorium in the territory.

### *Supporting the Process for Regulating Gold Exploitation, Applied to the Mining Community*

At the beginning of 2018, a mining collective made up of 72 small scale miners from the municipality of San José del Fragua presented the Ministry of Mines and Energy a request for support in the small-scale mining regulation process. This request allowed establishing the very first approach with the collective to plan the process and stages of formalization, identify their Mining Production Units (UPM) and parellelly establish an awareness-raising and strengthening process for the various actors that would directly or indirectly be involved in this activity's formalization and their inclusion in the municipality's Land-use Planning Diagram (EOT). The result of this support process concluded with presenting the collective's regulation request to the National Mining Agency (ANM) and signing the agreement of wills between the mining collective and the municipal Mayor's Office.

### *Mining Community Identification and Formation Process*

The process began with the Ministry of Mines and Energy identifying the UPM, which resulted in 52 productive units distributed in three rural settlement production centers (Sabaleta, Palmeiras and Cristal) throughout the municipality. This identification allowed determining the exact locations for them to work as an input in the formalization process presented to the ANM. In addition, the collective and their families were characterized, collecting demographic, economic, social and other information inherent to mining, and thematic issues such as regulations, organizational frameworks and the environment were worked on by means of workshops, with CORPOAMAZONIA's collaboration.

Part of the methodological design included visiting two mining organizations that have successfully worked in Valle del Cauca and Huila. This experience was particularly fruitful because people were able to share experiences and have models of success for the regularization process, expanding their expectations based on a peer exchange process.

As a result of the entire process, the mining collective organized itself to become the Asociación Agrominera Tradicional de San José del Fragua (Traditional Agromining Association of San José del Fragua), which is in the formalization process while it awaits the ANM's response in terms of creating a Special Area Reserve (ARE). The response is expected in May, 2019.

### *Bridging the Gap: Social Agreement for Sustainable and Responsible Mining*

Tensions between the local government, taxation and control institutions, civil society organizations and the mining collective surrounding mining have deepened in the municipality of San José del Fragua. A meeting space was promoted for institutions and the mining collective to convene based on a general agreement on the need to immediately and intensely face the phenomenon of the expansion of illegal extraction using machinery on land, in which they

hoped representatives from local and regional institutions and the members of the Agromining Association being created would participate. An agreement of wills to respect natural resources and mine gold responsibly in the municipality of San José del Fragua was established at this event, which was held once the two support processes had concluded. The agreement of wills was signed by representatives of the Traditional Agromining Association of San José del Fragua and the municipal Mayor, Dr. Arnulfo Parra Peña.

In this agreement, the association committed to: i) responsibly mine the municipality's gold, respecting the areas that have not been awarded as AREs to that end by the ANM, respecting environmental regulations and using the proper technology, ii) respect the provisions of the municipality's EOT in terms of the resource exploitation methods and environmental recovery practices, in accordance with land use provisions, iii) carry out a technical training process to improve gold exploitation technology and to apply restoration, recovery and environmental conservation practices derived from gold exploitation, and iv) support authorities in spreading the regulations related to mining.

On its part, the Mayor's Office and municipal, governmental and national institutions responsible for follow-up, taxation and control committed to the following: i) recognizing the Association's ARE as a space for responsible gold exploitation and communicating its existence and its members' authorization to mine, while respecting the EOT, to the various control authorities, ii) carrying out the follow-up required by regulations to make sure environmental protection activities are properly performed, iii) supporting the training and improvement processes of the Association's members in the various required areas in the measure of the existing technical and financial capacities.

This institutionalization space, in which a concrete social agreement was made, is a great step towards developing responsible and sustainable mining in the municipality, and it shows a feasible path towards generating positive social and community transformation in other municipalities in the country with similar conditions regarding social and productive issues.

## Productive Model, Antioquia

The Office of the Governor of Antioquia (Indigenous Management and Secretary of Mines) and the UNODC signed an International Cooperation Agreement[59] in 2018. It is currently being implemented, and is aimed at "Cofinancing strategies for improving mining in indigenous communities, seeking to develop and culturally recognize artisan work."

The model is focused on two relevant aspects:

- Defining a Business Model for indigenous mining communities.
- Regulating indigenous subsistence mining.

The project is focused on a business model for strengthening indigenous communities linked to mining processes, particularly gold. This initiative began in the Province of Antioquia through the Indigenous Management and Secretary of Mines of Antioquia, in coordination with the competitiveness Province of the United Nations Office on Drugs and Crime's (UNODC) Alternative Development Program and in the framework of an International Cooperation Agreement. This project considers identifying and structuring a model that allows consolidating gold exploitation productively, incorporating principles that are aligned with current market trends and promoting a culture of legality.

59 Cooperation Agreement No. 4600008930 dated 2018.

Implementing this strategy is aimed at strengthening the commercial dynamics of Indigenous Reserves, also seeking to strengthen their competencies and promoting a favorable scenario that involves private and/ or public strategic partners. In addition, this model encourages significant progress on issues such as: empowering leaders and community business units, strengthening the principle of gender equality and identifying new opportunities for selling products under superior quality standards that directly impact the lives of each one of the benefitting families.

On the other hand, a participatory program in favor of identifying the most feasible intervention alternatives in the included socio-corporate, financial, technical, productive, and commercial components will be developed that considers political, legal, economic, technological, environmental, social and cultural aspects and includes the participation of all the value chain's actors and their cooperation within the strategy.

Finally, this business model will strengthen traditional gold mining in the involved indigenous communities by providing support and exchanging good practices.

This model is circumscribed as a development pilot with subsistence mining indigenous communities. In this sense, and in accordance with the Agreement's objectives, the Government will provide the required support to regulate mining in these prioritized communities. After providing the support, these prioritized communities will have a Unique Seller Registration (RUCOM) certificate that accredits them as AUTHORIZED MINERAL SELLERS[60].

In addition, the Government will provide support for the communities to register in SI.MINERO[61], for which the Mayor's Office must provide support, as residents of the place where they mine. If they mine on private property, they must have the owner's authorization.

**Table 20.** Prioritized population for support

| MUNICIPALITY | COMMUNITY | FAMILIES | ETHNIC GROUP |
|---|---|---|---|
| EL BAGRE | Shoibado | 25 | Emberá |
| SEGOVIA | Tagual - La Pó | 25 | Emberá |
| ZARAGOZA | Vegas de Segovia | 25 | Zenú |

60 Individuals who regularly purchase and sell minerals to transform, process, distribute, export or consume them obtain this certificate in order for the National Mining Agency to be able to control mineral sales.

61 An information system of the mining sector that seeks to facilitate institutionalizing Colombian mining and its users by automating the proceedings for managing the mineral resources. All people who sand wash manually without the help of any machines or mechanical equipment to separate and collect the precious metals in said sand must register in this system. The same applies to those who collect precious and semi-precious stones in similar ways. Subsistence miners must register before the mayor's office as residents of the place in which they mine and, if they mine on private property, they must have the owner's authorization [26].

## Characterization of the Most Outstanding Features of Illegal Gold Exploitation in the Province of Antioquia

In the framework of the cooperation agreement between the Ministry of Mines and Energy and the UNODC in 2017, a study was performed that consisted of characterizing the most outstanding components of illegal gold exploitation in the Province of Antioquia. This chapter provides a summary of the study[62]. The following were its specific objectives:

- To carry out a case study on two municipalities that produce gold in the Province of Antioquia, considering their particularities in terms of their exploitation methods and illegal supply and mineral trading characteristics.
- To identify and characterize the activity's economic flows and social impacts on a municipal level.
- To identify the main gaps in public intervention that could facilitate the dynamics of illegal gold exploitation and sales in the territory.

The study consists of a qualitative approach to the issue of illegal gold exploitation and sales in the Province, using two specific cases as a reference (Santa Rosa de Osos and Barbosa). These cases have worked as reflection points for identifying the mentioned dynamics. Due to the above, even though it is not possible to determine the proportion of illegal sales with respect to the total volume of gold mined in the Province, the study provided a general vision of the methods by means of which supplies and the gold itself are traded and contributes elements for identifying the main public intervention gaps that facilitate this situation. The following were the municipalities selected for the case studies:

- Santa Rosa de Osos: This municipality has small scale traditional exploitation (underground gold vein subsistence mining and small-scale exploitation with a lower level of mechanization) and one legal, formalized mining company that currently has a mining title.
- Barbosa: This municipality has small scale traditional mining and areas with alluvial and vein gold exploitation with small and heavy machinery, where the local government sees gold exploitation as a risk for the municipality's social and economic development.

The work was performed by means of documentary research, workshops with focus groups with miners, public institutions and formal traders, as well as in-depth interviews with key actors.

### *Main Findings*

#### *Areas of Impunity as a Territorial Framework for Illegality*

An adaptation of the concept of "areas of impunity" was used to analyze the illegal economic flows associated to the value chain of gold in the Province of Antioquia, in accordance with [27] [28], understood as the areas in which there is persistent criminal activity and in which it is not probable that people who commit offences will be investigated and sentenced. Areas of impunity emerge as a result of criminal organization's management, which rationally seek to create a favorable environment for committing crimes [27] [28]. Now, criminal organizations are multi-product companies,

62 The study can be found at http://biesimci.org/Documentos/Documentos_files/Caracterizaci%C3%B3n_Antioquia_oro.pdf.

which means the capacities to manage an illegal value chain can be used to control other kinds of legal goods and services. When it comes to the referenced issue, areas of impunity can be expressed in two main ways:

- Territorial control by an illegal armed actor: The actor uses force in the territory and has the possibility to establish threats that Military Forces and the Police do not continuously counter.
- The State's failures to control an area that is not controlled by illegal armed actors: Public actions, including follow-up, oversight and control, are not performed enough, making it possible to create and consolidate areas in which the current regulations in the territory do not operate effectively.

With respect to the first mode, focus groups with local producers indicated that the illegal armed actors that participate in illegal mining in rural sectors are the ELN and some FARC dissidents. These groups mainly extort the owners of machinery, controlling the points where mining production units have been established. Along with these actors, there are also organized crime groups (GDO), mainly the Clan del Golfo. GDOs are also present in cities, and, in addition to monthly extortion, they charge advance payments to allow exploitation in areas close to cities and charge grammage taxes, which consists of delivering 10% of the product after each "wash" to the criminal organization.

In accordance with the information compiled on land, there is an informal commercial agreement between the ELN and some GDOs that operate in the Province, in which the ELN is in charge of controlling the mining infrastructure by means of taxes on supplies and machinery in areas that are difficult to access. In turn, criminal bands (BACRIM) control the municipalities' urban areas, where they use various collection mechanisms in addition to participating in the business of locally distributing and marketing psychoactive substances.

Finally, GDOs may acquire merchants through which they can perform their transactions at very low risk, with which they integrate sales within the business chain and increase their dividends by directly accessing the product. In addition, the BACRIM's actions in urban settings establish limitations to authorities' actions, since it is extremely easy to identify control agents in small towns, who can then be submitted to the informal authority of criminal organizations by means of bribes, intimidation, threats or a combination of these practices.

**Table 21**. Extortionary dynamics of illegal exploitation in the municipality

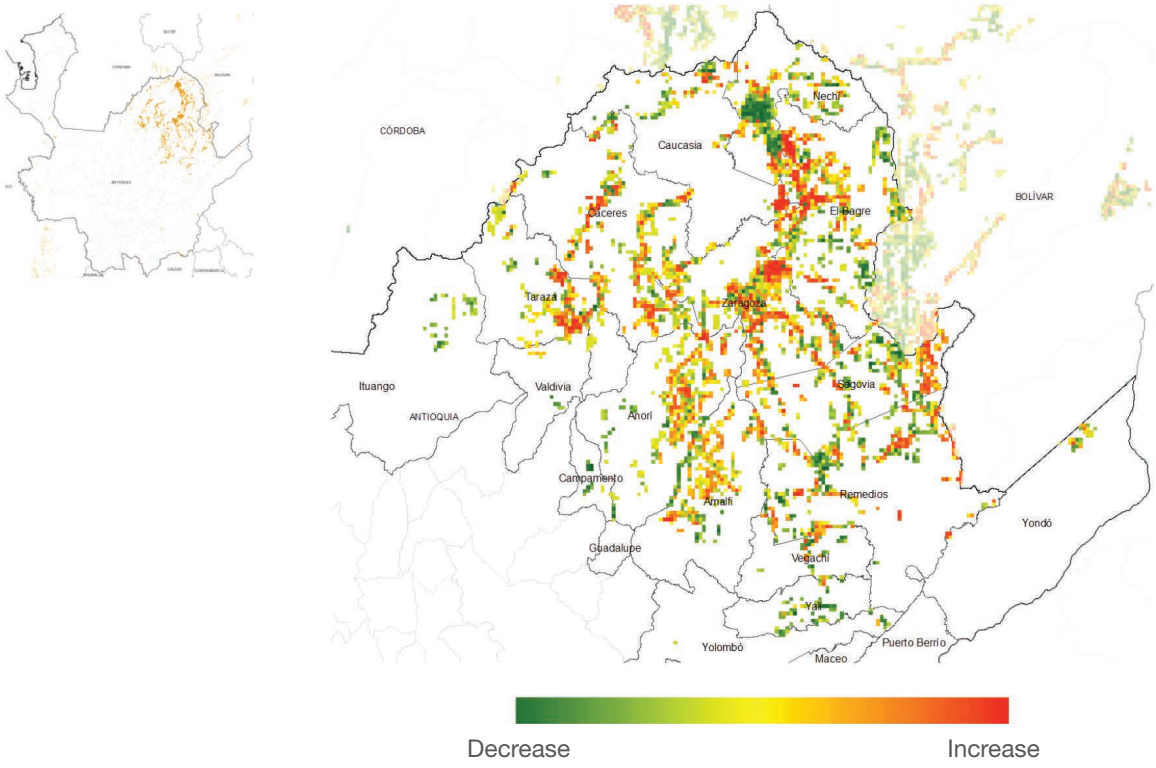
| Armed Force | Activity | Tax / Collections | Range of Action |
|---|---|---|---|
| ELN, FARC Dissidents | Machinery control | Taxes on supplies and machinery | Remote areas that are difficult to access |
| BACRIM | Financing third parties' extraction with machinery | Advance easement or work permit collection in a determined area. Frequency: weekly. | Accessible and urban areas |
| | | Grammage (10% of production). Frequency: every wash. | |
| | | Revolutionary tax / extortion. Frequency: monthly. | |

## *Expansion of the Evidence of Alluvial gold exploitation in the Province*

The analysis of EVOA on land shows a 17% increase with respect to 2014, which corresponds to 4,664 ha that have been added to the affected areas detected in the previous study. The region that is most heavily affected is the lower Cauca River valley in Antioquia, where the Province's main gold exctraction center is located.

The following map shows the increasing, stable and decreasing situation of the affected areas in this region.

**Figure 31.** Location of areas with decreasing and increasing EVOA on land in the lower Cauca River valley in Antioquia, 2014 - 2016




66% of the total affected area is concentrated in four municipalities: Zaragoza, Nechí, El Bagre, and Cáceres. The following table shows the affected area by municipality in 2016, the percentage of each municipality's participation and the change detected between 2014 and 2016 for the Province's ten most affected municipalities. The case of the municipality of Nechí is noteworthy because it is the only one in which a decrease in affected area has been recorded with respect to the previous evaluation. Nevertheless, the average increase in impact for the ten municipalities is 25%, which clearly indicates that the phenomenon is expanding in the Province.

**Table 22.** Municipalities of Antioquia most affected by EVOA on land in 2016.

| Municipality | 2016 EVOA on Land (ha) | % of Total EVOA on land in Antioquia (2016) | % of change in EVOA on land (2014 - 2016) |
|---|---|---|---|
| Zaragoza | 6,185.80 | 20.00% | 26.50% |
| Nechí | 5,916.30 | 19.10% | -4.60% |
| El Bagre | 4,376.80 | 14.20% | 39.60% |
| Cáceres | 4,095.70 | 13.30% | 22.00% |
| Caucasia | 1,715.40 | 5.60% | 34.30% |
| Tarazá | 1,603.50 | 5.20% | 31.70% |
| Segovia | 1,471.50 | 4.80% | 19.70% |
| Remedios | 1,442.40 | 4.70% | 30.80% |
| Anorí | 1,336.10 | 4.30% | 26.50% |
| Amalfi | 1,030.80 | 3.30% | 27.70% |

**Table 23.** Identified unregulated gold laundering modalities into the market's legal system

| Method | Mechanism |
|---|---|
| Supply Credit against Product | Machinery and supply sellers advance the products against future sales to the subsistence miner (SM), ensuring future sales at prices by which the financial costs of the advances can be covered. Subsequently, they enter the product into the legal market through the various legalization channels that have been described. |
| Purchasing gold from SMs without Registration | The local merchant directly and informally purchases the gold from an SM at a lower price than in the formal market (approximately 20%), and then legalizes it by a fraudulent use of quotas or sells it on the black market to avoid paying royalties.<br>The merchant's operators intimidate the SM by exaggerating the effects that registering has on collections by the DIAN. |
| Registering the Entire Family Group as a SM | The small-scale miner registers the entire family group as a subsistence miner to expand the possibilities of selling the gold produced with small machinery. |
| SM Over-registration | Illegal gold producers and sellers mass-register persons in the SI. Minero as Subsistence Miners, which allows them to legalize large volumes of gold as if it came from many individual agents. |
| Fraudulent use of SM Quotas | Illegal medium scale miners and other agents fraudulently use the sales quotas of registered SMs without their knowledge to legalize their UPM's volumes of production. |
| Simultaneous Trading by Merchants | The producer (legal or illegal) makes sales on the same day with various merchants under the same sales quota, taking advantage of the fact that information cannot be immediately consulted on the sales registration system, fictitiously increasing their sales quota.<br>When the current quota can be consulted, the producer first makes a round of all the merchants for them to verify the quota and then moves on to sell when the merchants have confirmed its quota, and makes the purchase. |
| Using Free Trade Zones for Legalization | Distributors acquire the gold on the informal market and then enter it through free trade zones, were source control is more flexible. |
| Smuggling with and without Repatriation | Gold is bought on the informal market and exported by smuggling it into other countries. In other cases, the gold is taken out of the country's borders and brought back in through a formal port, declaring it as recycled gold, which can enter the formal market with fewer restrictions. |

### *Gold Selling Phase: A Window to Asset Laundering*

Eight modalities were identified in the sales phase by means of which unregulated gold is laundered into the legal system of the mineral's market. These modalities are presented in the table below:

There is no information that allows establishing the percentage of the total gold sold in the Province that comes from the merchant modalities that do not comply with the requirements of the law.

### *Conclusions*

This study's main conclusion is that there is an extensive network of communicating vessels between legality and illegality in the value chain associated with gold exploitation in Antioquia, which includes the phases of provisioning, exploitation, usufruct and national and international sales. Some miners from the various categories participate in this network, as well as some machinery and supply providers and gold buyers and merchants. The above does not mean that all of the institutions and companies involved in the value chain of gold in Antioquia have some level of illegality, but that there are multiple functional linking mechanisms to illegality that are being used by some of the involved agents.

The second main conclusion of this research is that there are significant differences in the social and economic dynamics that result from mining among the municipalities that were the subjects of the case study. Illegality has a notably lighter weight in Santa Rosa de Osos, where systematic coordination work is being implemented between the community, the local government, the traditional mining union and the mining company in the territory as a qualified interface for liaising and handling conflict. This model's positive impact with respect to the following elements is visible:

- Integrating the local population as the mining project's workforce, with a visible effect on generating income for the local community and the municipality's commercial dynamic.
- A favorable dynamic for the local mining union's organizational processes, providing technical, organizational and business consultations, which contribute to regulating the activity in the municipality.
- Properly handling conflicts between community sectors that are against mining and the mining company in the territory.
- The clarity and visibility of the actions of the mining company's corporate social responsibility program.

By comparison, the situation in the municipality of Barbosa shows multiple signs of deterioration, and the positive impacts of mining cannot be felt. Mining in this municipality is usually unregulated. The following are this issue's main features:

- The disorganized growth of businesses associated with providing supplies and machinery and gold sales in the municipality.
- Continuous conflict between the local government and the mining union in the municipality. Part of this union is made up of a migrant population associated with unregulated gold exploitation, which has increased the load of services and support that the municipal authority has to provide.
- Noticeable impacts on the cost of living and the value of rural properties without there being a similar increase in the population's income, except for those who get their income from mining or its sales or services sector.

# TERRITORY AFFECTED BY EVIDENCE OF ALLUVIAL GOLD EXPLOITATION AND COCA CROPS

SIMCI, in its 20 years of monitoring, has identified evidence of illegal phenomena that come together in one same area and, at the same time, drive the transformation of territories in different ways. In Colombia, this process began with coca crops, the first phenomenon that was identified by the monitoring system. However, verification flyovers, visits to territories and interviews with inhabitants and institutions helped identify another type of illegal activity, which was illegal exploitation, specifically gold mining.

These two phenomena, even though they have different production cycles and market characteristics, are carried out in areas characterized by poverty, marginality, difficult access and a presence of illegal armed groups that stands out. These coca crops and illegal exploitation not only generate negative impacts on natural ecosystems, but they are also a determining factor in the territory's economic and social dynamics.

In Colombia, an overlap of 43% with coca crops was identified in 2018 for territories affected by EVOA on land (5 $km^2$ grids), which was one percentage point higher than in 2016. In these areas, coca crops cover 15,519 ha and EVOA on land covers 28,172 ha. The two phenomena increased 30% and 16%, respectively, with respect to what was observed in 2016.

On a Provincial scale, a significant increase in overlap was identified in Valle del Cauca. This Province went from 22% in 2016 to 36% in 2018. Antioquia, Putumayo and Cauca recorded an increase in the two phenomena's spatial overlap, though at a lower proportion. The three Provinces witnessed a significant increase in coca crops, but Antioquia, the Province with the greatest impact due to EVOA on land, registered an increase in coca crops both in spatial overlap areas and outside of them.

**Figure 32.** Overlap between territories affected by EVOA on land in 2018 and coca crops in 2017.

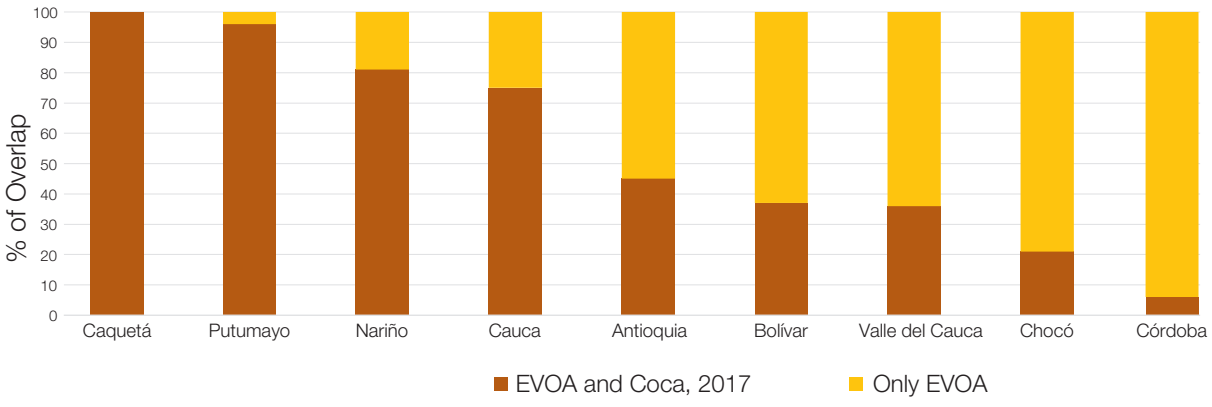
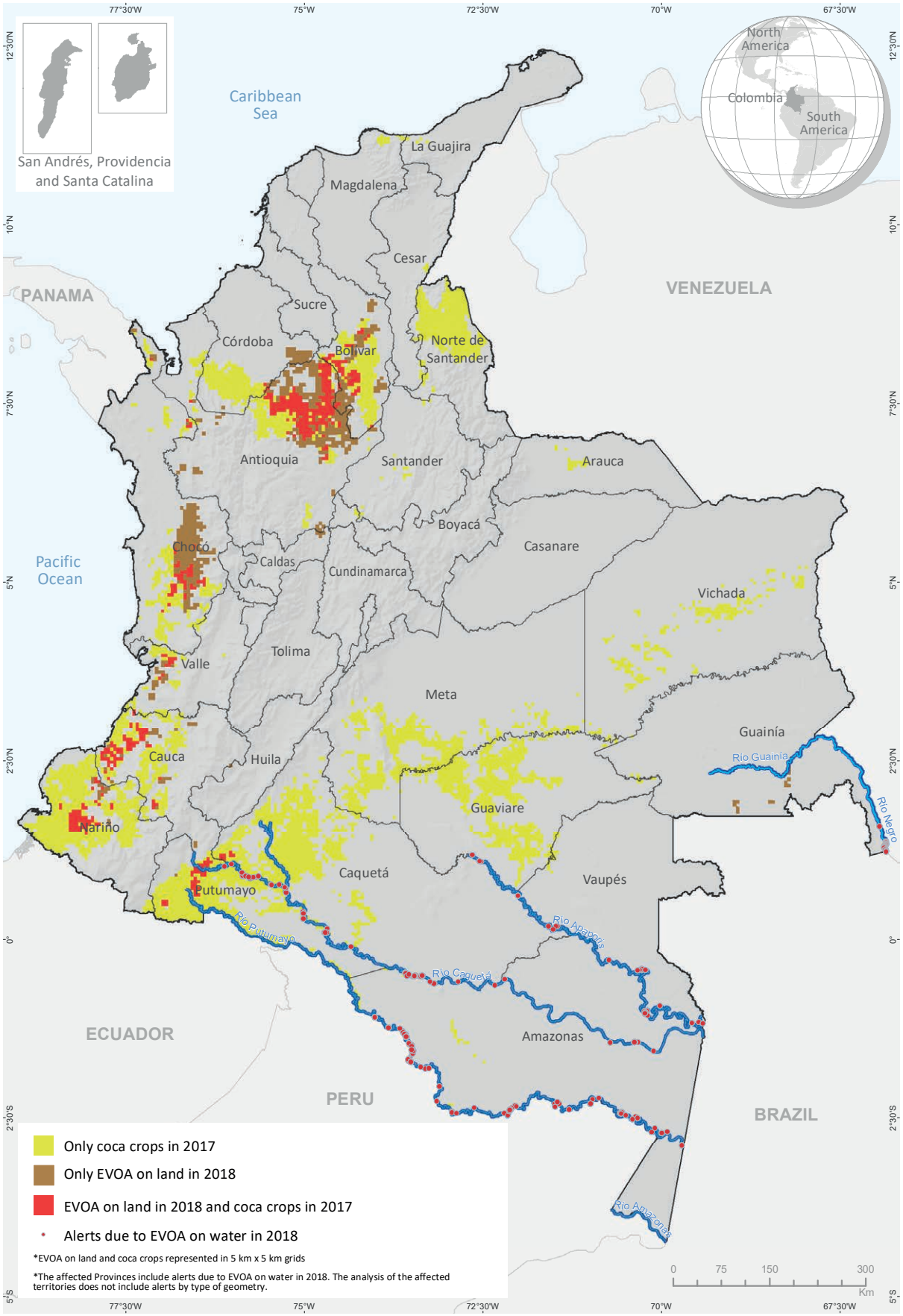


**Figure 33.** Area affected by alluvial gold exploitation on land and coca crops. Municipality of El Bagre, Antioquia

## Map 18. Territory affected by EVOA on land / EVOA on water in 2018 and coca crops in 2017.



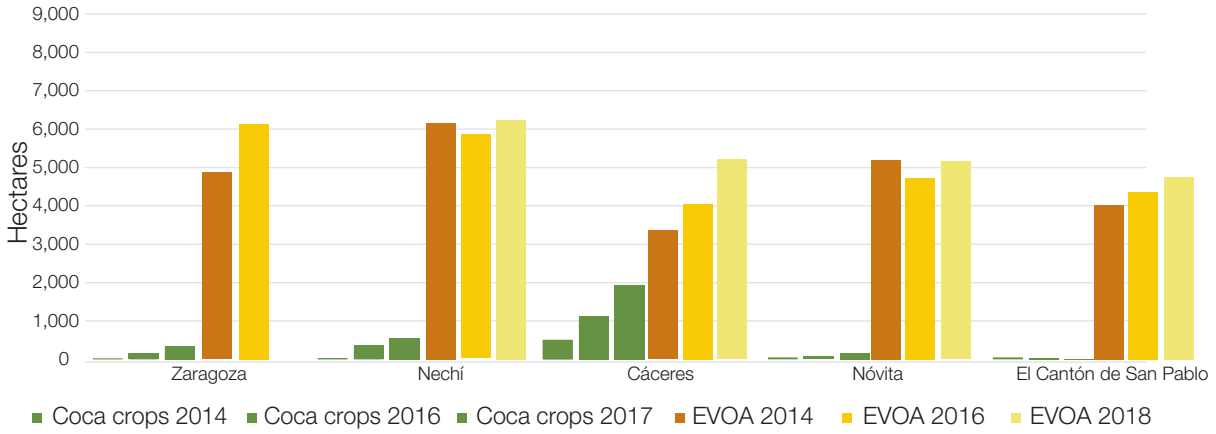

Source: Government of Colombia – Monitoring system supported by the UNODC
*The borders, names and titles used in this map do not represent the United Nation's recognition or acceptance.*

A different outlook was identified in the Provinces of Bolívar and Chocó, where spatial overlapping decreased. However, the two activities increased in the general impacts they exert on territories that are increasingly characterized by the presence of one of these phenomena. This is mainly related to reactivating coca crops in areas far away from the expanding centers of EVOA on land, and, for EVOA, expanding exploration areas. Despite the reduction in spatial overlap, illegal activities continue in the area.

In a municipal context, 53% of EVOA on land was concentrated in 10 municipalities, of which 8 had an increase in the affected area. 3% of the area with coca crops is concentrated in these territories, and only Ayapel and Unión Panamericana continued without this phenomenon.

The five municipalities most affected by EVOA on land, which were Zaragoza, Nechí, Cáceres, Nóvita and El Cantón de San Pablo, reported 29,672 ha of EVOA, 17% more than what was identified in 2016. All of them had an increase in EVOA. Impacts due to coca crops in these municipalities increased by 54% with respect to 2016, going from 1,954 ha to 3,016 ha. The area with coca crops increases in all municipalities except for the municipality of El Cantón de San Pablo.

**Figure 34.** Top 5 municipalities affected by EVOA versus those affected by coca crops, 2014 – 2016 – 2018.




The historical series of coca crops for these five municipalities from 2007 – 2017 was analyzed, finding that there were a recorded 3,349 ha as of 2007 and 3,016 ha as of 2017. This was a 10% decrease. However, it was also identified that there were only 303 ha of coca crops in 2013 (a 91% decrease with respect to 2007) and that there was an increase of more than 800% between that year and 2017. This increasing trend can also be observed in recent years in the data about EVOA on land, which is significantly greater in the municipality of Cáceres for both phenomena.

*The global trend of coca crop cultivation between 2014 and 2017 with respect to the territories affected by EVOA on land is evidence of areas in which coca crops tend to reduce the constant effects of EVOA. This characteristic is mainly seen in areas of the municipality of Segovia and El Bagre in Antioquia; in Santa Rosa del Sur and Montecristo in Bolívar; sectors of the north of Novita (a municipality that makes up the top 5 most affected by EVOA on land) in Chocó and, lastly, in López de Micay in Cauca.*

With respect to detecting EVOA on water, alerts detected in the Putumayo, Caquetá and Apaporis River[63] are related to areas with coca crops. The Caquetá River has the most spatial overlap with this phenomenon, mainly on the range's foothills, coming down on the boot of Cauca (Piamonte) and in municipalities of Caquetá (Solano, Solita and Curillo) and Putumayo (Puerto Guzmán). An increase in the area with coca crops has been reported in the municipalities with overlap for 2017.

For alerts on the Putumayo River, it can be observed that coca crops have no spatial overlap with alerts due to EVOA on water. However, the two illegal activities in the territory are threat factors for conservation and the development of legal economies. Lastly, even though alerts due to EVOA on the Apaporis River have no direct spatial overlap with coca crops, they are close to significant epicenters south of Miraflores, which has expanded in recent years, mainly towards the border of Serranía de Chiribiquete PNN, where there are alerts due to gold exploitation on water.

## *Municipal Overlap Analysis between EVOA on Land in 2018 and Coca Crops in 2017*

As of 2018, impacts due to EVOA were recorded in 100 municipalities, of which 73 were also affected by coca crops. Of these, 7 only reported an impact in the latest period. The decrease in municipal impact[64] is mainly associated with abandoning small areas of EVOA on land, which is evidence of unsuccessful exploration/ surveying.

Upon analyzing the percentage changes of EVOA from 2014 – 2018, the municipalities belonging to Cauca and Córdoba are the ones with the largest increases. One particular case is Timbiquí (Cauca), where the two phenomena grew from 458 ha of EVOA and 572 ha of coca crops in 2014 to 1,307 ha of EVOA in 2018 and 1,633 ha of coca crops in 2017, which represent variations of greater than 180%.

On the other hand, upon considering the magnitude of the impact, or hectares that have been detected, the most significant changes were concentrated in four municipalities of Antioquia (Zaragoza, Cáceres, El Bagre and Remedios). In these municipalities, the impact due to EVOA on land had a 60% increase from 12,487 ha in 2014 to 19,957 ha in 2018, and coca crops had a 420% increase from 560 ha in 2014 to 2,910 ha in 2017.

*The municipalities of Zaragoza, Nechí, Cáceres, Novita, Istmina, El Bagre, Santa Rosa del Sur, Segovia, Anorí, Amalfi and Riosucio make up part of the top 5 most affected by EVOA in Chocó and, lastly, in López de Micay in Cauca. They are part of Antioquia, Chocó and Bolívar. A significant increase of the two phenomena in the last five years has been identified.*

Of the 73 municipalities that share EVOA and coca crops, EVOA is predominant in 35 (48%) of them. 11[65] recorded a general growth trend for EVOA, with a low impact due to coca crops, specifically in municipalities where coca crops have not been traditionally grown that are surrounding centers with high coca crop densities. Of the municipalities where coca crops are predominant, nine[66] were identified where both activities were increasing. Most were located in the lower Cauca River valley in Antioquia and some were in the Provinces of Cauca and Nariño.

63 This report only includes alerts detected due to EVOA on water for five rivers (the Amazonas, Caquetá, Putumayo, Apaporis and Guainía Rivers). The coverage of rivers affected by this method of exploitation will be expanded during 2019.
64 In 2014, 82 of 147 municipalities affected by EVOA were simultaneously affected by the two illegal phenomena; as of 2016, this figure decreased to 75 of the 131 municipalities affected by EVOA.
65 Rioviejo, Norosi, Rio Iró, San Martín de Loba, Vegachí, Mutatá, Yondó, Remedios, Unguía, Chigorodó and Acandí.
66 Tarazá, Barbacoas, Magüí, Valdivia, San José de Uré, Bolívar, Patía, San José del Fragua and Tierralta.

The previous findings indicate that there are municipalities where both economies coalesce, one surrounding coca crops and the other surrounding illegal gold extraction. No matter which of the two is predominant, the increases in impact for both show the need to generate intervention strategies that are aimed at both reducing the activity that is performed most in the municipality and leading to a comprehensive intervention that reduces the territory's vulnerabilities. In this way, communities will not migrate to the other illegal activity, but instead will have the necessary conditions to develop legal activities.

Tumaco was the most affected municipality in Nariño, the Province most highly affected by coca crops in 2017, with 19,517 ha. In Tumaco, the recorded EVOA on land (71 ha) represented less than 0.01% of the total national impact. It is located in the north part of the municipality at the Inguambí and Muñambí Grande Gorges. However, EVOA on land had a 30% increase compared to what was reported in 2016. On the other hand, Barbacoas and Magüí have been recorded as the municipalities most highly affected by EVOA on land, where coca crops were significant and both activities tend to increase. The same thing happens in Cauca – the coastal municipalities of Lopez de Micay and Timbiquí are more greatly affected by EVOA on land, and their area with coca crops is increasing.

In Putumayo, Puerto Guzmán has the most EVOA on land (213 ha) and also has alerts due to EVOA on water. Puerto Asís is a municipality with low impacts due to EVOA. The area with coca crops tends to increase in these two municipalities. In Caquetá, only the municipality of San José del Fragua had EVOA on land, and the area with coca crops is increasing.

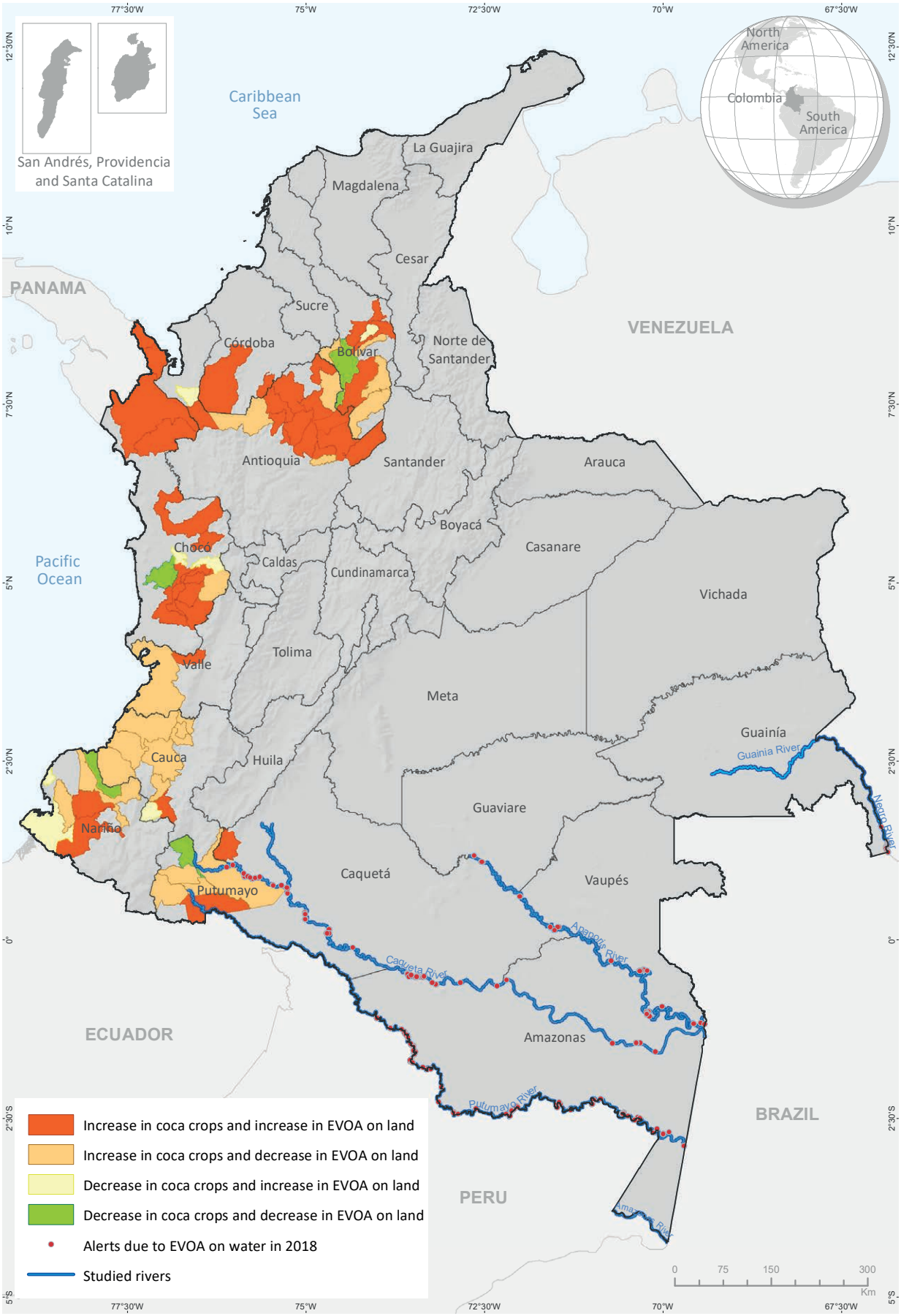
In 2018, Antioquia surpassed Chocó as the Province with the most EVOA on land, with 36,447 ha, which is 1,253 most hectares than Chocó. In Antioquia, the municipalities of Zaragoza and Nechí have the most EVOA on land, and the area with coca crops is significant. The two illegal activities tend to increase. In Chocó, most EVOA on land is located in Novita and El Cantón de San Pablo. The area with coca crops only increased in Novita.

In Bolívar, Montecristo is the municipality with the most EVOA on land, and the planting of illegal crops is stable. In Córdoba, the spatial overlap between the two phenomena is the country's lowest, at 6%. Ayapel, the municipality most affected by EVOA, has no coca crops. Furthermore, the areas with coca crops are far away from areas with mineral exploitation.

Guainía and Caldas registered a low amount of EVOA on land, and there was no spatial overlap with coca crops. In Guainía, the areas with coca crops are far away from traditional mining areas, and Caldas has had no record of coca crops for the last five years.

Finally, it can be concluded that the territories where both activities tend to grow are very complex places, where isolated intervention strategies can result in failed attempts of interdiction and to contain expansion. It is recommended to develop new interventions strategies that allow greater coordination between the two ways to approach controlling the phenomena. The strategies must keep in mind the production and sales conditions, but must mainly reduce communities' vulnerabilities for people to be able to migrate from one activity to another easily, depending on the market conditions and territorial control the Government exerts.

## Map 19. Dynamic of coca crops in municipalities affected by EVOA, 2018.

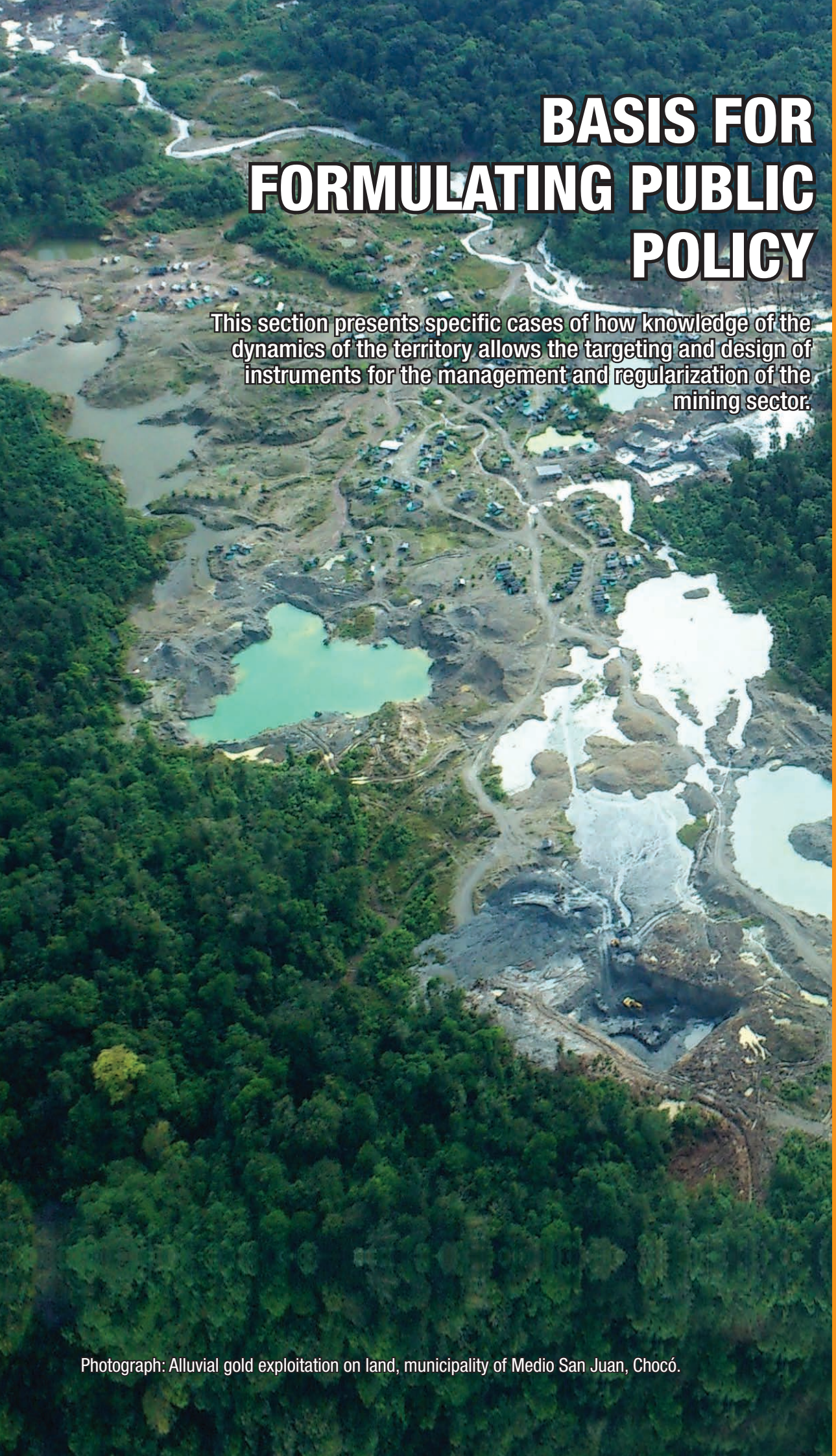



Source: Government of Colombia – Monitoring system supported by the UNODC
The borders, names and titles used in this map do not represent the United Nation's recognition or acceptance.

SECTION III

# BASIS FOR FORMULATING PUBLIC POLICY

This section presents specific cases of how knowledge of the dynamics of the territory allows the targeting and design of instruments for the management and regularization of the mining sector.



Photograph: Alluvial gold exploitation on land, municipality of Medio San Juan, Chocó.

## REGULATION

An exercise to regulate gold extraction in the municipality of San José de Fragua, Caquetá was performed within the actions taken in the framework of the activities designed and executed to stop this scourge's expansion. The following were this process' specific objectives:

- To strengthen the mining community's capacities in organization, sales and environmental issues within the current regulatory framework related to gold extraction.
- To characterize the traditional mining production carried out in San José del Fragua.
- To technically support the information collection process and technical management to request a Special Area Reserve (ARE) for the mining community.
- To promote an organizational alternative that facilitates the current ARE management process and future exploitation improvement processes in the framework of current regulations.

This support process culminates in lessons and good practices that can define options for other territories with similar conditions in the future.

The mining community of San José del Fragua voluntarily sought the very first approach with the Ministry of Mines and Energy to regulate their extractive activity. In answer to this request, the Ministry of Mines and Energy provided competency training, the mining framework, the right to explore and mine, etc. It also provided support in georeferencing in alluvial gold exploitation areas with professional personnel, helping identify Mining Production Units (UPM). This resulted in characterizing 52 productive units distributed in three Rural Settlement production centers (Sabaleta, Palmeiras and Cristal) throughout the municipality. With this, the UPM's locations in the municipality were determined, as well as the families that benefit from the activity and the execution conditions, an important input in documenting the regulation process.

**Figure 35.** Georeferenced areas in territories with mining.

The members of the mining community and their families were characterized using a structured survey that covered demographic, economic, social and other aspects inherent to mining.

To summarize, the support process was carried out following the methodological sequence presented below:

The mining community's approach: The team of small-scale miners from San José del Fragua sought the first approach with the Ministry of Mines and Energy. They subsequently identified and characterized themselves, which began the evaluation of the project's conditions and definition of the process' scopes to finally come to an agreement.

Strengthening workshops for the mining community: Strengthening workshops were performed based on the following topics:

a. The Mining Regulatory Framework, in which the legal, technical, environmental, economic, social and occupational requirements that allow small scale mining to become a formal activity were explained.
b. The organizational aspect, a workshop that taught about the process for forming different types of associations, their characteristics and formation requirements.
c. The commercial aspect, which covered the advantages in terms of profitability of being recognized as authorized miners and, in this way, access better prices on the market. This workshop presented the existing regulations for regulating the industry, the necessary procedures to sell minerals and the national and international demand they would have for gold.
d. The environmental aspect, where work was performed with the mining community on good environmental practices when mining and on counteracting the damage done. Furthermore, they were informed of the requirements of the environmental license they must obtain after getting authorization to mine legally and made aware of the negative environmental aspects of mining.
e. An experience exchange, in which the collective was presented two successful cases of mining formalization in other regions in the country, specifically in the municipalities of Íquira (Huila) and Yumbo (Valle del Cauca).

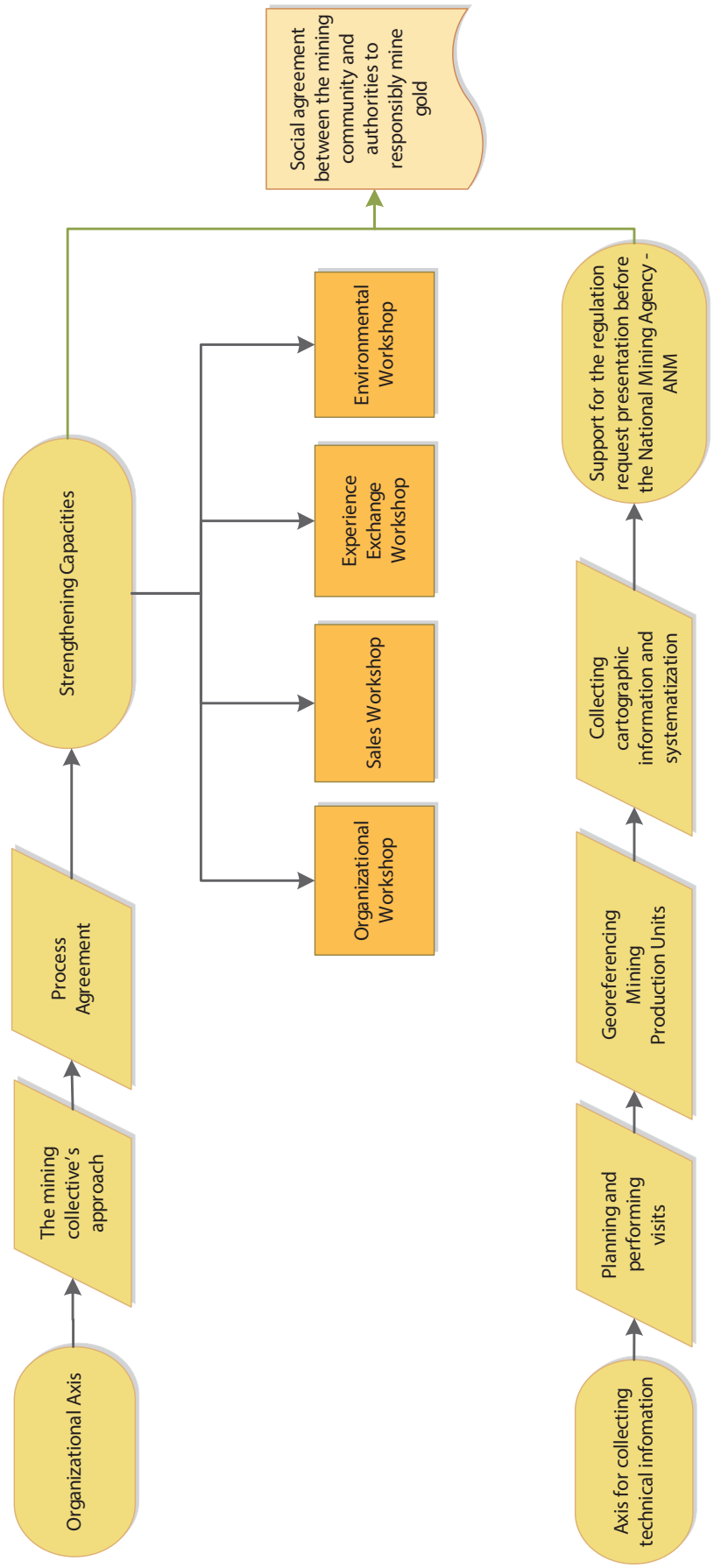
*Awareness-raising Workshops and Coordination with Regional Authorities and Institutions*

a. The Mining Regulatory Framework, in which the legal, technical, environmental, economic, social and occupational requirements that allow small scale mining to be a formal activity were explained.
b. Developing the matrix on authorities and institutions' capacities and weaknesses to address mining in compliance with the applicable regulatory framework.

On the other hand, technical support provided by the Ministry of Mines and Energy's specialized personnel began with collecting technical information that included the procedures used for extraction and visits during which each one of the UPMs were characterized and working points and probable lines of expansion were georeferenced. Subsequently, the information was systematized with the help of the SIMCI project's geographic Province and the maps that integrated the different elements considered to be pertinent were produced. Finally, the process concluded with support to prepare the request that the mining community presented to the National Mining Agency for a Special Area Reserve (ARE).

The following chart shows a summary of the support process provided to the mining community of San José del Fragua in their organizational and technical aspects.

**Figure 36.** Summary of the support process for the mining collective.



## Process Results

a. The organizational, commercial and environmental capacities of San José del Fragua's mining community were strengthened.

b. The Asociación Agrominera Tradicional de San José de Fragua (Traditional Agromining Association of San José de Fragua) organization was created, which will seek to perpetuate the progress achieved to date.

c. The adjudication request for a Special Reserve Area was formally presented for the mining community's members who participated in the process. The ANM is expected to communicate its decision in May, 2019, to continue with the regulation process.

d. Agreements were made to strengthen capacities in the future by liaising with the municipal Mayor's office and SENA.

e. The extraction performed by members of the mining community was characterized: The type and methods of exploitation in alluvial fans with gold were determined.

f. A social agreement for sustainable mining in San José del Fragua was made: An agreement of wills to respect natural resources and mine gold responsibly in the municipality of San José del Fragua was signed between the Asociación Agrominera Tradicional de San José de Fragua (being created) and the municipal Mayor's office, representing the various local, regional and national institutions that participated in the process.

# PRIORITIZING THE INTERVENTION MODEL

Coca crop cultivation is one of the issues that has generated regional conflicts and has negatively impacted the rural development of the affected territories. In the framework of implementing the Havana agreement, particularly in formulating and implementing alternative development programs to solve the problem of illegal drugs, it is necessary for the National Government to design programs that will solve this issue.

Due to the above, a development alternative that will substitute the revenues that producing coca crops generates is legal mining, particularly gold exploitation in territories with potential to establish this economy. This option makes sense if you take into account the fact that legal gold extraction is an activity with economic potential that allows small scale miners to obtain benefits and may generate between 4 and 6 direct formal jobs 8 months a year according to the size of the exploitation operation. In order to implement the above, some conditioning factors must be taken into account to consider gold exploitation an alternative with which to substitute coca crops.

Initially, it must be mentioned that none of the excludable mining areas are part of the prioritized territories. With that in mind, the first element to consider is the territory and gold potential analysis. In this case, collective territories must be particularly taken into account because they require previous consultation for the interventions and because these territories' governments and communities may be interested in supporting and driving the change from using illicit crops to gold extraction. In addition to the above, the restrictions to gold extraction defined by regulations must be taken into account in such a way that exploitation areas are delimited while carefully following these conditioning factors.

When it is clear what areas cannot be mined, the exploitation title that is valid in the territory must be considered. This must be done because of the variety of existing possibilities, examining each one particularly so that, on one hand, they can avoid unduly using territories that have previously been requested or assigned in a current concession contract and, on the other hand, they can identify the opportunities for establishing agreements between title-holders and small scale miners for the possible compensation related to extraction in previously agreed upon areas, using various existing formal alternatives. In the event no request of area covered by the current legal framework or current contract exists, the possibility of establishing a special reserve area or managing a concession contract must be examined.

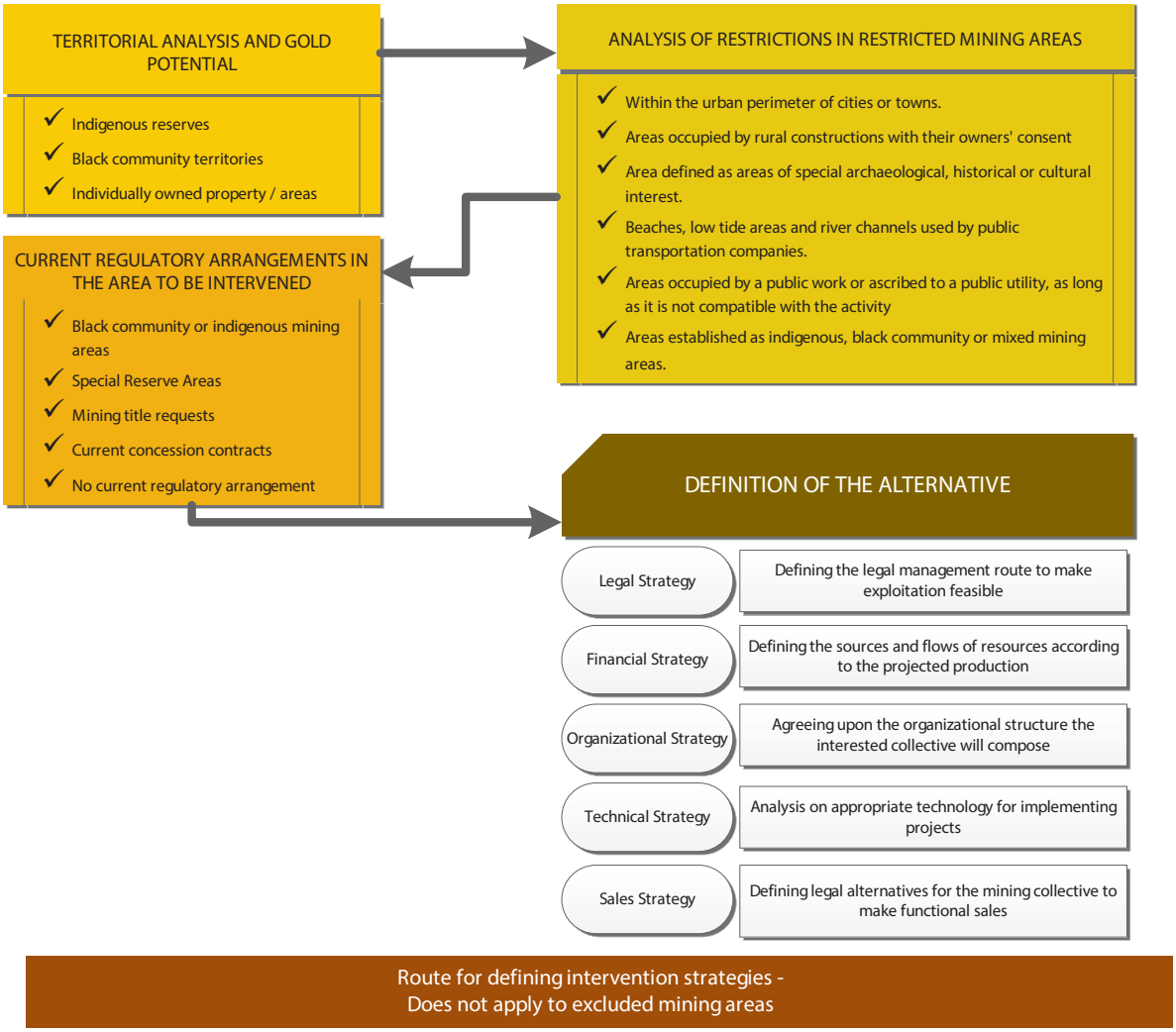
It is possible to start defining the specific alternative to be used in the territory with the identified elements. This alternative must at least consider five congruent strategies:

- A legal strategy, which must define the mode of access to the mining area and must facilitate the process for agreeing to compensation when it applies.
- A technical strategy, which is necessary to define the exploitation method that will be used in the area, as well as the set of required equipment and materials.
- A financial strategy, which will define the capital investment requirements, dynamic of resource flow and the potential investment resource sources in case the resources the substitution program contributes are not enough to cover the investment costs in accordance with the technical proposal.

- An organizational and corporate strategy, which will define the business model and the way miners will be integrated into the organizational structure (partnership, cooperative, etc.). This proposal must consider the project's cash flow, which is made up of individual extraction projects, a business unit with shareholding or a cooperative. It must also define the process for organizational formalization and strengthening required to make the work and management model feasible.
- A sales strategy, which must define the sales methods that will be applied. In accordance with the mining collective's knowledge and experience, the sales strategy may consider various sales routes, including selling the raw product or transforming it into jewelry for the national and international market.

The previously mentioned process is presented in the following chart:

**Figure 37.** Route for defining intervention strategies



# METHODOLOGICAL APPENDICES

SECTION IV

Photograph: Alluvial gold exploitation on water, municipality of Magüí Payán, Nariño.

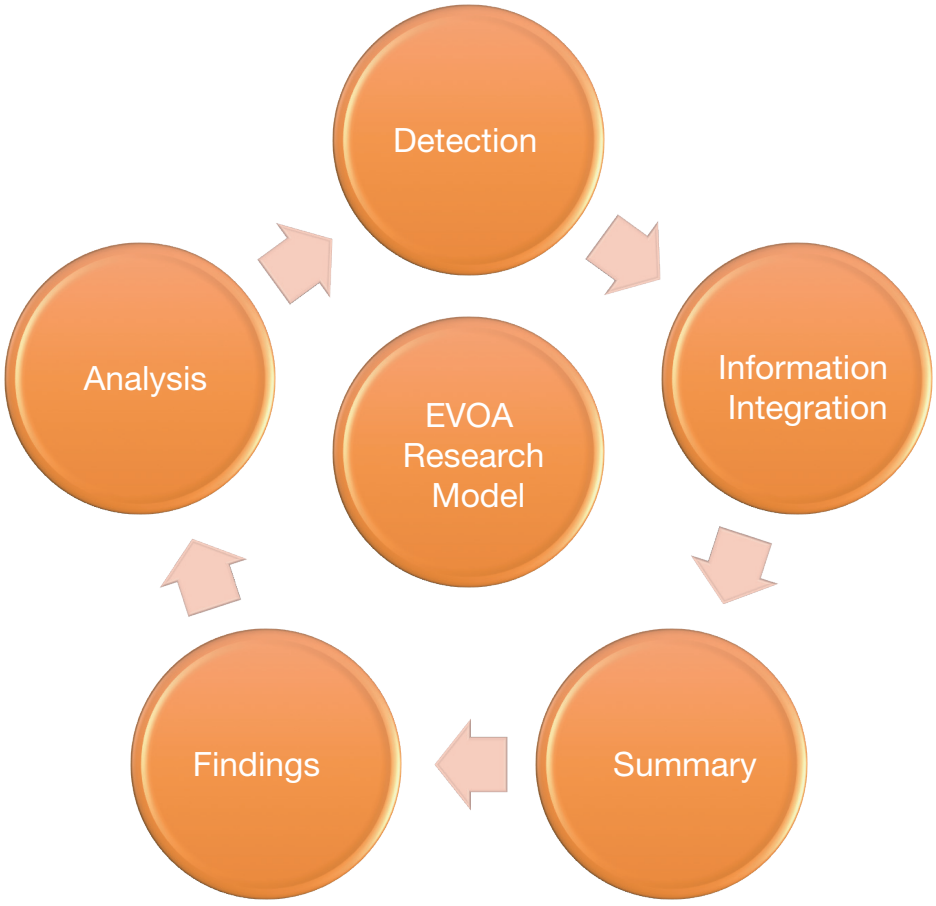
# APPENDIX 1: METHODOLOGY FOR INTERPRETING EVIDENCE OF ALLUVIAL GOLD EXPLOITATION WITH MACHINERY ON LAND

A research model that includes detection, information integration, summary, findings and analysis stages was implemented to characterize the phenomenon of alluvial gold exploitation with machinery on land.

*Detection by means of remote sensors is the starting point for the monitoring system as a fundamental input for identifying the dynamic and other geographic and thematic analyses and applications contemplated in this report.*

This model comes from detecting EVOA with remote sensing images by means of applying an interpretation key designed for this purpose. Subsequently, the interpreted EVOA is integrated with primary (historical interpreted EVOA) and secondary information (from official sources) in a research framework using geographic information system tools. The obtained data is processed and quantified (summary) to obtain the main findings that will eventually be analyzed.

**Figure 38.** EVOA research model.



The research model implemented for detecting EVOA gives it the nature of a census for the obtained results because it complies with the following premises: universality, which means it takes all the elements of the population into account in accordance with the study population, in this case the Colombian territory, simultaneity, a defined period of reference based on the temporariness of EVOA, "Lasting Evidence[67]," which has a period of reference for collecting information (2017 - 2018), and enumeration, which means the different detected evidence is identified individually following defined and structured criteria in accordance with an interpretation key designed for this purpose.

With the mentioned considerations, it can be concluded that the research model allows developing a census of evidence of alluvial gold exploitation with machinery on land, which provides the National and Regional Government and the international and academic community data based on robust and transparent methodologies. It also helps formulate public policy with an emphasis on territories' particularities and design new research models to improve knowledge on this activity's dynamics in the territories.

## *Remote Sensing*

One of the more relevant contributions of remote sensing[68] is its capacity to monitor dynamic processes. La information acquired by satellite images is an important and valuable source for studying changes in the earth's surface, whether they occur because of natural factors or human actions. The orbital characteristics of earth observation satellites allow acquiring periodic images of any place in comparable observation conditions, which is ideal for studying the expansion dynamics and trends of phenomena of interest.

Some specific advantages of using satellite images as a source of information on natural resources and the environment are: i) Scene coverage allows obtaining a synoptic view of large surface areas, which enables a better understanding of spatial organization. ii) The periodicity of shots allows following up on and monitoring dynamic processes. It is possible to perform spatial and temporal analyses with this characteristic by comparing two or more images of one place on different dates (Decision Tree). iii) The capacity to capture data in different wavelength ranges makes it easier to identify and differentiate the land covers analyzed in the image and allows accessing information that our vision cannot capture, such as infrared wavelengths. iv) Information can be updated quickly because of the periodicity of the shots (temporal resolution). v) Regional coverage, which provides accessibility to data in isolated areas, making it less expensive per area unit than aerial photographs or information collected on the ground [29]. vi) The availability of images from various free remote sensing systems.

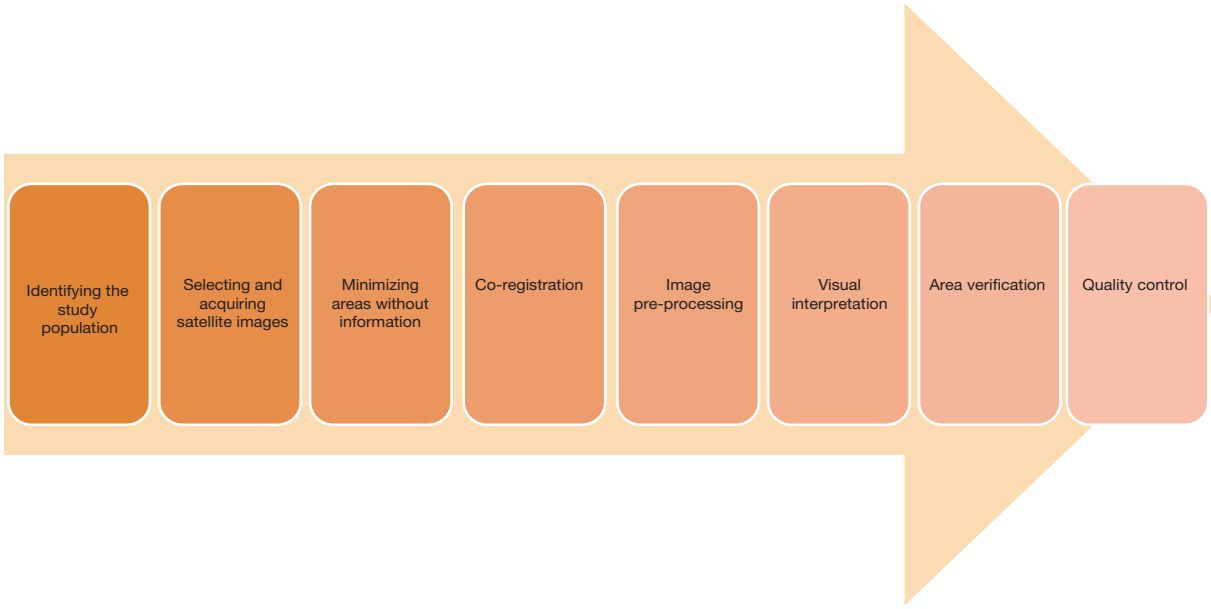
Digital image processing techniques make it easy to apply theoretical and algorithmic bases by means of which real world information based on the analyzed image can be collected. Information can be collected through visual interpretation and digital classification. The differences between the two techniques are based on the methodology. Visual interpretation is performed based on previous knowledge of the observed territory and applying identifi-

67 The evidence generated by exploitation is considered permanent in time due to the deterioration to the layer of vegetation and soil.
68 Remote sensing is commonly defined as the process of acquiring information from a distance without there being physical contact between the source of information (object) and its recipient (sensor). For this reason, it is also called "teledetection" (Tele = far – teledetection = detecting from afar) [44].

cation techniques based on the image's pictorial and morphological characteristics. On the other hand, digital classification is based on digital levels (DL), which allow grouping equal visualization values in gray scales.

The methodology for detecting EVOA on land is based on interpreting medium and high spatial resolution satellite images and includes the following stages:

**Figure 39.** Stages for detecting EVOA on land.




## *Selecting and Acquiring Satellite Images*

The land cover of EVOA on land was obtained by interpreting medium resolution images from the Landsat remote sensing program[69]. These images, widely known nationally and internationally for their multiple applications, have been used to identify coca crops and their trend since 2001 because they provide ideal periodicity, availability, coverage and spectral resolution conditions. For this reason, they are valuable tools for studying the dynamics of natural resources, making the implemented monitoring sustainable. Targeting to eliminate elements of spectral confusion was performed by using high spatial resolution images from WorldView.

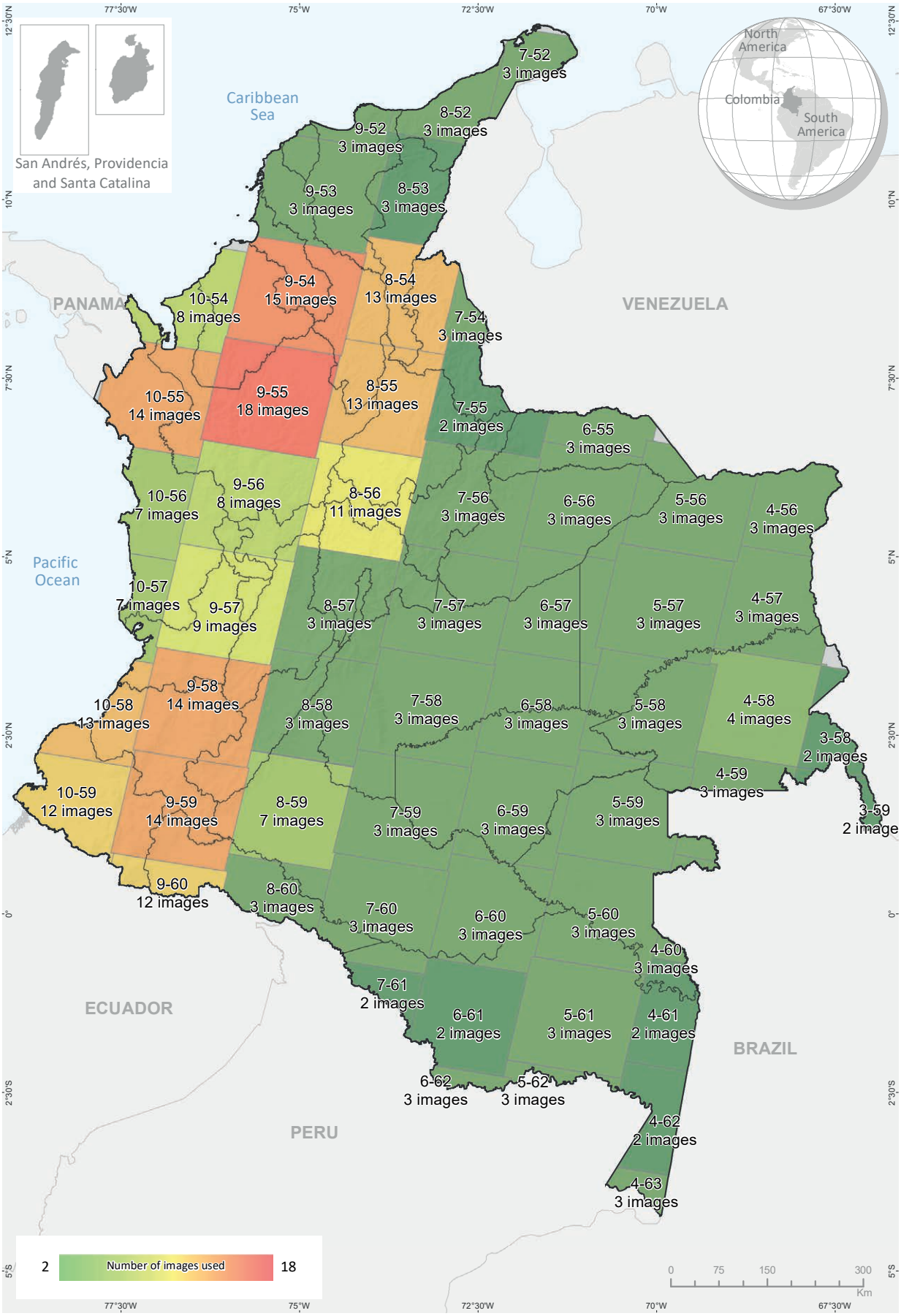
***Baseline EVOA for 2018 Images***

*58 Path/Row images were processed and interpreted, which cover the entire national territory (1,142,000 km²) except the Islands of San Andrés and Providencia. 311 Landsat 8 images (LDCM) taken between January, 2017 and May, 2018 were downloaded.*

A temporary window of a year and a half (2017 – 2018) was used to update the national EVOA on land baseline. The obtained data does not have temporality adjustments.

69 The system of LANDSAT satellites (LAND = land and SAT = satellite), which were initially called ERTS (Earth Resources Technology Satellites), was the first United States mission to monitor land resources. The National Aeronautics and Space Administration (NASA) is in charge of maintenance and operation, while the United States Geological Survey (USGS) is in charge of producing and selling the images.

**Mapa 20.** Cobertura de imágenes de satélite Landsat 8 usadas para la detección de EVOA

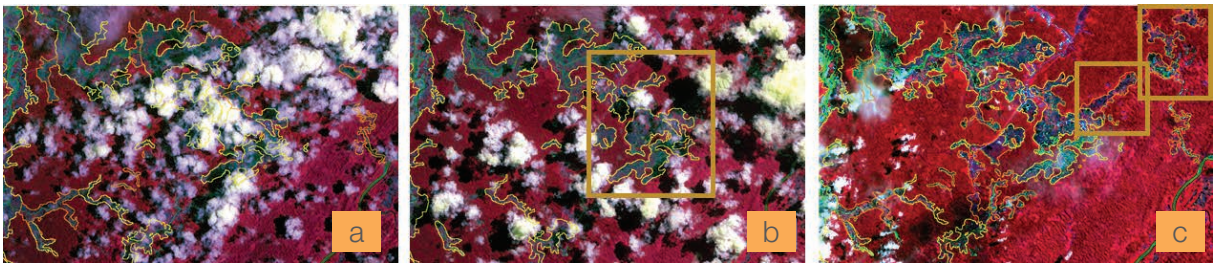



Source: Government of Colombia – Monitoring system supported by the UNODC
The borders, names and titles used in this map does not represent the United Nation's recognition or acceptance.

### *Minimizing Areas without Information*

This stage is aimed at minimizing or completely eliminating cloud cover to ensure better coverage of the territory with EVOA on land. To that end, and in light of the temporality of EVOA, a time window between May, 2017 and May, 2018 was established, which allowed obtaining the total reduction of the area without information in the territory affected by EVOA on land in 2018.

**Figure 40.** Example of minimizing areas without information - A baseline Landsat 8 OLI image (a), and by selecting and adding available information in other Landsat images with nearby dates (b), a complete information image of the EVOA phenomenon was obtained in t his period (c).




### *Image Pre-processing*

Image pre-processing brings together a series of techniques aimed at: correcting or removing effects on the image due to sensor errors or environmental factors, increasing contrast to make it easier to interpret and increasing spatial resolution to improve object delimitation and detection.

### *Co-registration*

A mosaic for the entire country was developed to facilitate interpretation, which is defined as the basis for georeferencing each one of the images.

Co-registration ensures each processed image is adjusted pixel by pixel to the mosaic, which in turn ensures geographic and temporal (historical) comparability for identifying the dynamic and other spatial analyses.

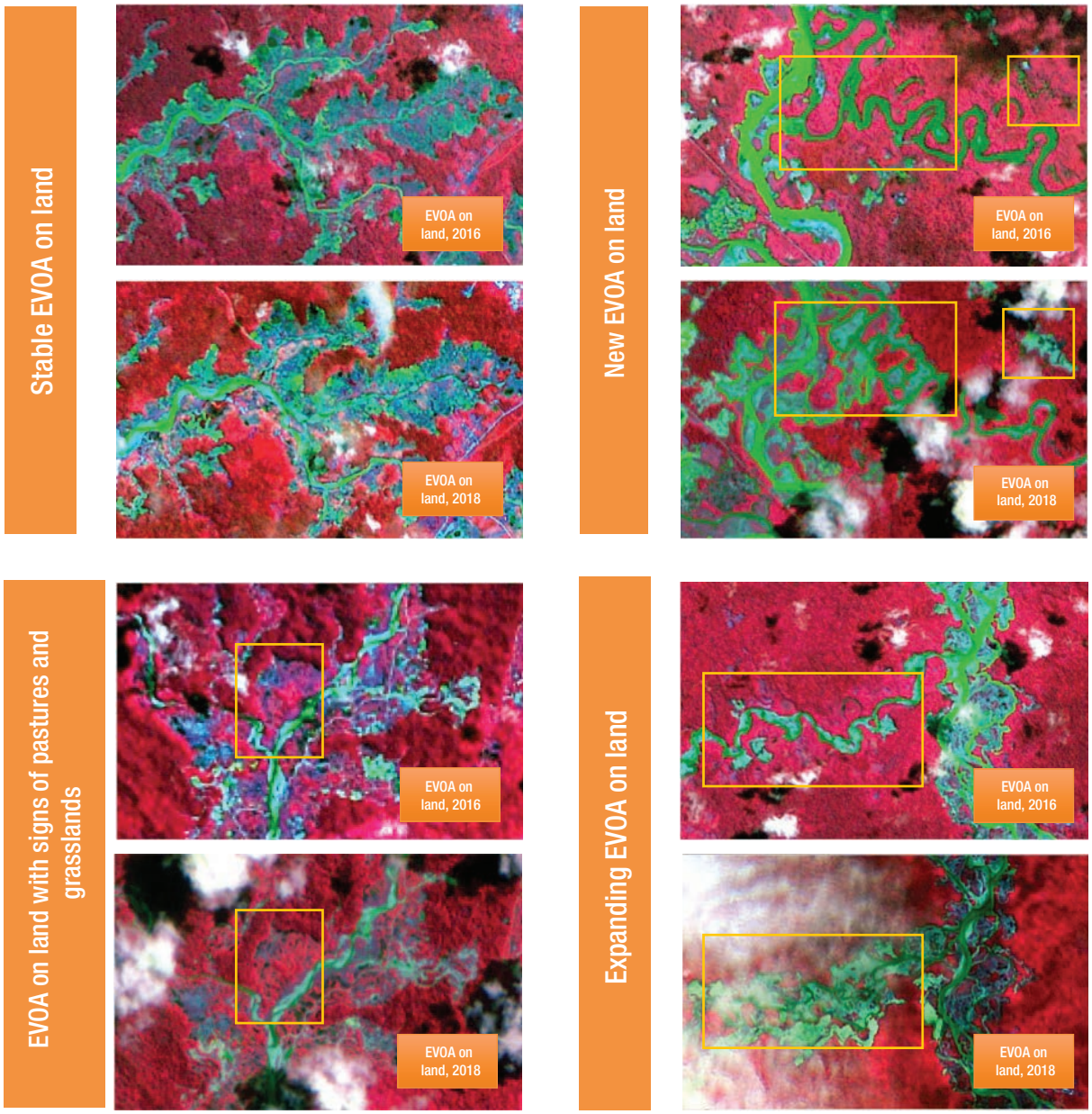
*The SIMCI project has adopted the 1984 World Geodetic System (WGS 84) as a frame of spatial reference. This system has the same ellipsoid as the one the Agustín Codazzi Geographic Institute used in Colombia, which allows the UNODC/SIMCI data to be linking to another type of geographic information officially produced in the country.*

### *Interpretation*

This stage was approached with digital processing tools, with an emphasis on a model for updating the EVOA detected in 2016. The update includes the following legend, which has already been explained in the chapter on dynamics:

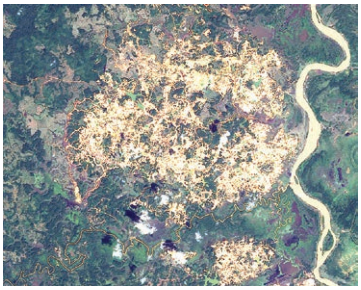
- Stable Area
- New Area
- Area with Signs of Grasslands and Pastures
- Expanding Area

**Figure 41.** Interpreted categories in the national 2018 EVOA on land baseline. 1056 Landsat Image (RGB 547).

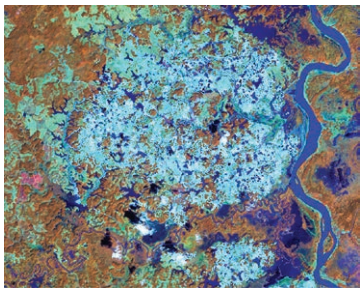



The amplitude of the spectral range that characterizes EVOA makes it possible to confuse them with other land covers. In this context, the UNODC has created an interpretation key that allows eliminating or minimizing these factors of spectral confusion. Another important tool for reliably identifying EVOA is using colored images (true color and false color), which allow highlighting different elements in the landscape that characterize EVOA.

**Figure 42.** Examples of some color compositions used for detecting EVOA, (a) true color, RGB (432), (b) false color, RGB (564), (c) false color, RGB (654).



a) Composition RGB 432 (Landsat 8). It is the combination closest to the way our eyes perceive the earth as seen from space. That is where the name, true color, comes from.



b) Composition RGB 564 (Landsat 8). It sharply highlights the limits between water and land.

c) Composition RGB 654 (Landsat 8) Differentiates between bodies of water and vegetation.

A comparison between the information obtained by means of field verifications during flyovers, secondary information and validations with high resolution images from the World Imagery gallery provided by the Esri map service[70] was performed to support interpretation. The Esri gallery provides high resolution GeoEye[71], IKONOS[72], QuickBird[73] and WorldView[74] satellite images that can be viewed with ArcGis' Add Basemap tool. These images are only used to support interpretation because only images prior to 2010 are available in much of the country. However, they provide a good benchmark.

High resolution images allow improving the delimitation of areas with evidence and clarifying cases of spectral confusion with other land covers in the area, such as hamlets, bare ground or other types of mineral exploitation.

### *Aerial Reconnaissance*

The methodology includes reconnaissance and verification flyovers to support the interpretation of satellite images and validate or adjust patterning to identify EVOA on land. This reconnaissance is based on the direct visual inspection of the areas affected by the phenomenon from an aircraft, where they collect direct geographic information on tablets and record photographic and video evidence. The project has historical information on records since 2012 for a large part of the territory that has illicit crops.

70 Esri (Environmental Systems Research Institute) is a company founded by Jack Dangermond in 1969 that, when it began, was dedicated to land consulting. It currently develops and sells software for Geographic Information Systems and is one of the leading companies in the sector worldwide.

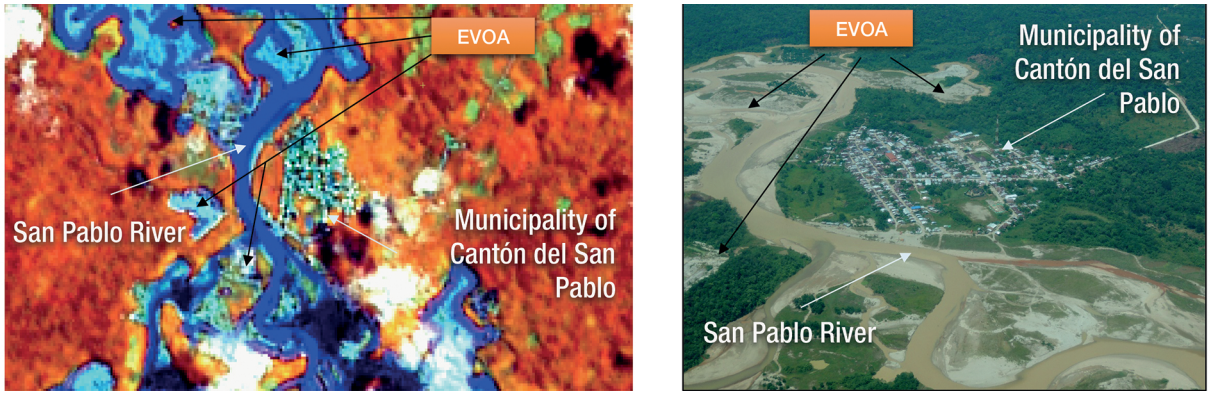
71 GeoEye is a commercial satellite that was launched on September 6, 2008. This satellite can capture panchromatic 0.41 m images and multispectral 1.65 m images.

72 IKONOS is a commercial remote sensing satellite owned by DigitalGlobe. It was the first to collect publically available, high resolution images with a spatial resolution of between 1 and 4 meters. It was launched on September 24, 1999.

73 QuickBird is a commercial satellite that belongs to the company, DigitalGlobe. It was launched from the United States airforce base in Vandenberg, California on October 18, 2001. The system collected panchromatic 61-centimeter images and multispectral, stereoscopic 2.5 meter images. The last image was acquired on December 14, 2014. QuickBird reentered the earth's atmosphere on January 27, 2015.

74 WorldView 1, 2 and 3 are very high resolution optical satellites that belong to the company, DigitalGlobe. They have operated since 2007 (WorldView-1).

**Figure 43.** Comparison between satellite image (1056 Landsat 8 – RGB 547) (left) and traditional photograph (right) taken on a SIMCI reconnaissance flyover. Municipality of El Cantón de San Pablo, Chocó.




## *Quality Control*

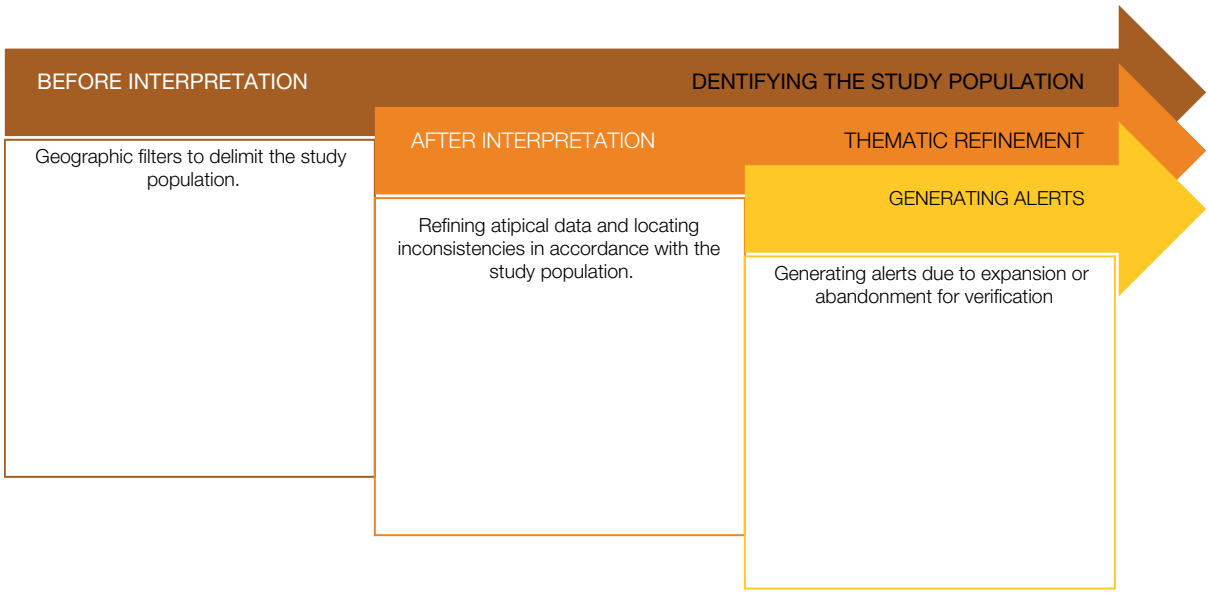
Quality control performed by the SIMCI project seeks to ensure procedures are standardized so that the generated data complies with quality, accuracy and comparability parameters required by the Colombian Government and the information's users.

This quality control is generally based on specific evaluations of the various activities involved in detecting EVOA, especially in interpretation processes. Quality is controlled in:

- Image selection: areas without information are reduced as much as possible using various images of the same area and making mosaics. Cloud cover was minimized to 0% in 2018.
- Interpretation: A semi-automated support and quality control model[75] for visual interpretation was developed to evaluate this parameter in such a way that the data refined with thematic, spatial and temporal criteria was integrated into the framework of areas for the geographic analysis. This model is divided into three stages that are approached individually and ensure the interpretation's objectivity and quality.

75 A spatial analysis tool was designed to process inputs automatically once the required data is entered according to the level (filters, review or alerts), in such a way that information is eliminated in the first level and the visual refinement areas are targeted in the following two as it may apply.

**Figure 44.** Automated models used to interpret EVOA on land.




## *Identifying the Study Population*

This stage, prior to interpretation, objectively identifies the territory to be explored and leads to greater reliability in subsequently detecting EVOA because it eliminates confusion with other types of mining and land cover.

This study population or exploration territory is identified by implementing an automated model[76] designed to that end by the UNODC, which is substantiated in broad terms with primary information (EVOA obtained in the framework of the phenomenon's studies performed in previous years by the UNODC) and specific geographic information identified to this end.

*Detecting EVOA on land using remote sensing is based on applying a decision tree (interpretation key) designed by the project to that end, which allows identifying changes in the landscape caused by alluvial gold exploitation with machinery on land with satellite images. Using the decision tree is aimed at objectively identifying EVOA on land, eliminating spectral confusion factors.*

*The sequence of the key's criteria and partial results at each level is defined by means of a flow chart for the interpretation to progress from broad terms to details until it reaches a conclusive result.*

*The logical conditions that make up the various levels of the decision tree for detecting EVOA on land include a sequence of questions on the following topics: i) landscapes, ii) pictorial and morphological characteristics, iii) reference infomration, and iv) validation, whether it is by means of aerial verification or by accessing high spatial resolution images.*

76 A spatial analysis tool was designed to process inputs automatically once the required data is entered according to the level (filters, review or alerts), in such a way that information is eliminated in the first level and the visual refinement areas are targeted in the following two as it may apply.

### *Thematic Refinement*

This consists of a thematic review of the detected EVOA in the study population. It is used to identify outliers and inconsistencies with other land covers. Although the model automatically generates the inconsistencies, an expert has to validate whether or not the data should be deleted. With this objective in mind, verification flyover data, primary information generated by the UNODC in the framework of monitoring the crime and secondary information from official sources is used. Furthermore, inconsistencies without sufficient evidence to be deleted or validated are compared to high resolution spatial images.

### *Generating Alerts*

Alerts are set off in this last stage of quality control due to changes in the phenomenon's dynamic (expansion or reduction), and, in addition, this stage takes into account an analysis of the areas without information in the previous period. This stage seeks to perform an additional review of the targeted polygons to make sure the indicated changes correspond to the previously identified magnitudes. In the event it is necessary to refine the information, the interpretation key must be used again, and the polygons must be adjusted to obtain the final layer of EVOA on land that works as an input to be integrated into the master framework of areas and subsequent geographic analysis.

# APPENDIX 2: METHODOLOGY FOR DETECTING SUSPENDED SEDIMENT ALTERATION

The methodology for detecting suspended sediment alteration was developed in the framework of convention 589 dated 2015 between the Ministry of Justice and Law and the United Nations Office on Drugs and Crime - UNODC. A methodological approach for detecting EVOA on water based on evidence from remote sensing that can be measured by means of changes in the spectral indices and can be associated with alluvial gold exploitation was carried out during this convention. The model is based on the dynamics of change in the natural behavior of rivers' sediments, and validation.

The methodology was first validated by a pilot study on the Inírida River in the sector between the "El Zancudo" and "Morroco" communities, in the Province of Guainía. Subsequent to 2016, the model was once again implemented on a section of the Apaporis River (borderline with Serranía del Chiribiquete National Natural Park) between the Dos Ríos and Puerto Penalito communities, on limits shared between the municipalities of Solano in the Province of Caquetá, Miraflores in the Province of Guaviare and Pacoa in the Province of Vaupés. Both studies' findings validate the methodology to be implemented on a national scale and make up the baseline for monitoring the phenomenon under the mode of exploitation with machinery on water in these territories.

## Model

The model begins by developing a baseline of suspended sediments in a river's natural conditions, which means without external factors that encourage this alteration and continues by calculating the index used in the different study periods. The baseline is the reference input for following up on the index's changes and, in this way, detecting possible alert sites due to gold exploitation with machinery on water.

In this sense, establishing a river's spectral behavior is, first, supported by specialized remote sensing tools with the spectral index MNDWI (modification for normalized difference water index) and by the analysis and statistical standardization of obtained natural behavior.

It is important to mention that applying the index both in developing the baseline of natural behavior and detecting the river's spectral dynamic implemented with Landsat Program images where the range of the electromagnetic spectrum of the bands has stayed relatively constant throughout the Program's various missions.

In general, the model involves four stages, which are stated below:

i) Identifying the study area for each river.

ii) Developing the baseline for identifying each river's natural spectral behavior.

iii) Detecting changes in spectral behavior by analyzing the MNDWI trend.

*Spectral indices are based on the algebric combination of bands in their corrected spectral values that have also been radiometrically calibrated (reflectance), improving the capacity to interpret results. The objective is to group and minimize the diferente sensors' responses to one value per pixel that can successfully relate to a phenomenon to be researched [53].*

iv) Validating the findings of alerts through qualitative information, elements of association and direct inspection by means of flyovers or unmanned aerial vehicles.

On the other hand, the model is approached based on the following premises:

1. Spatial comparability, by applying co-registration techniques to satellite images.
2. Spectral comparability, by using atmospheric correction instruments to minimize the effects of atmospheric noise and maximize the absolute values of radiance.
3. Comparability according to the river. Here, an intermediate time window between the dry and rainy seasons is established. Therefore, less flowing water during the dry season facilitates detecting riverbed sediment and can lead to incorrect readings, while an increased flow of water during the rainy season and the effects of heavy precipitation in nearby landscape (landslides, erosion) make the river susceptible to transporting a larger amount of sediment caused by other external sources.

# APPENDIX 3: TOOLS FOR MONITORING THE CRIME, THE FRAMEWORK OF AREAS

The monitoring model is made up of two lines of work. The first one consists of analyzing the landscape's visible elements using satellite images and remote sensing. This line allows geolocating traces or evidence of changes that may be associated with activities, such as illicit crop cultivation or alluvial gold exploitation. In the second line of business, qualitative information, statistical sampling models, social mapping, regional visits and spatial analyses are used when phenomena do not have detectable spatial patterns to characterize and monitor said phenomenon.

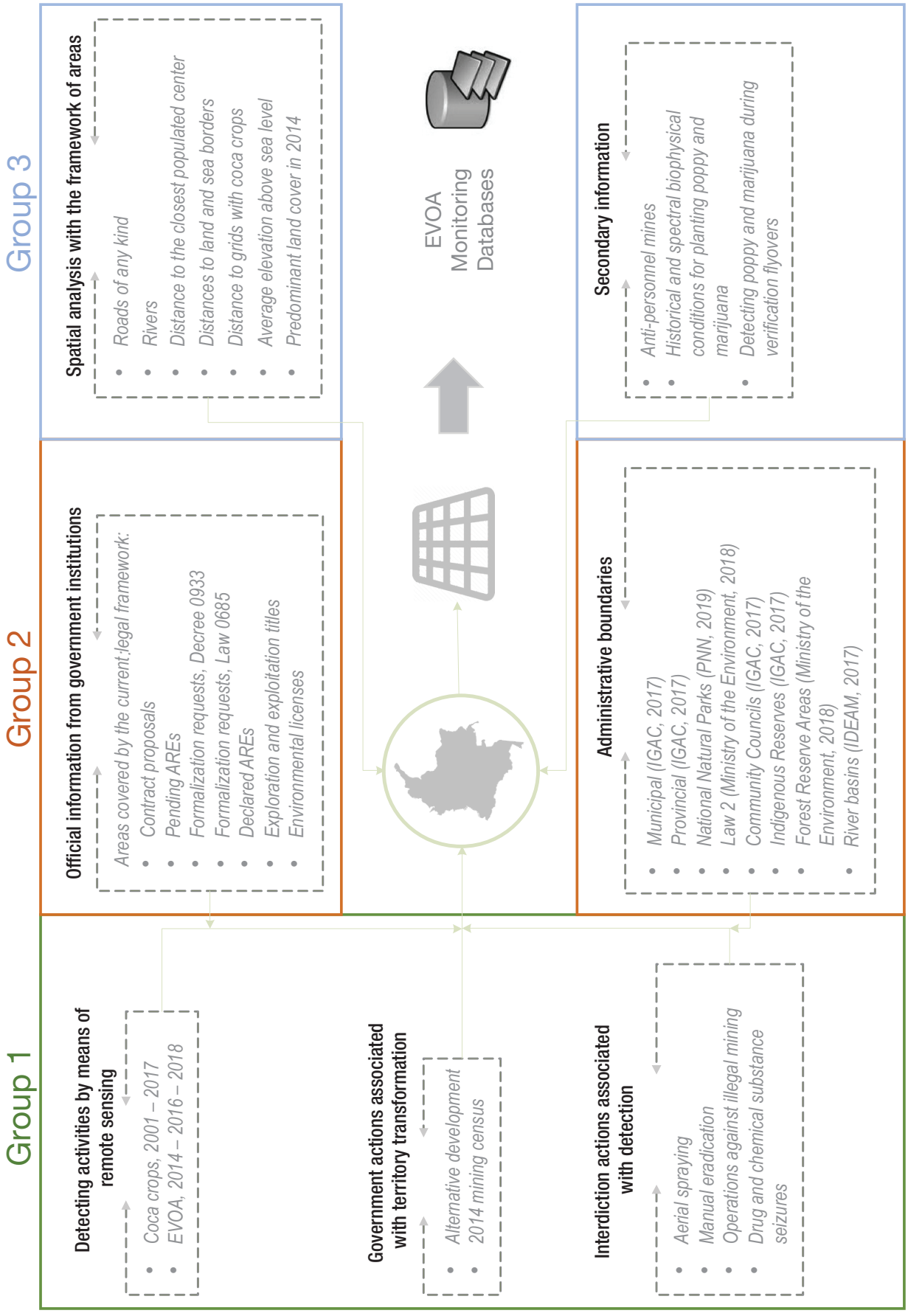
It is necessary to have both information on the activity's location and the greatest amount of available related data to understand the dynamics of illegal activities in the territory. A high percentage of this data has different collection methodologies and scales. For this reason, integrating these variables becomes a complex challenge. The project has used the geographic focus as a mechanism to incorporate another kind of information into monitoring. With this focus, the territory becomes the axis for analyzing and bringing together the related data from different sources of information.

In order to facilitate the integration and spatial and statistical analysis of data, SIMCI prepared a framework of areas made up of fixed grids that covers the entire country with a systematic and cartographic distribution of 1 km2 (100 hectares) and 5 km2 units. Since they are the unit of analysis, grids, changes and updates to the boundaries of regional institutions do not alter the results. For this reason, spatiotemporal studies can be performed simply and efficiently.

As of 2019, in addition to having data on coca crops and EVOA, the framework has data on other types of phenomena in the territory, such as land mines, provided by Descontamina Colombia, and data on annual deforestation, provided by the Ministry of Environment and Sustainable Development. The layers of administrative boundaries and those of other regional institutions allow creating useful dynamic tables and reports to analyze and verify the coherence of the data.

In short, the available information can be divided into three groups: the first is related to illegal activities in the territories and the actions the government has advanced to control, follow up on and monitor them. The second is related to the official information from regional institutions and administrative boundaries. The third is related to the additional spatial analyses that allow better understanding each phenomenon's dynamics.

**Figure 45.** Pillars of information in the framework of areas.



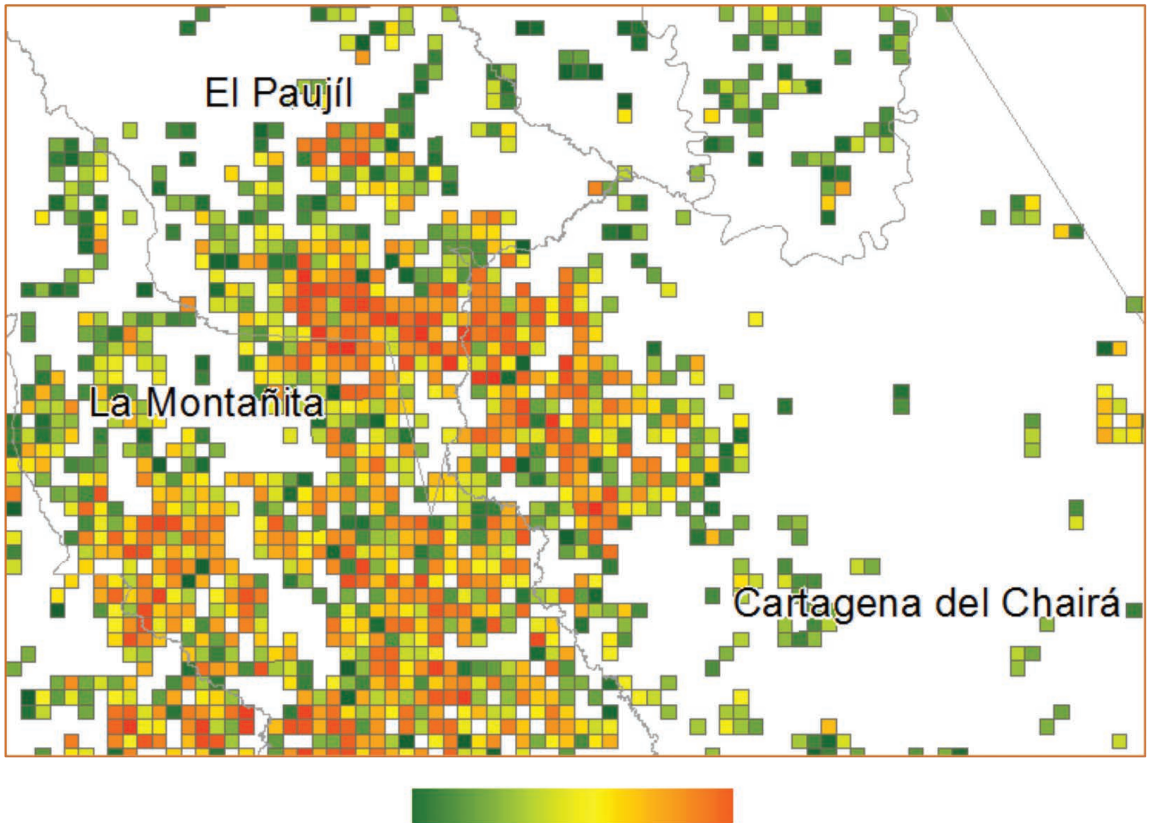
## Activities in the Territories (Group 1)

The data for detecting coca crops and Evidence of Alluvial gold exploitation and the information related to the actions the Colombian government has taken to face the issue can be classified as interdiction and territory transformation.

### Coca Crops, 2001 - 2017

It corresponds to a geographical and statistical process that calculates the amount of hectares where coca crops have been sown as of December 31 of each year. It includes adjustments due to temporality, such as voluntary and forced manual eradication actions, grid trends and adjustments due to areas without information because of cloud cover in the images that were used.

**Figure 46.** Visualization of illegal phenomena in the framework of areas, example of coca crop density.




### EVOA 2014-2016-2018

The procedure for determining the area of EVOA per grid begins with an intersection between the evidence polygons interpreted in the satellite images and grids. The area of each resulting polygon is then calculated. The sum of all the areas in one grid's polygons corresponds to the total area. The identified (grid1kf) facilitates following up on each unit. The final reported data for each municipality corresponds to the sum of grids that belong to one same municipality (spatial coincidence analysis between the centers of each grid and the municipal boundaries).

Figure 47. EVOA in the framework of areas, 1km * 1 km grids.

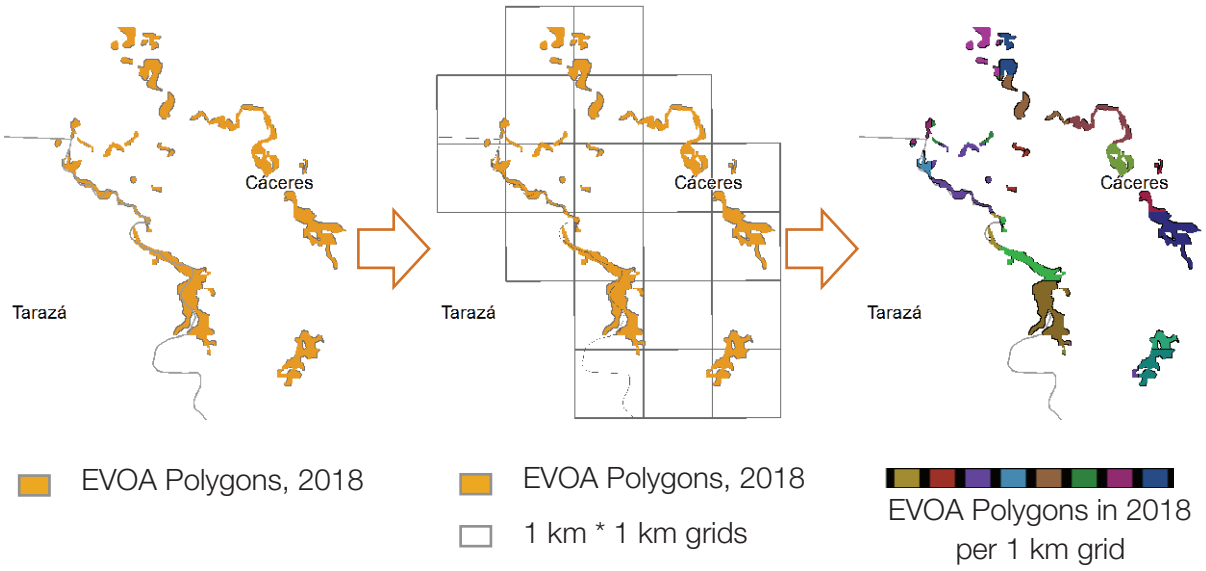



Table 24. Secondary official information in the framework of areas.

| | |
|---|---|
| **Alternative Development** | Grids that have had alternative development programs, such as park ranger families, containment programs and voluntary substitution programs since 2007. |
| **Mining Census** | Each grid has a dichotomous variable that differentiates in what grid there is information about the mining census. |
| **Aerial Spraying** | 2004 - 2015 historical series of the area sprinkled with glyphosate. |
| **Manual Eradication** | 2007 - 2015 historical series of data on eradication certified by the UNODC, carried out by mobile eradication groups.<br>2017 - 2018 historical series of the grids with voluntary eradication processes in the framework of the peace agreements.<br>2017 - 2018 historical series of forced eradication validated by the UNODC. |
| **Raids against Illegal Mining** | Each grid has a dichotomous variable regarding the amount of raids carried out by the armed forces and police against illegal mining. |
| **Drug and Chemical Substance Seizures** | Amount of drugs and chemical substances seized by Province. |

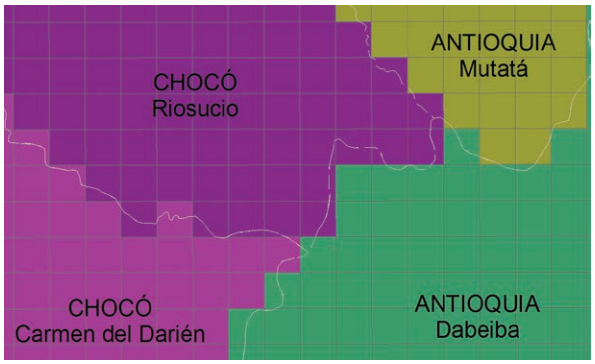
## Official Information from Regional Institutions and Administrative Boundaries (Group 2)

Even though area analyses and calculations are performed by means of 1 km2 grids, it is necessary to consolidate data on municipal, Provincial and national scales, and in other types of administrative institutions of interest. To comply with this objective, the framework of areas integrated the information from municipal (IGAC 2017) and Provincial boundaries (IGAC 2017), National Natural Parks (PNN 2018), Law 2 (Ministry of Environment and Sustainable Development 2018), Community Councils and Indigenous Reserves (IGAC 2017), Ramsar Sites (Ministry of Environment and Sustainable Development 2018), Páramo Areas (Ministry of Environment and Sustainable Development), Forest Reserve Areas (RUNAP), populated centers (IGAG 2017), areas of archaeological interest (Ministry of Culture), low tide areas (Ministry of Transportation – INCO) and Public Utility Areas (National Infrastructure Agency, Ministry of Mines and Energy).

The administrative boundaries and other regional institutions were assigned by intersecting the coordinates of the center of the grid and the administrative boundary polygon. In this procedure, the main boundary is territorial delimitation, since there are grids that share administrative boundaries with two or more regional institutions called boundary grids. For 2018, 106,632 grids have this situation with respect to municipal boundaries. Of these, only 1,475 had EVOA in 2014, 2016 or 2018. For the latest EVOA detection, 12,690 hectares are in boundary grids, which correspond to 14% of the total for 2018.

The continental Colombian territory is made up of 1,190,675 1 km$^2$ grids or 47,627 5 km$^2$ grids. The following example shows the differences between the original data on administrative boundaries (left) and the result in grids (right). In the same way, information from the previously mentioned special regional institutions has been incorporated.

**Figure 48.** Administrative boundaries and assignment models by center of grid in the framework of areas.




Administrative Boundaries (Municipalities)


Municipality assignment according to the center of the grid.

## Spatial Analysis in the Framework of Areas (Group 3)

Having unrepeatable units with regular geometry, it is possible to quickly and simply perform spatial analysis exercises. As an added value, having all of the information consolidated in each one of the grids makes the spatial analyses apply for all variables. For example, by calculating the distance to the closest land boundary or populated centers, it is possible not only to know the relationship between coca crops and boundaries or populated centers, but also the relationship between EVOA, manual eradication and aerial spraying, with respect to boundaries and populated centers.

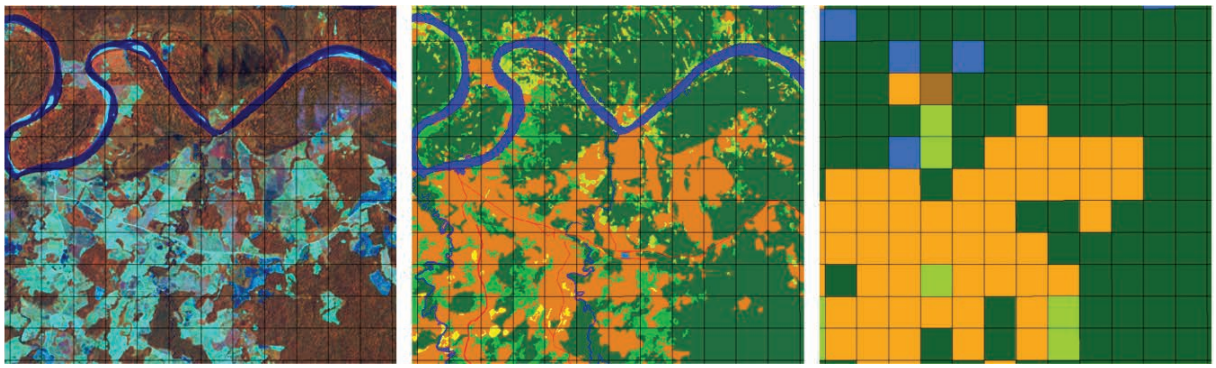
The framework of areas essentially acts as a geographic database that a user that is not a geographic information system expert can easily handle, which facilitates any users' access to data and analyses. The exercise in integrating information into the framework of areas has the goal of having experts from various fields use the information related to illegal activities in the territory.

As of 2019, various spatial analyses have been performed with the framework as the main input. Some analyses have covered the distance to coca crop centers, the distance to populated centers, road and river density, distances to land and sea borders, average elevation above sea level, predominant land covers, risk analyses due to anti-personnel mines, biophysical historical and spectral properties for planting poppy and marijuana. Some examples of the results by grid are presented below.

- Predominant land covers for the grid

By having the 2001 – 2014 historical series of land covers in the areas of influence of coca crops, 18 types of information on land covers were defined[77]. The framework of areas was assigned each grid's predominant land cover[78].

**Figure 49.** Visualization of the thematic map of land covers in the framework of areas.

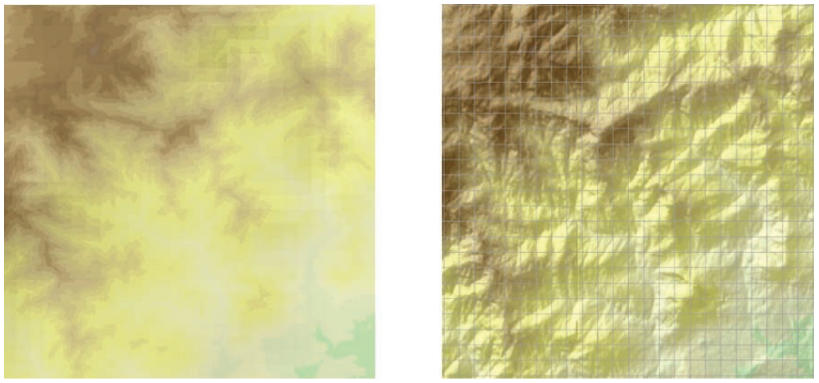



77 For more information, see: Multitemporal analysis of coca crops, SIMCI, 2001.
78 The last versión of land covers corresponds to 2014.

- Average elevation above sea level

The main input of the incorporation of data is the Digital Elevation Model developed by the Ministry of Economy, Trade and Industry (METI) of Japan and the National Aeronautics and Space Administration (NASA), created in 2011. The resulting data for each grid is the average elevation above sea level.

**Figure 50.** Visualization of the Digital Elevation model in the framework of areas (1 km * 1 km grids).



Digital Elevation Model
Elevation above sea level

Average elevation above sea level per 1 km * 1 km grid

In conclusion, the framework of areas is a unique institution with fixed geographic characteristics. It does not change its position in time or its shape. In addition, the framework allows integrating georeferenced data from various sources of information, a characteristic that facilitates monitoring, following up on and evaluating the interventions performed on the territory.

# GLOSSARY

**Affected territory.** 1 km* 1 km grids in the framework of areas that have EVOA according to the established methodology based on remote sensing.

**Alluvial deposits.** Detritic material (made or composed of fragments) transported by a river and deposited in sections throughout its flood plain.

**Band.** A wave length interval within the electromagnetic spectrum. By implication, each one of the channels through which a sensory system's data is acquired is called a band [29].

**Color.** A basic element of the visual interpretation of images. It comes from the different wavelengths that the eyes capture as a characteristic of each thing's selective reflectivity. For example: If an object reflects 0.5 to 0.6 mm wavelengths, that object will be green [35].

**Color composite.** The process of creating a colored image by putting together three bands, where each one of the bands corresponds to the primary colors, which are red, green and blue [36].

**Decision Tree.** A set of conditions organized into hierarchical multitrack guide structure in such a way that the final decision to be made can be determined following the conditions met from the tree's roots to one of its leaves [31].

**Digital Elevation Model - DEM.** Numerical structure of data that represents the spatial distribution of a land surface's elevation [41].

**Digital level.** Discrete numerical value that translates the spectral intensity received by an electro-optical sensor. It is also known as gray level, luminance, digital number, pixel value, etc. [43].

**Digital processing of satellite images.** A discipline that develops the theoretical and algorithmic bases by means of which real world information can be automatically collected based on an observed image. This information can relate to recognizing objects and their three-dimensional descriptions, position and orientation, or to measuring any spatial property, such as the distance between two well-defined points or the object's transversal section [33].

**Filter.** A local operator by means of which the information contained in an image is selectively highlighted or suppressed to make some of its elements stand out or to hide anomalies [37].

**Flood plains.** Flood plains are areas by rivers subject to recurring floods.

**Framework of areas:** A set of grids that cover the nation with a systematic and cartographic distribution of 1 km2 and 5 km2 geospatial units. It was built by the SIMCI – UNODC project to facilitate the geographic continuity of the spatial and statistical analysis of illicit crops in Colombia.

**Geographic Information System (GIS).** In its broadest sense, a GIS is a group of procedures used to store and handle georeferenced data, whether that is manually or on a computer [48].

**Georeferencing.** This is the procedure by means of which the cartographic validity of a digital image is provided, geometrically correcting cells' positions and giving them coordinates in a reference system [39].

**Hamlet.** A site with a group of houses that is generally located by a main road and has no civil authority [32].

**Interpretation.** Formally, interpretation is defined as "explaining or stating the meaning of something" [38]. In the context of remote sensing, interpretation consists of having trained personnel use image analysis techniques, systems and processes to provide reliable and detailed information about the natural or artificial objects on the surface of land whose image has been analyzed and to determine the factors implied by their presence, condition and use [33].

**Interpretation key.** It refers to the characteristic or combination of characteristics that make it possible to identify a particular object, such as size, shape, tone and color [34].

**LandSat.** Civil satellite information program. The system of LANDSAT satellites, which were initially called ERTS (Earth Resources Technology Satellites), was the first United States mission to monitor land resources. The National Aeronautics and Space Administration (NASA) is in charge of maintenance and operation, while the United States Geological Survey (USGS) is in charge of producing and selling the images [37].

**Land cover.** It is composed of different types of objects or bodies on the earth (vegetation, soil, water, among others) that receive the energy signal from the source of energy and reflect or emit it according to its physical and chemical characteristics [35].

**Multispectral.** An optically acquired image in more than one spectrum or wavelength. Each individual image is usually of the same physical area and scale, but with a different spectral band [42].

**Multitemporal Analysis.** A type of spatial evaluation that consists of identifying not only the changes of a particular phenomenon, but also its relationship with land covers, by means of observations or readings that are made in different periods of time [30].

**Panchromatic.** An image collected within the wide range of visible wavelengths produced in black and white. The term has historically referred to the black and white photographic emulsion that is sensitive to all the visible colors, although not necessarily uniformly [42].

**Pattern.** A spatial distribution of a set or association of similar objects, as well as a systematic repetition of shapes. It takes into account the particular spatial organization of the objects of a land cover [35].

**Patterning.** A term used in remote sensing to relate the behavior of an object in the image (pictorial and morphological characteristics) to the territory's reality.

**Pictorial and morphological characteristics.** It refers to the elements in an image that work as evidence for identifying objects, among which are shape, size, shadows, tone, color, special patterns, texture and association [33].

**Radiance.** The amount of energy radiated from an object in time per unit solid angle per unit projected area perpendicular to the direction of propagation [29].

**Radiometric resolution.** This refers to a sensor's capacity to detect variations in light or radiation translated into gray scales. In this manner, it can be concluded that the more bits there are, the more gray values there are, which is equivalent to a higher radiometric resolution. This characteristic allows there to be enough contrast in the images, making it easier to differentiate patterns [37].

**Reference system.** A set of properly modeled conventions and concepts that allow defining the orientation, location and scale of three coordinate axes (x, y, z) [39].

**Reflectance.** The measurement of a surface's capacity to reflect radiant energy in a determined wavelength. It is the ratio that exists between the flow of reflection and incidence on said surface. Applied to the visible spectrum, albedo is normally mentioned [29].

**Remote sensing**. This science refers to the "process of acquiring information from a distance without there being physical contact between the source of information (object) and its recipient (sensor)" [44].

**Satellite images.** These are the products of passive sensors, which work in the optical range of the electromagnetic spectrum from 0.4 µm to 15 µm. The system for collecting information is com-

bined with optics similar to those of photography and an electronic detection system [37].

**Settling ponds.** A hole in the ground, generally made with heavy machinery used to remove material, where there are considerable volumes of water for cleaning and separating the mined minerals to subsequently be used or transformed [45].

**Shape.** Defined as "a thing's external configuration" [38]. A certain object's shape is a key determining factor in identifying it, since its outline allows assimilating it to a familiar pattern [29].

**SIMCI.** A project framed in the Worldwide Illicit Crop Monitoring Program established by the United Nations General Assembly, whose main objective is to determine the extent of coca crops in Colombia by means of satellite images and field verifications [47].

**Size.** The size of an object is one of the most useful signs for identifying it. With an object's measurements, an interpreter can eliminate many possibilities of confusion [33].

**Spatial resolution.** This term designates the smallest object that can be distinguished in an image [37]. In other words, it is the distance that corresponds to the minimum unit of information included in the image (pixel). In this manner, the smaller the pixel, the greater the spatial resolution, which implies that the sensor will obtain greater object details.

**Spectral index.** Algebraic combinations of two or more bands that work to spectrally highlight a certain land cover. These operations result in new images where certain pixels related to parameters of the analyzed land cover stand out [40].

**Spectral resolution**. It indicates the number and width of spectral bands that the sensor can differentiate [46]. The more bands of the spectrum a sensor system can differentiate, the greater the spectral resolution. This particularity facilitates identifying certain characteristics of an image, since it differentiates information depending on the wavelength between the visible and infrared spectrum, which allows determining the spectral signatures of the land covers [29].

**Spectral signature.** Also defined as spectral response, spectral signature is the expression of an object of the earth's surface that allows recognizing it in a satellite image in accordance with its characteristics, which are the way it interacts with electromagnetic energy and its wavelengths [29].

**Temporal resolution.** It is defined as the amount of time needed for a sensor to acquire images for the exact same location. This cycle is based on the platform's orbital characteristics (height, speed, angle, time of capture, inclination), as well as the sensor's design [37].

**Texture.** An image's texture refers to the spatial contrast between the different elements in the image and comes from the relationship between the size of the objects and the sensor's resolution. It is related to the apparent roughness or softness of a region in the image [33].

**Tone.** Defined as the degrees of gray variations between black and white [33]. This characteristic refers to the intensity of the energy received by the sensor for a certain spectral band. That is to say, it is related to the spectral behavior of the different land covers for the particular spectral band being used [39].

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## NOTES

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