

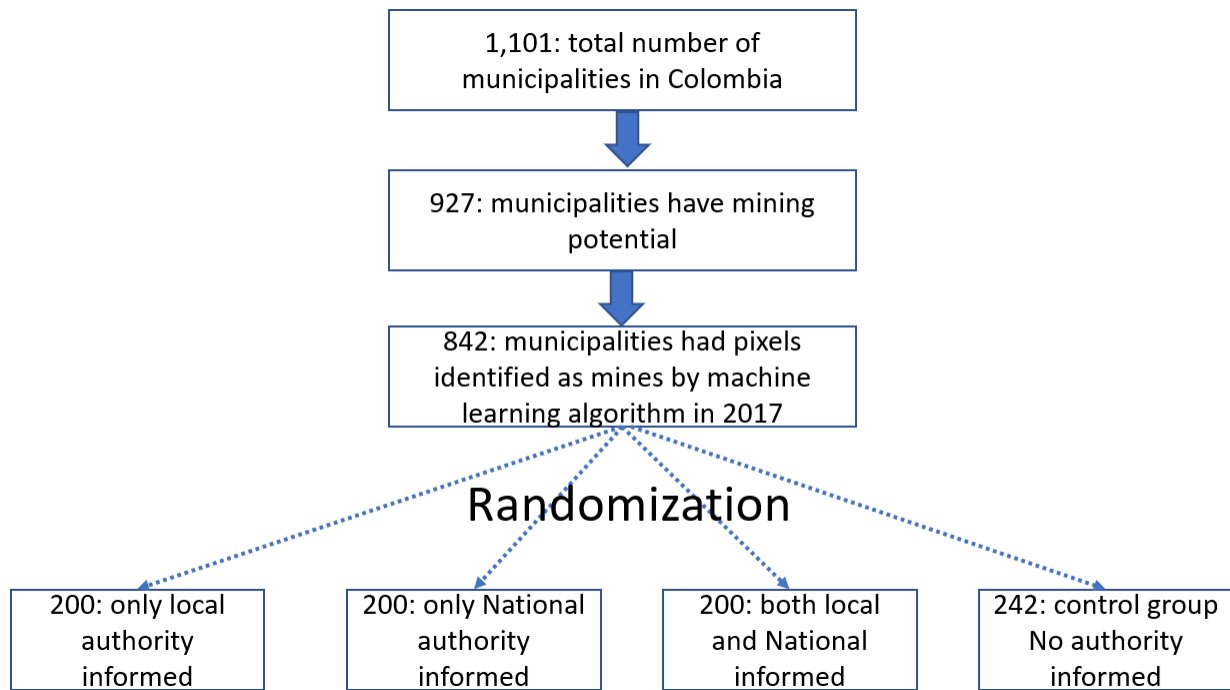
Supplemental Appendix
Technology, Information and State Capacity:
Experimental Evidence from Illegal Mining in Colombia

Santiago Saavedra

This supplemental appendix accompanies the conditionally accepted manuscript.

Appendix B Supplementary Figures and Tables

Figure 1: Structure of the experiment



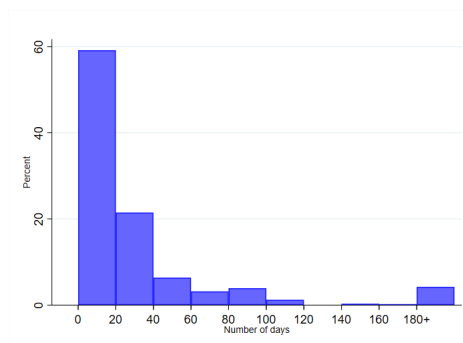
Notes: Allocation of Colombian municipalities to control and treatment groups.

Figure 2: National authority treatment

Código Divipola Mpio	Departamento	Municipio	Longitud	Latitud
54003	Norte de Santander	Abrego	-73,02930109	8,08612853
54003	Norte de Santander	Abrego	-73,18639958	7,94771262
54003	Norte de Santander	Abrego	-73,12553243	7,93116889
54003	Norte de Santander	Abrego	-73,01482651	8,09663557
54003	Norte de Santander	Abrego	-73,09220015	7,78374356
27006	Chocó	Acandí	-77,34937030	8,46752252
27006	Chocó	Acandí	-77,18134244	8,42104209
27006	Chocó	Acandí	-77,34366791	8,47026820
27006	Chocó	Acandí	-77,26301260	8,46315159
27006	Chocó	Acandí	-77,11376477	8,36364958
25001	Cundinamarca	Agua de Dios	-74,73182195	4,38098266
25001	Cundinamarca	Agua de Dios	-74,70452168	4,35926036
25001	Cundinamarca	Agua de Dios	-74,66016595	4,39072386
25001	Cundinamarca	Agua de Dios	-74,68937707	4,36793904
25001	Cundinamarca	Agua de Dios	-74,70966485	4,34352115
20011	Cesar	Aguachica	-73,63099118	8,03405840
20011	Cesar	Aguachica	-73,62747928	8,02617925
20011	Cesar	Aguachica	-73,65285667	8,00645864
20011	Cesar	Aguachica	-73,66394898	8,02684184
20011	Cesar	Aguachica	-73,64959251	8,00590538

Notes: I sent to the national authority (the Air Force) a letter with 2,000 coordinates, 5 points for each of the 400 selected municipalities.

Figure 3: Treatment letter response time histogram



Notes: Number of days local authorities took to respond the information letter.

Table 5 presents the regression results of testing for alternative explanations to the results presented in Table 5. In all cases, the coefficient of the differential accuracy of local authorities for illegal mines is stable, and similar to the ones in Table 5. Columns 2 and 8 presents a robustness check by separating accuracy by “fully illegal” from “fuzzy illegal” mines. That is, whether the illegal mine is right outside a legal title (“fuzzy

Table 1: Summary statistics before treatment restricted to UNODC sample

Group:	Control (1)	Only Local (2)	Only Nat (3)	Both (4)	p-value (5)
Panel A: mining variables					
% mined area mined illegally	77.81 (25.98)	81.44 (23.93)	87.79 (19.76)	79.98 (28.03)	[0.56]
% gold mined area illegally	80.59 (32.37)	87.28 (24.74)	91.28 (10.91)	87.20 (16.82)	[0.44]
Municipality has gold mines	0.94 (0.24)	0.85 (0.36)	0.85 (0.37)	0.93 (0.25)	[0.54]
km mines to muni office	19.71 (11.39)	23.03 (15.97)	16.99 (11.91)	20.00 (11.49)	[0.45]
Panel B: other variables					
Area (km ²) municipality	1439.20 (1,826)	1528.06 (1,170)	1214.84 (1,512)	1210.24 (992)	[0.80]
Population	30,460 (34,542)	27,410 (19,182)	40,336 (85,050)	26,948 (26,610)	[0.72]
Homicides per cap. (2016)	38.61 (36.44)	39.59 (35.03)	35.73 (28.63)	41.39 (33.86)	[0.95]
Answered end-line survey	0.76 (0.44)	0.85 (0.36)	0.85 (0.37)	0.80 (0.41)	[0.78]
N	33	27	20	30	

Notes: Mean and standard deviation of the main variables, separated by treatment group restricted to the municipalities with gold mining. Column (1): control municipalities, where no letter was sent. (2) Municipalities where the treatment letter was sent only to the local authority (3) Municipalities disclosed in the letter to the national authority (4) Municipalities where both local and national authorities were informed. Column (5) p-value of testing if all means are equal. Panel A contains mining variables. The percentage of gold mined area illegally is calculated from United Nations Office on Drug and Crime (UNODC) data. The distance of the mine to the municipality office is computed using national Administrative Department of Statistics (DANE) information about the location of municipal administrative offices. Population and municipality area data comes from DANE. Homicides from the national Police. Answered end-line survey is a dummy indicating if the municipality answered the 2021 end-line survey. N is the number of municipalities in each group. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 2: Disclosed and would have been disclosed grids

Dependent variable:	Gold area mined	
Disclosed X After	-16.2	
	(19.0)	
Disclosed X After X Local	-7.38	
	(28.3)	
Disclosed X After X National	-21.1	
	(27.6)	
Disclosed X After X Both	-16.8	
	(19.8)	
Mean Dep. Var. Control	248.51	248.51
Obs.	222	222
N. Munis	29	29
R ²	0.97	0.97

Notes: This table shows the treatment effect restricting the baseline grid-level spillover specification from Table 3 to disclosed grids and would have been disclosed grids that are gold mines. Clustered standard errors at the grid level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

illegal”) or more than 1km away. I create a 1km buffer around legal mining titles and test whether there is differential accuracy for strict illegal mines. The coefficients are similar suggesting that the differential response is not a confusion of legal boundaries. In all columns the coefficient for the accuracy for the national authority for illegal mines is statistically not different from zero. On Columns 3 and 9, I test whether the differential results could be explained because illegal mines are more recent, and therefore local authorities are less likely to know about their existence. I measure Age of the Mine as the years since the first year the mine was detected by the model. When controlling for age of the mine, the coefficients for illegal mines are similar to those of Table 5. In

Table 3: Minimum Detectable Effect of the intervention on other outcomes

Dependent variable:	% Gold mined illegally (1)	(2)	Defo rate (3)	Poverty (4)	Child Labor (5)
Local only X After	1.57	1.71	-0.037	4.07	0.57
National only X After	0.72	0.78	-0.052	4.21	0.63
Both X After	-0.053	0.78	0.053	-4.18	-0.60
N. Obs	363	363	880	110	110

Notes: This table shows the minimum detectable effect of the treatment on other outcomes. See Table 2 for the corresponding results. Columns (1) and (2) are the percentage of gold mining mined illegally. Column (3) is the deforestation rate computed as deforested area divided by municipality area. Columns (4) and (5) are poverty and child labor in terms of percentage of population.

Table 4: Determinants of local and national government's accuracy and pixel characteristics

Dependent variable: Responses	Accurate response = 1					
	Local or National			Local and National		
	(1)	(2)	(3)	(4)	(5)	(6)
Local X Illegal Mine	-0.16** (0.066)	-0.075** (0.034)	-0.14** (0.069)	-0.44** (0.19)	-0.12** (0.054)	-0.55** (0.19)
Local X Title X FP	0.57*** (0.11)	0.24*** (0.054)		-0.26 (0.37)	0.091 (0.060)	
Local X No Title X FP	0.62*** (0.074)	0.27*** (0.040)		0.36* (0.21)	0.23*** (0.058)	
National X Illegal Mine	-0.058 (0.087)	0.030 (0.030)	0 (0.10)	-0.058 (0.20)	0.039 (0.041)	0.18 (0.17)
National X Title X FP	0.79*** (0.098)	0.29*** (0.057)		0.77*** (0.16)	0.32*** (0.10)	
National X No Title X FP	0.85*** (0.086)	0.31*** (0.037)		0.84*** (0.21)	0.33*** (0.051)	
N. of obs.	1,205	4,000	488	254	2,000	98
Mean of Dep. Var.	0.64	0.20	0.25	0.68	0.21	0.33
R^2	0.79	0.66	0.69	0.85	0.69	0.82
Input missing	No	Yes	No	No	Yes	No
Exclude FP	No	No	Yes	No	No	Yes

Notes: Estimates of the main accuracy specification for government responses in 2017. False positive (FP) is a prediction of the model that was not a mine according to independent verification. Clustered standard errors at the municipality level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

addition, the coefficient of Age of the Mine is only significant at the 10% level in Column 1 and not statistically significant when interacted. Moreover, it has the opposite sign as it would be expected that local authorities are more accurate for older mines.

Next, in Columns 4, 5, 10 and 11, I test whether the reduction in accuracy for the responses for illegal mines is because these mines are further from the municipality town hall, and consequently, local officials monitor them less. In columns 4 and 10, I use linear distance, and in columns 5 and 11 topographical distance accounting for mountains. The coefficient on the dummy for illegal mines is basically unchanged, and the interaction of distance with response by local authority is small and switches sign from columns 4-5 to 10-11. In Columns 6 and 12, I test whether the results are because the accuracy of local authorities' responses decreases during the verification process I asked them to perform. Although this is unlikely, given that I randomize the selection of the mines, I find that the order in which I listed the prediction does not affect the accuracy. Another concern is that local authorities are not confirming the existence of illegal mines that are in the process of formalizing.

Table 5: Alternative determinants of local and national government's accuracy and pixel characteristics

Dependent variable: Sent to	Accurate Response=1											
	Local or National						Both Local and National					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Local X Illegal Mine	-0.16** (0.066)		-0.20*** (0.073)	-0.22*** (0.072)	-0.22*** (0.072)	-0.19*** (0.072)	-0.44** (0.19)		-0.47** (0.19)	-0.42** (0.20)	-0.42** (0.20)	-0.46** (0.20)
National X Illegal Mine	-0.058 (0.087)		-0.064 (0.087)	-0.060 (0.086)	-0.060 (0.086)	-0.050 (0.088)	-0.058 (0.20)		-0.060 (0.19)	-0.13 (0.18)	-0.12 (0.18)	-0.060 (0.20)
Local X Illegal Mine Strict		-0.14** (0.058)						-0.42*** (0.15)				
National Illegal Mine Strict		-0.0011 (0.049)						-0.059 (0.084)				
Local X Illegal Mine X Age of Mine			0.012 (0.017)						0.013 (0.012)			
Age of Mine			-0.010* (0.0054)						-0.015* (0.0090)			
Local X Illegal Mine X Linear Dist. (Km)				0.0065** (0.0028)						-0.0080** (0.0038)		
Linear distance (Km)				0.00083 (0.0020)						0.017** (0.0083)		
Local X Illegal Mine X Topog. Dist. (Km)					0.0060** (0.0027)						-0.0073** (0.0033)	
Topographic distance (Km)					0.00096 (0.0018)						0.016** (0.0076)	
Location 2						-0.022 (0.022)						-0.057 (0.039)
Location 3						0.034 (0.023)						0.0000021 (0.054)
Location 4						0.0024 (0.025)						-0.013 (0.056)
Location 5						-0.0012 (0.025)						-0.015 (0.031)
Local X Illegal Mine X Location 2						0.011 (0.052)						0.036 (0.10)
Local X Illegal Mine X Location 3						0.067 (0.072)						-0.010 (0.15)
Local X Illegal Mine X Location 4						0.10 (0.066)						0.21 (0.14)
Local X Illegal Mine X Location 5						0.017 (0.067)						0.015 (0.10)
N. of obs.	1,205	1,205	1,205	1,205	1,205	1,205	254	254	254	254	254	254
Mean of Dep. Var.	0.64	0.64	0.64	0.64	0.64	0.64	0.68	0.68	0.68	0.68	0.68	0.68
Mean of Interacted Var.	-	-	2.37	9.94	10.7	-	-	-	2.59	7.63	8.25	-
R ²	0.79	0.79	0.79	0.80	0.80	0.80	0.85	0.85	0.85	0.86	0.86	0.85

Notes: Alternative explanations for the results of Table 5. Columns 1 and 2 repeats the results of Table 5 for comparison. "Strict Illegal Mine" is defined as a mine that is neither in titled area nor 1 km around. "Age of the Mine" as the first year our model detect the pixel as mined. "Linear Distance" is the distance from the disclosed coordinate to the municipality office using the shorter distance (linear). "Topographic Distance" is the shorter distance between the municipality office and the disclosed point but adjusting by the slope of the road provided by a Digital Elevation Model. "Location" is the position of the mine in the sent letter. All estimations include municipality fixed effects. Clustered standard errors at the municipality level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 6: Results for accuracy of local's aggregate responses (2017-2019-2021)

Dependent variable:	Accurate Response=1	
	(1)	(2)
Illegal Mine	-0.16*** (0.032)	-0.11*** (0.033)
False Positive x Title	0.43*** (0.071)	0.47*** (0.087)
False Positive x NO Title	0.54*** (0.046)	0.65*** (0.051)
N. of obs.	1,071	1,052
Mean of Dep. Var.	0.69	0.69
R^2	0.41	0.68
Municipality FE	No	Yes

Notes: Estimates of the main accuracy specification for local government responses in 2017, 2019, 2021. The national government did not respond in 2019 and 2021, so it is not included in this Table. Clustered standard errors at the municipality level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Appendix C CoMiMo's Machine-Learning Algorithm

I present the machine-learning algorithm used to detect mining activity using satellite data. The data is available on <https://comimo.sig-gis.com/>. I present the description of the latest model used for the data posted on Colombian Mining Monitoring (CoMiMo).

CoMiMo aims to detect illegal mining using satellite data and machine learning. I train the model with thousands of examples of images with mines, and also of images without mines. The goal of the machine-learning algorithm is to detect the footprint of an open-pit mine (e.g., the white part in Figure 1). One could impose a rule for declaring an image as mined or allow the machine to “learn” the optimal rule based on the characteristics of known mines. For example, we could impose the following rule: Every image without forests and with a color close to white is a mine. Instead of imposing a rule, I let the algorithm find the characteristics that differentiate images with mines from those without mines.

Table 7: Determinants of local and national government's accuracy gold mining municipalities

Dependent variable: Sent to	Accurate Response=1					
	Local or national			Both Local and national		
	(1)	(2)	(3)	(4)	(5)	(6)
Local X Illegal Mine	-0.14 (0.19)	-0.13** (0.063)	-0.083 (0.19)	0 (.)	-0.15 (0.098)	0 (5.0e-18)
National X Illegal Mine	0.0065 (0.23)	0.076 (0.098)	0 (0.24)	1.00 (.)	0.050 (0.13)	1.00*** (4.1e-16)
N. of obs.	155	535	80	40	300	24
Mean of Dep. Var.	0.62	0.19	0.51	0.55	0.20	0.58
R^2	0.56	0.56	0.65	0.75	0.58	0.71
p-value $\beta_L = \beta_N$	0.64	0.08	0.78	.	0.22	.
Input missing	No	Yes	No	No	Yes	No
Exclude FP	No	No	Yes	No	No	Yes

Notes: This table is the equivalent of Table 5 but restricted to municipalities with gold mining area according to the UNODC data. Columns without coefficients do not have enough observations for the estimate. Clustered standard errors at the municipality level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Figure 1: Example of satellite imagery of a mine



Notes: The white portion of the image is the mine footprint, in contrast to the river (brown) and vegetation (green). Source: Digital Globe-Google Maps.

I divide this section into four sub-sections. First, I present the satellite data used as input for training and predictions. Second, I present the labeled data of examples of mining and no-mining areas. Third, I present the model architecture and other specifications. Finally, I present the performance metrics of the best model used for the predictions available in CoMiMo.

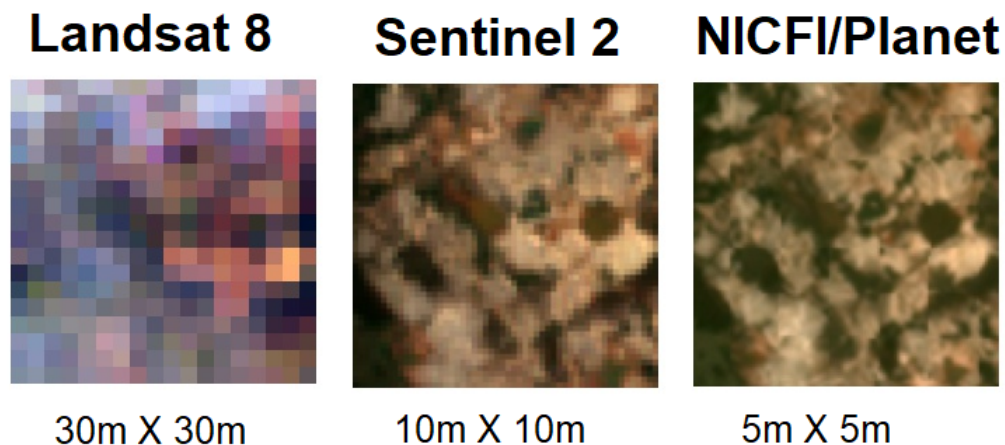
C.1 Satellite data

I used four different satellite sources: NICFI-Planet, Sentinel 1, and Sentinel 2. Although the satellites have different resolutions, each satellite imagery is divided into common 540mx540m grid squares that will be the basis of the analysis. That is, in the training data, I have an indicator on whether the 540mx540m grid square has a mine or not. The images are processed in Google Earth Engine.

NICFI-Planet data The image is provided for free by Norway's International Climate and Forest Initiative (NICFI), from Planet's constellation of satellites. There are four variables that can be used as predictors: The red band, green band, blue band, and the fourth band (near-infrared). Available every six months since December 2015 and monthly since September 2020. The resolution is 4.77m per pixel.

Sentinel 1 data This imagery is created using radar, so it is not affected by the presence of clouds. Provided by the European Space Agency daily since October 2014. I use the two bands (VV, VH) and a combination of these two (VH-VV). The resolution is 10m per pixel.

Figure 2: Satellite imagery resolution



Notes: Example of the different resolution of imagery products.

Sentinel 2 data It is also provided by the European Space Agency, but it is affected

by clouds. Available every 5 days March 2017. I use the red, green, and blue bands. The resolution is 10m per pixel.

Landsat data It is provided by the national Aeronautics and Space Administration (NASA) of the United States, it is also affected by clouds. Available every 8 days since the nineties. The resolution is 30m per pixel.

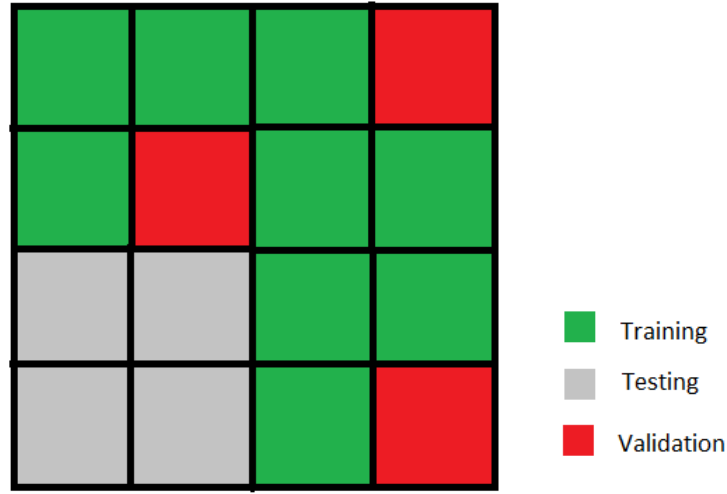
C.2 Training, validation and testing data

The labels on whether a grid square has a mine or not are derived from many sources. The first source is the Colombian Mining Census of 2010, the source used for the random forest model described below. The second source is The United Nations Office on Drugs and Crime (UNODC) map of open pit gold mining from 2014. The final source is our own validation of three different kinds of points. The first kind is a random sample of grid squares in Colombia, and a random sample from mining regions. The second kind is from grids belonging to mining titles. The final kind is validation from previous models. This last kind allows me to present the model examples of imagery that is difficult to classify. We have 5,602 images classified as mines and 12,517 images classified as no mined. I expand this base set of images with rotations, reflections, and extracting on different dates.

Besides the label on whether there is a mine, each image extracted from a given satellite needs to be inspected in case there are clouds. For example, even though a given grid might have a mine, a satellite image of the grid might have a cloud, so the label needs to be adjusted for that satellite. The labels were done by students in double-blinded validation using the extracted image and Google Maps, Digital Globe, and Planet for additional context.

I divided the country into 100kmX100km data squares. Each data square is divided into four equal sub-squares. One of these sub-squares was randomly assigned to testing. The remaining sub-squares were each split again into four, assigning randomly a fourth for validation. See the figure below for an example. That is, I have 56.25% of the area for training, 18.75% for validation, and 25% for testing. The reason for not doing fully random splitting is to avoid geographical correlation between training and testing. In fully random splitting, I might train in a grid and test in its neighbor, which is easy to predict, overstating performance metrics.

Figure 3: Division of grids for training, testing and validation



Notes: Each data square is divided into four equal sub-squares. One of these sub-squares was randomly assigned to testing. The remaining sub-squares were each split again into four, assigning randomly a fourth for validation.

C.3 Model architecture

There is a trade-off between having a large image with more pixels that provides more information for classification and a small image that would be more certain of the location for field verification. We decided on 540mx540m images because half a kilometer is a reasonable distance to walk on the field.

- Architecture: ResNet-50, ResNet-18, ResNet-34, ResNet-101, EfficientNet-B1, DenseNet-101
- Satellite: NICFI-Planet, Sentinel-1, Sentinel-2, Landsat 8
- Bands: RGB, add Infrared
- Learning rate: 0.0001, 0.0002, 0.0005
- Epochs: 30, 15, 45, 60
- Dropout: 0.5, 0.25, 0.75
- Data augmentation: simple, rotation, reflection, multiple periods

- Hybrids of the models above: hierarchy, arithmetic or geometric average of predictions

C.4 Metrics

The validation metrics of the best performing model used for the CoMiMo predictions are presented in Table 1. The precision is 90.54%

C.5 Details of the random forest algorithm

The satellite data used for the random forest algorithm in [Saavedra and Romero \(2021\)](#) was only Landsat, as it was the only source available from 2001-2014, the period of analysis studied in that paper. The coordinates for the training data were obtained from the mining Census of the year 2010. It was carried out by the Colombian Ministry of Mines in 20 out of the 32 departments of the country. The census provides only a point coordinate and we had research assistants drawing the exact boundaries of the mines. This process produced a data set with 168,000 square pixels of size 30mx30m. The algorithm is a random forest at the pixel level using as predictors the six bands from the satellite data, ecosystem type and a deforestation indicator. [Saavedra and Romero \(2021\)](#) divided each 40km x 40 km square of the country into four 20km x 20km squares and randomly choose one for testing and the other three for training. Within the training pixels the best parameters were chosen by 10-fold cross-validation. For additional information of the random forest model see Appendix D of [Saavedra and Romero \(2021\)](#).

C.6 Letter Sent Translated

Bogotá, September 15, 2017

Mr. Jesús Eduardo Díaz Ríos

Mayor of Rosas

Ref.: Right of petition

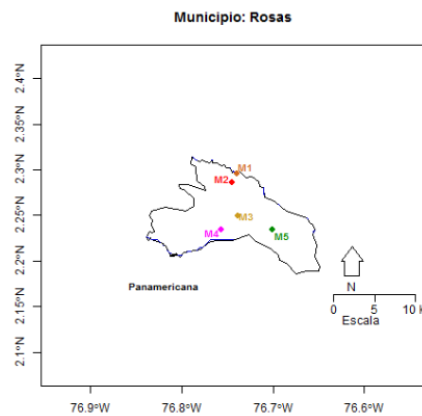
Request for validation of mining model predictions

Respected Mr. Mayor

I, Santiago Saavedra, identified as it appears at the bottom of my signature, acting in my own name, in accordance with the provisions of article 23 of the Politican Constitution and 5, 13 and following of the Code of Administrative Procedure and Administrative Litigation, respectfully I formulate the following Freedom of Information Act Request:

1 Acts

As part of my research at Universidad del Rosario we have developed a machine learning model to detect mining activity using satellite images. For your municipality in particular, we predict that there is mining activity in the following points.



I send the predictions in different coordinates at the end of the letter, so that you use the one that suits them best in the verification. The points on the map are the same in all tables. It is only necessary to check one table, the one with the coordinates in the system you prefer.

Coordinates in Latitude Longitude format

Prediction	Latitude	Longitude	THERE IS evidence	THERE IS NO evidence
Mina 1	2.29608118	-76.73956063		
Mina 2	2.28630785	-76.74521233		
Mina 3	2.24942041	-76.73869571		
Mina 4	2.23447786	-76.75674665		
Mina 5	2.2340023	-76.70011267		

2 Request

I politely request to do a field verification, if indeed there is evidence of mining at these points, complete the table and respond preferably by email. It may be that there is an active mine or evidence that there was mineral extraction in the past. We have the map of mining titles from the National Mining Agency, but what we want is your field verification of the coordinates predicted by our model. It may be that there is a mining title but that extraction has begun or not at the coordinate point. There may be illegal extraction of minerals, or the model may have been confused with another activity. The coordinates in the main table are in Latitude Longitude format. If you consider that another format is more suitable, we will gladly transform them.

3 Fundamentals of law

As legal fundamental for the above petition, I cite the following provisions:

A. Political Constitution

Article 23—: Every person has the right to present respectful petitions to the authorities for reasons of general or particular interest and obtain a prompt resolution.

B. Code of Administrative Procedure and Administrative Litigation

Article 5—: In their relations with the authorities, everyone has the right to:

1. Submit requests in any of its modalities, verbally, or in writing, or by any other appropriate means and without the need for a attorney, as well as to obtain information and guidance on the requirements that the current provisions require for this purpose.

The previous actions may be carried out or promoted by any technological or electronic means available in the entity, even outside the hours of attention to the public.

Article 13—: Every person has the right to present a freedom of information request and get a timely response. Article 6—: Requests for documents must be resolved within ten (10) days of receipt. If no response has been given to the petitioner within that period, it will be understood, for all legal purposes, that the respective request has been accepted and, consequently, the administration will no longer be able to deny delivery of these documents to the petitioner, and as a consequence copies will be delivered within three (3) days. Article 21—: If the authority to which the request is addressed is not the competent one, it will immediately inform the interested party if he acts verbally, or within ten (10) days following receipt, if he acted in writing. Within the indicated term, it will forward the petition to the competent authority and will send a copy of the referral letter to the petitioner. The terms to decide will be counted from the day following the receipt of the petition by the competent authority.

4 Notifications

I will receive correspondence, preferably at the email santiago.saavedrap@urosario.edu.co or on Calle 12c # 4-69 Casa Pedro Fermin Of 315 in the city of Bogotá. Telephone 2970200 ext 4903-4172

Sincerely,
Santiago Saavedra
Assistant Professor
CC xxxxxx

C.7 Municipality Survey

A. OPERATIONAL CONTROL									
1.	Include unique call ID: _____								
2.	Select enumerators name: _____								
3.	Date: _____ Day _____ Month _____ Year _____								
4.	Start time: _____ Hour _____ Minute _____ A.M. _____ P.M. _____								
5.	Interview style: _____ Phone _____ In-person _____								
B. MUNICIPALITY DATA									
1.	1. ☐ Antioquia 2. ☐ Arauca 3. ☐ Atlántico 4. ☐ Bolívar 5. ☐ Boyacá 6. ☐ Caldas 7. ☐ Caquetá 8. ☐ Casanare 9. ☐ Cauca 10. ☐ Cesar 11. ☐ Chocó 12. ☐ Córdoba 13. ☐ Cundinamarca 14. ☐ Huila 15. ☐ La Guajira 16. ☐ Magdalena 17. ☐ Meta 18. ☐ Nariño 19. ☐ San Andrés y provid 20. ☐ N. de Santander 21. ☐ Putumayo 22. ☐ Quindío 23. ☐ Risaralda 24. ☐ Santander 25. ☐ Tolima 26. ☐ Valle 27. ☐ Amazonas 28. ☐ Guainía 29. ☐ Guaviare 30. ☐ Sucre 31. ☐ Vaupés 32. ☐ Vichada								
2.	Municipality (appears a drop down list given the chosen department) _____								
3.	Is the mayor of the municipality Mr./Mrs. _____ ? 1. ☐ Yes → Go to C 2. ☐ No								
4.	What is the name of the mayor? _____								
5.	What is the surname of the mayor? _____								
C. PREGUNTAS DEL ENTREVISTADO									
1.	What is your name? _____								
2.	What is your current position? 1. ☐ Mayor → Go to 3 2. ☐ Secretary of Mines → Go to 3 3. ☐ Secretary of Environment → Go to 3 4. ☐ Secretary of the UMATA → Go to 3 5. ☐ Other								
2.1.	What is your position? _____								
3.	Since what date (month and year) do you serve in this position? _____ Month _____ Year _____								
4.	Since what date (month and year) do you work in this entity? _____ Month _____ Year _____								
5.	In which other entities have you worked in the last 5 years? _____								
D. MUNICIPALITY MINING INFORMATION									
1.	Does the municipality have a Health Department or equivalent? 1. ☐ Yes, is called Health Division 2. ☐ Yes, is called _____ 3. ☐ No								
2.	Does the municipality have a Mining Division or equivalent? 1. ☐ Yes, is called Mining Division 2. ☐ Yes, is called _____ 3. ☐ No								
3.	Does the municipality have an Environment Division or equivalent? 1. ☐ Yes, is called Environment Division 2. ☐ Yes, is called _____ 3. ☐ No								
4.	Is mining in the Territorial Management Scheme or Plan of the municipality? 1. ☐ Yes 2. ☐ No								
5.	Is mining performed within the boundaries of the municipality? 1. ☐ Yes 2. ☐ No → Go to E								
5.1	How many exploitations / mines are there in the municipality? _____								
6.1	How many carbon exploitations / mines are there in the municipality? _____								
6.2	How many precious metals exploitations / mines are there in the municipality (gold, silver, platinum)? _____								
6.3	How many construction material exploitations / mines are there in the municipality (sands, soil)? _____								
6.4	How many precious stones exploitations / mines are there in the municipality (emeralds, sapphire, ruby)? _____								
6.5	How many rare mineral exploitations / mines are there in the municipality (tantalum, coltan)? _____								
6.6	Are there any other sort of exploitations / mines in the municipality? 1. ☐ Yes 2. ☐ No → Go to E								
6.7	Which? 1. _____ 2. _____ 3. _____ 4. _____								
6.8	How many exploitations/mines are there of each one? 1. _____ 2. _____ 3. _____ 4. _____								
E. OPERATION OF THE MAYORS OFFICE									
1.	Through which communication channels does the Office of the Mayor receive claims or reports? a. ☐ Website → Go to 3 b. ☐ E-mail → Go to 3 c. ☐ Mail → Go to 3 d. ☐ Phone → Go to 3 e. ☐ In-person → Go to 3 f. ☐ Application (App) → Go to 3 g. ☐ Other								
2.	Which? _____								
3.	Have the channel (options selected in 1 and 2) worked normally during the emergency for COVID-19? a. Website 1. ☐ Yes 2. ☐ No b. E-mail 1. ☐ Yes 2. ☐ No c. Mail 1. ☐ Yes 2. ☐ No d. Phone 1. ☐ Yes 2. ☐ No e. In-person 1. ☐ Yes 2. ☐ No f. Application (App) 1. ☐ Yes 2. ☐ No g. Other mentioned in 1.1 1. ☐ Yes 2. ☐ No								
4.	Answers to claims have been delayed due to COVID-19? 1. ☐ Yes 2. ☐ No								
5.	Did the municipality realigned budget lines to respond to the emergency of COVID – 19? 1. ☐ Yes 2. ☐ No								
6.	Were the physical and/or financial resources meant for surveillance and monitoring of mining activities, affected due to the COVID-19 emergency? 1. ☐ Yes 2. ☐ No → Go to 8								
7.	How were these resources affected? _____								
8.	Through which communication channels does the municipality receive claims regarding illegal mining? a. ☐ Website → Go to 7.1 b. ☐ E-mail → Go to 7.1 c. ☐ Mail → Go to 7.1 d. ☐ Phone → Go to 7.1 e. ☐ In-person → Go to 7.1 f. ☐ Application (App) → Go to 7.1 g. ☐ Never received → Go to 7.1 h. ☐ Other								
9.	Which? _____								
10.1	Claims regarding illegal mining are transfer to who, or who would they be transferred to in case the municipality have never received? 1. ☐ Mayor → Go to 10.3 2. ☐ Secretary of Mines → Go to 10.3 3. ☐ Regional autonomous corporation → Go to 10.3 4. ☐ Police → Go to 10.3 5. ☐ Prosecutor Office → Go to 10.3 6. ☐ Other								
10.2	Who? _____								
10.3	Do you know what is the "SI MINERO"? 1. ☐ Si 2. ☐ No → Go to 7.1								

10.4	Through which communication channels are the "SIMINERO" claims, received?	a. ☐ Website → Go to 7.1 d. ☐ Phone → Go to 7.1 g. ☐ Other	b. ☐ E-mail → Go to 7.1 e. ☐ In-person → Go to 7.1	c. ☐ Mail → Go to 7.1 f. ☐ Application (App) → Go to 7.1	
10.5	Which?	[] [] [] [] [] [] [] [] [] []			
7.1	Have the municipality received reports of illegal mines presence in the last 12 months?	1. ☐ Yes 2. ☐ No → Go to 10			
7.2	How many reports have been made after X date?	[]			
8.	Out of the received reports, how were they received?	a. ☐ Anonimously by phone → Go to 10 e. ☐ In-person → Go to 10	b. ☐ Anonimously by e-mail → Go to 10 f. ☐ Signed requirement → Go to 10	c. ☐ Anonimously by mail → Go to 10 g. ☐ Otro	
9	In which other way(s) was it reported?	[] [] [] [] [] [] [] [] [] []			
10.	Out of these received reports, how did the person who did the report found out about illegal mines?	a. ☐ In site visit → Go to 15 c. ☐ is receiving polluted water → Go to 15 e. ☐ Machine learning → Go to 15	b. ☐ Someone told the person → Go to 15 d. ☐ Satellite images → Go to 15 f. ☐ Did not specify → Go to 15	g. ☐ Other	
11.	How?	[] [] [] [] [] [] [] [] [] []			
15.	Through which communication channel do national authorities transfer claims regarding illegal mining to the municipality?	a. ☐ Website → Go to 17 d. ☐ Phone → Go to 17 g. ☐ Other	b. ☐ E-mail → Go to 17 e. ☐ In-person → Go to 17	c. ☐ Mail → Go to 17 f. ☐ Application (App) → Go to 17	
16.	Which?	[] [] [] [] [] [] [] [] [] []			
17.	Does the municipality count on tools to monitor and follow claims or interventions regarding illegal mines?	1. ☐ Si 2. ☐ No → Go to 19			
18.	On which tool(s) the municipality count on?	1. [] [] [] [] [] [] [] [] [] [] 2. [] [] [] [] [] [] [] [] [] [] 3. [] [] [] [] [] [] [] [] [] []			
19.	Does the Office of the Mayor patrol municipality areas where mining is performed?	1. ☐ Yes 2. ☐ No → Go to F			
20.	In which areas are the mining surveillance rounds performed?	a. Where there are mining titles 1. ☐ Yes 2. ☐ No c. In all territory 1. ☐ Yes 2. ☐ No	b. Where legal mining without title is performed 1. ☐ Yes 2. ☐ No d. Where illegal mining is taking place 1. ☐ Yes 2. ☐ No		
21.	How many days per month are these rounds performed?	[] [] [] [] [] [] [] [] [] []			
22.	Which means of transportation are used to perform these rounds?	a. ☐ Car → Go to 24 d. ☐ Motorcycle → Go to 24 g. ☐ Other	b. ☐ Boat → Go to 24 e. ☐ Horse → Go to 24	c. ☐ Helicopter → Go to 24 f. ☐ Bicycle → Go to 24	
23.	Which?	[] [] [] [] [] [] [] [] [] []			
24.	How many of each mean of transportation (a,b,c,d,e,f,g) are used to perform the rounds?	a. Car [] [] [] [] [] [] [] [] [] [] e. Horse [] [] [] [] [] [] [] [] [] []	b. Boat [] [] [] [] [] [] [] [] [] [] f. Bicycle [] [] [] [] [] [] [] [] [] []	c. Helicopter [] [] [] [] [] [] [] [] [] [] g. Other mentioned in 23 [] [] [] [] [] [] [] [] [] []	d. Moto [] [] [] [] [] [] [] [] [] []
25.	How much does a round in the transportation means mentioned in 22 and 23 cost?	a. Car \$ [] [] [] [] [] [] [] [] [] [] e. Horse \$ [] [] [] [] [] [] [] [] [] []	b. Boat \$ [] [] [] [] [] [] [] [] [] [] f. Bicycle \$ [] [] [] [] [] [] [] [] [] []	c. Helicopter \$ [] [] [] [] [] [] [] [] [] [] g. Other mentioned in 23 \$ [] [] [] [] [] [] [] [] [] []	d. Moto \$ [] [] [] [] [] [] [] [] [] []
26.	Has the frequency of the rounds been affected by COVID-19?	1. ☐ Yes 2. ☐ No → Go to 28			
27.	In which way?	a. Authorities are busy 1. ☐ Yes 2. ☐ No → Go to 29 c. Authorities got sick 1. ☐ Yes 2. ☐ No → Go to 29 e. Other	b. There are no available fiscal and / or financial resources 1. ☐ Yes 2. ☐ No → Go to 29 d. Mines are nt working 1. ☐ Yes 2. ☐ No → Go to 29		
28.	In which other way?	[] [] [] [] [] [] [] [] [] []			
29.	Does the municipality has an established anual budget to make these rounds or surveillance in mining areas?	1. ☐ Yes 2. ☐ No → Go to F			
30.	How much is this budget?	\$ [] [] [] [] [] [] [] [] [] [] COP			
F. LEGAL AND ELLEGAL MINING IN THE MUNICIPALITY					
7.1	In the municipality are there mines legally supported by mining titles?	1. ☐ Yes 2. ☐ No → Go to 7.3			
7.2	How many mines operate under this legal scheme?	[] [] [] [] [] [] [] [] [] []			
7.3	In the municipality are there mines legally supported by special reserve areas?	1. ☐ Yes 2. ☐ No → Go to 7.5			
7.4	How many mines operate under this legal scheme?	[] [] [] [] [] [] [] [] [] []			
7.5	In the municipality are there mines legally supported by ongoing formalization requests?	1. ☐ Yes 2. ☐ No → Go to 7.7			
7.6	How many mines operate under this legal scheme?	[] [] [] [] [] [] [] [] [] []			
7.7	In the municipality are there mines legally supported by formalization subcontracts?	1. ☐ Yes 2. ☐ No → Go to 7.9			
7.8	How many mines operate under this legal scheme?	[] [] [] [] [] [] [] [] [] []			
7.9	In the municipality is barequeo performed?	1. ☐ Yes 2. ☐ No → Go to 7.11			
7.10	How many barequeros are there in the municipality?	[] [] [] [] [] [] [] [] [] []			
7.11	In the municipality are there scrap dealers or selectors ?	1. ☐ Yes 2. ☐ No → Go to 8			
7.12	How many scrap dealers or selectors are there in the municipality?	[] [] [] [] [] [] [] [] [] []			
8.	How many mining processing facilities are authorized in the municipality?	[] [] [] [] [] [] [] [] [] []			
9.	How many mineral sellers are authorized in the municipality?	[] [] [] [] [] [] [] [] [] []			
10.	Do you know what the RUCOM (unique registrar of mineral sellers) is?	1. ☐ Yes 2. ☐ No → Go to 13			
11.	Does the municipality use this tool permanently?	1. ☐ Yes 2. ☐ No			
12.	Does the municipality use the RUCOM to control the production of subsistence miners that have established quotas?	1. ☐ Yes 2. ☐ No			
13.	Do you know which Regional Service Office of the National Mining Agency serves this municipality?	1. ☐ Yes 2. ☐ No → Go to 15			
14.	What is the Regional Service Office of the National Mining Agency that serves this municipality?	1. ☐ Bogotá 2. ☐ Cali 3. ☐ Bucaramanga	4. ☐ Cúcuta 5. ☐ Cartagena 6. ☐ Manizales	7. ☐ Medellín 8. ☐ Ibagué 9. ☐ Valledupar	
		10. ☐ Nobsa 11. ☐ Pasto 12. ☐ Quibdó			
15.	Does the municipality receive direct assignments from the National Royalty System?	1. ☐ Yes 2. ☐ No → Go to 18			
16.	What percentage of the 2020 budget comes from those direct assignments?	[] %			

17.	What is the <i>regional autonomous corporation</i> that rules over the municipality?	1. ☐	Corporación Autónoma Regional para la Defensa de la Meseta de Bucaramanga – CDMB	10. ☐	Corporación Autónoma Regional de los Valles del Sinú y del San Jorge – CVS	19. ☐	Corporación Autónoma Regional del Cauca – CRC	28. ☐	Corporación Autónoma Regional para el Desarrollo Sostenible del Chocó – CODECHOCÓ
		2. ☐	Corporación Autónoma Regional de Boyacá – CORPOBOYACÁ	11. ☐	Corporación Autónoma Regional de Nariño – CORPONARIÑO	20. ☐	Corporación Autónoma Regional del Centro de Antioquia – CORANTIOQUIA	29. ☐	Corporación para el Desarrollo Sostenible del Norte y el Oriente Amazónico – CDA.
		3. ☐	Corporación Autónoma Regional de Caldas – CORPOCALDAS	12. ☐	Corporación Autónoma Regional de Risaralda – CARDER	21. ☐	Corporación Autónoma Regional del Cesar – CORPOCESAR	30. ☐	Corporación para el Desarrollo Sostenible de La Mojana y El San Jorge – CORPOMOJANA
		4. ☐	Corporación Autónoma Regional de Chivor – CORPOCHIVOR	13. ☐	Corporación Autónoma Regional de Santander – CAS.	22. ☐	Corporación Autónoma Regional del Guavió – CORPOGUAVIO	31. ☐	Corporación para el Desarrollo Sostenible del Archipiélago de San Andrés, Providencia y Santa Catalina – CORALINA
		5. ☐	Corporación Autónoma Regional de Cundinamarca – CAR.	14. ☐	Corporación Autónoma Regional de Sucre – CARSUCRE	23. ☐	Corporación para el Desarrollo Sostenible del Urabá – CORPOURABA	32. ☐	Corporación para el Desarrollo Sostenible del Área de Manejo Especial de La Macarena – CORMACARENA
		6. ☐	Corporación Autónoma Regional de la Frontera Nororiental – CORPONOR	15. ☐	Corporación Autónoma Regional del Magdalena – CORPAMAG	24. ☐	Corporación Autónoma Regional del Quindío – CRQ	33. ☐	Corporación para el Desarrollo Sostenible del Sur de la Amazonia – CORPOAMAZONIA
		7. ☐	Corporación Autónoma Regional de La Guajira – CORPOGUAJIRA	16. ☐	Corporación Autónoma Regional del Alto Magdalena – CAM	25. ☐	Corporación Autónoma Regional del Sur de Bolívar – CSB		
		8. ☐	Corporación Autónoma Regional de la Orinoquia – CORPORINOQUIA	17. ☐	Corporación Autónoma Regional del Atlántico – CRA	26. ☐	Corporación Autónoma Regional del Tolima – CORTOLIMA		
		9. ☐	Corporación Autónoma Regional de las Cuencas de los Ríos Negro y Nare – CORNARE	18. ☐	Corporación Autónoma Regional del Canal del Dique – CARDIQUE	27. ☐	Corporación Autónoma Regional del Valle del Cauca – CVC		
1.	How many exploitations/mines that are not covered under any of the legal categories have the municipality identified?						→ If 0 go to 4		
2.1	How many carbon exploitations / mines, that are not covered under any of the legal categories, are there in the								
2.2	How many precious metals exploitations / mines, that are not covered under any of the legal categories, are there in the								
2.3	How many construction material exploitations / mines, that are not covered under any of the legal categories, are there in the								
2.4	How many precious stones exploitations / mines, that are not covered under any of the legal categories, are there in the								
2.5	How many rare mineral exploitations / mines, that are not covered under any of the legal categories, are there in the								

2.6	Are there any other sort of exploitations / mines, that are not covered under any of the legal categor 1. ☐ Yes 2. ☐ No → Go to 4	
2.7	Which? 1. 2. 3. 4.	
2.8	How many explotations/mines are there of each one? 1. 2. 3. 4.	
4.	Has the municipality reported the presence of an illegal mine to the competent authorities in the last 12 months? 1. ☐ Yes 2. ☐ No → Go to 12	
5.	To whom has the municipality made the report? a. ☐ National Guard → Go to 12 b. ☐ National Police → Go to 12 c. ☐ Mining Authority → Go to 12 e. ☐ Environmental Authority → Go to 12 f. ☐ National Prosecutor → Go to 12 g. ☐ Other	
6.	To who?	
12.	Did the municipality received from the previous administration a register of mining related reports? 1. ☐ Yes 2. ☐ No	
13.1	How many adminstraive cases of sanctions due to illegal mining has the municipality handle in 2020 under Law 685 of 2001?	
13.2	How many adminstraive cases of sanctions due to illegal mining has the environmental authority handle in 2020 under law 1333 of 2009?	
14.	In 2019 were illegal mines closed in the municipality? 1. ☐ Yes 2. ☐ No → Go to 16	
15.	How many illegal mines were closed in 2019?	
16.	In 2020 have there been illegal mine closures? 1. ☐ Yes 2. ☐ No → Go to 18	
17.	How many illegal mines have been closed in 2020?	
18.	Do you consider unemployment increases when illegal mines are closed? 1. ☐ Yes 2. ☐ No	
19.	What do people who work at those closed illegal mines usually do? a. ☐ Search for another formal occupation → Go to 21 b. ☐ They wait without income until the situation of the mine is settled → Go to 21 c. ☐ Search for another informal occupation → Go to 21 d. ☐ They go to work to another municipality → Go to 21 e. ☐ They go back to work in the mine → Go to 21 f. ☐ Other	
20.	What?	
21.	Do you perform follow up visits to closed mines? 1. ☐ Yes 2. ☐ No → Go to 24	
22.	On average how many visits are made to closed mines in a year lapse?	
23.	How many follow up visits have been made in 2020?	
24.	Have there been people caught by the police for illegal mining in the municipality in 2020? 1. ☐ Yes 2. ☐ No → Go to 26	
25.	How many?	
26.	How does the municipality follow up the decisions taken by the Prosecutors Office related to mining? a. ☐ There is no follow up → Go to 28 b. ☐ Requests are sent or done → Go to 28 c. ☐ Await for notifications → Go to 28 d. ☐ Other	
27.	In which other way?	
28.	Does the municipality have established protocols to coordinately intervene places with other authorities where mining is performed? 1. ☐ Yes 2. ☐ No → Go to 30	
29.	What protocols does the municipality have?	
30.	How many investigations regarding illegal mining have been done only in alliance with environmental authority in 2020?	
31.	How many investigations regarding illegal mining have been done only in alliance with the Mining Authority in 2020?	
32.	How many investigations regarding illegal mining have been done only in alliance with the police in 2020?	
33.	How many investigations regarding illegal mining have been done in alliance with more than one authority in 2020?	
1.	Would the Mayor's Office of this municipality, be interested in using a precise virtual and innovative tool for free that allows to detect and monitor mines within their territory? 1. ☐ Yes 2. ☐ No	
2.	Would the Mayor's Office of this municipality be interested in attending a course in the second semester of 2020 (or when COVID-19 situation allows for it) in Bogota, where the virtual mining detection tool will be introduced? 1. ☐ Yes 2. ☐ No	
G. DEFORESTATION		
1.	How many hectares have been deforested in the municipality in 2020? 3. ☐ Don't know	
2.	How does the municipality receive deforestation alerts? a. ☐ Early alerts of IDEAM → Go to 4 b. ☐ Global Forest Watch (FGW) → Ir a 4 c. ☐ Citizen reporting → Go to 4 d. ☐ Other national authorities reporting → Ir a 4 e. ☐ Other	
3.	How?	
4.	How many people have been caught by the police in 2020 due to illegal deforestation?	
H. FIRES		
1.	How many hectares of forest have been burn by fires in the municipality in 2020? 3. ☐ Don't know	
2.	How does the municipality receive fire alerts? a. ☐ Early alerts of IDEAM → Go to 4 b. ☐ Global Forest Watch (FGW) → Ir a 4 c. ☐ Citizen reporting → Go to 4 d. ☐ Other national authorities reporting → Ir a 4 e. ☐ Other	
3.	How?	
4.	How many people have been caught by the police in 2020 for causing intended fires in forests?	
5.	Does the municipality have a Fire Department? 1. ☐ Yes → Go to 6 2. ☐ No	
6.	Where is it located the closest Fire Department? → Go to J	
7.	What is the anual budget of the Fire Department? COP \$	
8.	In what year was the Fire Department established? YYYY	
I. PRESENCE OF ARMED GROUPS		
1.	Does the ELN have presence in the municipality? 1. ☐ Yes 2. ☐ No → Go to 3	

2.	Does the ELN perform mining activities in the municipality?	1.	☐ Yes	2.	☐ No	3.	☐ Don't know
3.	Does the FARC dissents have presence in the municipality?	1.	☐ Yes	2.	☐ No → Go to 5		
4.	Does FARC dissents perform mining activities in the municipality?	1.	☐ Yes	2.	☐ No	3.	☐ Don't know
5.	Does the Clan del Golfo (Autodefensas Gaitanistas de Colombia) have presence in the municipality?	1.	☐ Yes	2.	☐ No → Go to 7		
6.	Does Clan del Golfo (Autodefensas Gaitanistas de Colombia) perform mining activities in the municipality?	1.	☐ Yes	2.	☐ No	3.	☐ Don't know
7.	Does Los Caparros have presence in the municipality?	1.	☐ Yes	2.	☐ No → Go to 9		
8.	Does Los Caparros perform mining activities in the municipality?	1.	☐ Yes	2.	☐ No	3.	☐ Don't know
9.	Is there presence of other armed groups in the municipality?	1.	☐ Yes	2.	☐ No → Go to H		
10.	Which ones?	☐ ☐ ☐ ☐ ☐					
11.	Does armed group (answers in 10) perform mining activities in the municipality?	1.	☐ Yes	2.	☐ No	3.	☐ Don't know

J. MUNICIPALITY'S PERSPECTIVE							
**Answers to these questions must reflect the municipality perception and not personal point of views							
1.	What are the three main concerns of the Mayors Office about this municipality? Name them according to their relevance (1 the most relevant, 3 the least relevant)	a.	☐ Financial resources → Go to 3	b.	☐ Health → Go to 3	c.	☐ Security → Go to 3
		d.	☐ Education → Go to 3	e.	☐ Natural environment → Go to 3		
		f.	☐ Political Instability → Go to 3	g.	☐ Corruption → Go to 3	h.	☐ Mining → Go to 3
						i.	☐ Other
2.	Which other concern or concerns?	☐ ☐ ☐ ☐ ☐					
3.	What are the three main concerns voters have in this municipality? Name them according to their relevance (1 the most relevant, 3 the least relevant)	a.	☐ Financial resources → Go to 5	b.	☐ Health → Go to 5	c.	☐ Security → Go to 5
		d.	☐ Education → Go to 5	e.	☐ Natural environment → Go to 5		
		f.	☐ Political Instability → Go to 5	g.	☐ Corruption → Go to 5	h.	☐ Mining → Go to 5
						i.	☐ Other
4.	Which other concern or concerns?	☐ ☐ ☐ ☐ ☐					
5.	What percentage of the inhabitants within this municipality do you believe agree with mining that complies with all the requirements?	☐ ☐ ☐ ☐ %					
6.	What percentage of the inhabitants within this municipality do you believe agree with mining that does not comply with the necessary paperwork?	☐ ☐ ☐ ☐ %					
7.	What percentage of the inhabitants within this municipality do you believe perform mining activities because they are in need?	☐ ☐ ☐ ☐ %					

References

Saavedra, S., & Romero, M. (2021). Local incentives and national tax evasion: The response of illegal mining to a tax reform in Colombia. *European Economic Review*, 138, 103843. [12](#), [23](#)

Table 8: Determinants of response

Dependent variable:	Verified=1				
	(1)	(2)	(3)	(4)	(5)
Panel A: Logit model					
Share illegal	-0.34 (0.47)				-0.054 (0.49)
Model accuracy		0.66** (0.29)			0.70** (0.30)
Distance (Km)			-0.045*** (0.013)		-0.042*** (0.014)
Armed Group				-0.50** (0.25)	-0.14 (0.29)
N. of obs.	400	389	400	400	389
Mean of Dep. Var.	0.41	0.41	0.41	0.41	0.41
Panel B: Probit model					
Share illegal	-0.22 (0.29)				-0.048 (0.30)
Model accuracy		0.41** (0.18)			0.43** (0.18)
Distance (Km)			-0.026*** (0.0073)		-0.024*** (0.0080)
Armed Group				-0.31** (0.15)	-0.097 (0.18)
N. of obs.	400	389	400	400	389
Mean of Dep. Var.	0.41	0.41	0.41	0.41	0.41

Notes: Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 9: Tabulation of local authority responses and predictions accuracy

(a) All the responses			
	Mine NO	Mine YES	Total
Local NO	369	263	632
Local YES	9	111	120
Total	378	374	752

(b) Only responses inside legal titles			
	Mine NO	Mine YES	Total
Local NO	28	44	72
Local YES	1	31	32
Total	29	75	104

(c) Only responses outside legal titles			
	Mine NO	Mine YES	Total
Local NO	341	219	560
Local YES	8	80	88
Total	349	299	648

Notes: Panel A includes all the points for which we obtained local authorities responses and high resolution verification. Panel B has only the responses to disclosed points inside legal titles and Panel C points outside legal titles. Each panel presents the tabulation of local government responses (Local NO/ Local YES) against the high resolution verification (Mine NO / Mine YES), what I consider the “truth”. The implied precision of the model according to Panel A (49.7%) is different from the precision reported in (Saavedra & Romero, 2021) of 79% for three reasons: (i) the sample of Panel A gives equal weight to each municipality, while in reality (and in the testing sample of (Saavedra & Romero, 2021)) mining is concentrated in certain municipalities (ii) Panel A sample is restricted to municipalities that responded (iii) the (Saavedra & Romero, 2021) model was trained and evaluated in 2010 imagery and the disclosed predictions are from 2017.

Table 10: Effects of the intervention on other outcomes with all municipalities

Dependent variable:	Defo rate (1)	Poverty (2)	Child Labor (3)
Local only X After	-0.027 (0.021)	-1.23 (1.29)	0.18 (0.16)
National only X After	-0.038* (0.021)	-2.21* (1.27)	-0.17 (0.14)
Both X After	-0.0098 (0.023)	-0.70 (1.30)	0.029 (0.14)
Mean Dep. Var. Before	0.19	58.88	3.21
Obs.	6736	842	842
N. Munis	842	842	842
R ²	0.77	0.32	0.28

Notes: An observation is a municipality-year. Column (1) is deforestation rate computed as deforested area divided by municipality area. Columns (2) and (3) are poverty and child labor in terms of percentage of population. Clustered standard errors at the municipality level in parentheses. Significance level: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 11: Local responses to the information letters (2019-2021)

	2019		2021	
	Frequency	%	Frequency	%
Verified	75	18.75	113	28.25
Lack resources	17	4.25	36	9.00
Fear armed groups	2	0.50	1	0.25
Other response	6	1.50	11	2.75
No response	300	75.00	239	59.75
Total	400	100.00	400	100.00

Notes: I classify the response of the local authorities into five categories: (1) Verified: if the authority answered whether there was mining or not on the disclosed coordinates; (2) Doesn't have resources: if the authority answered that they could not visit the coordinates because they did not have money or personnel to reach the disclosed locations; (3) Fear of armed groups: if they expressed concern on visiting the coordinates because of armed groups presence there; (4) Other response: if the response included a different answer to the ones above (5) No response: if after six months I did not receive a response.

Table 1: Confusion matrix for the model currently in CoMiMo

	Non-Mined	Mined
Predicted Non-Mined	1647	923
Predicted Mined	14	134

Notes: The confusion matrix presents the accuracy of the prediction model in classifying mined images using the optimal threshold. The columns show the actual mined status of the images according to the validation data, while the rows show what the model predicts. The precision is 90.54%.