High Resolution Satellite Imagery Reveals Petroamazonas Violated Environmental Impact Study by Building Road into Yasuní National Park

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Abstract

Petroamazonas inherited Block 31 – located in the core of the megadiverse Yasuní National Park – in 2009, along with an already approved Environmental Impact Study (EIS) and Environmental License. This EIS was noteworthy because it was the product of several years of intense debate between scientists, environmentalists, and government officials regarding development in Yasuní. It represented a cutting-edge development design that did not include destructive new access roads. Here we demonstrate, however, that three years later Petroamazonas violated the EIS by building a new access road into the core of the park.

We analyzed very high resolution (0.5 m) satellite imagery from September 2013 and confirmed the following violations: 1) Petroamazonas is using the flowline corridor as an access road, evidenced by numerous vehicles and permanent waterway crossing structures such as bridges and culverts, 2) the average right-of-way for the flowline corridor is 26 m, which is 2.5 times greater than what was approved in the EIS, 3) less than 6% of the access route within the park is less than 15 m wide, the maximum width allowed in the EIS, and 4) Inside the park, the total deforestation is 63.64 ha, 34.4 % greater than the 47.33 ha authorized by the logging licence.

This issue of building new access roads and violating terms of the EIS and Environmental License is critically important at the moment because Petroamazonas just received these same approvals to begin work in the adjacent ITT Block. Without improved oversight, Petroamazonas will likely continue building new access roads deeper into the core of Yasuni National Park in both Blocks 31 and 43 (ITT).

Introduction

The Ecuadorian state oil company Petroamazonas operates a number of oil concessions in the Ecuadorian Amazon, including the controversial Block 31 located in the core of the megadiverse Yasuní National Park (Figure 1). Petroamazonas inherited Block 31 in 2009 after the concession was returned to Ecuador by the Brazilian state company Petrobras. Prior to returning the block, Petrobras received development approval from the Ecuadorian government in 2007 based on a cutting-edge, roadless, helicopter-enabled design. Here, we demonstrate with high resolution satellite imagery that, five years later, Petroamazonas violated these approved plans and instead built a network of business-as-usual, high-impact access roads within and around Yasuní National Park.

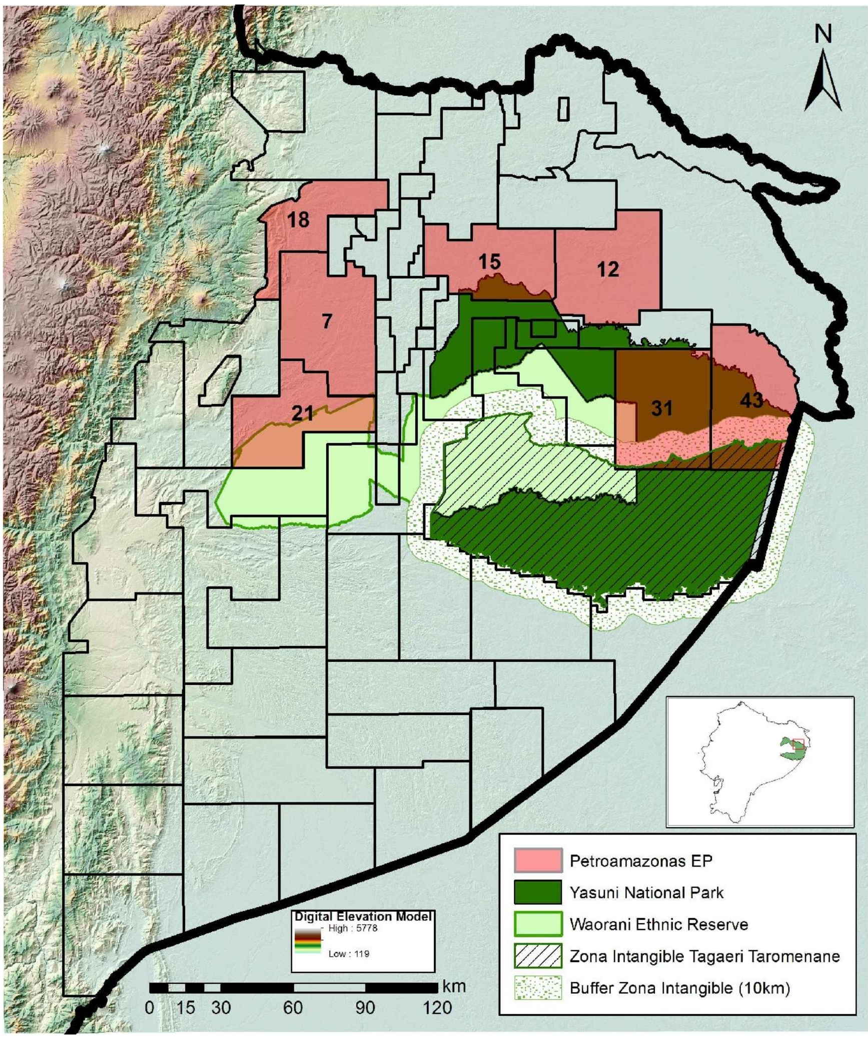


Figure 1. Oil blocks of the Ecuadorian Amazon.

The centerpiece of hydrocarbon best practice is no new access roads[1], particularly in areas dominated by primary forest. Roads are well documented to be a leading driver of tropical deforestation as they not only cause direct forest loss, but also may trigger uncontrollable and irreversible indirect impacts associated with subsequent colonization. In some extremely remote areas, like Yasuní, oil access roads and associated infrastructure may also threaten the integrity and remoteness of territories of uncontacted indigenous people living in isolation[2].

In 2012, Petroamazonas built a 20.4 km flowline route into Yasuní National Park to connect the Nenke and Apaika drilling platforms (within the park) to the processing facility (just north of the park boundary) (Figure 2). Subsequently, in 2013, Petroamazonas built a 22.2 km pipeline route north of the park boundary to connect the processing facility to the existing outgoing pipeline in Block 12 (Figure 2).

The basis of both flowline and pipeline projects is an Environmental Impact Study (EIS) prepared by Petrobras in September 2006 and an Environmental License granted by the Ecuadorian Environment

Ministry in October 2007. Overall, the EIS emphasized that an access road would not be built within Yasuní National Park. Instead, all construction and operation phase transport of machinery, pipes, and personnel, between the processing facility and drilling platforms would be via helicopters or low-impact machinery. The EIS also indicated that no permanent bridges would be built; the only mention of bridges in the EIS is that they would be temporary, wooden structures removed after construction phase.

The 2006 EIS presented four construction options, largely based on the width of the right-of-way (ROW), for the flowline and pipeline routes. The EIS concluded that the traditional construction method (ROW > 15 m) was the most destructive alternative, while the reduced ROW method (10 m) was the least destructive and most viable option. The EIS selected the reduced ROW (10 m) construction model as the chosen alternative, although it did allow for 15 m in areas with flooded or irregular terrain.

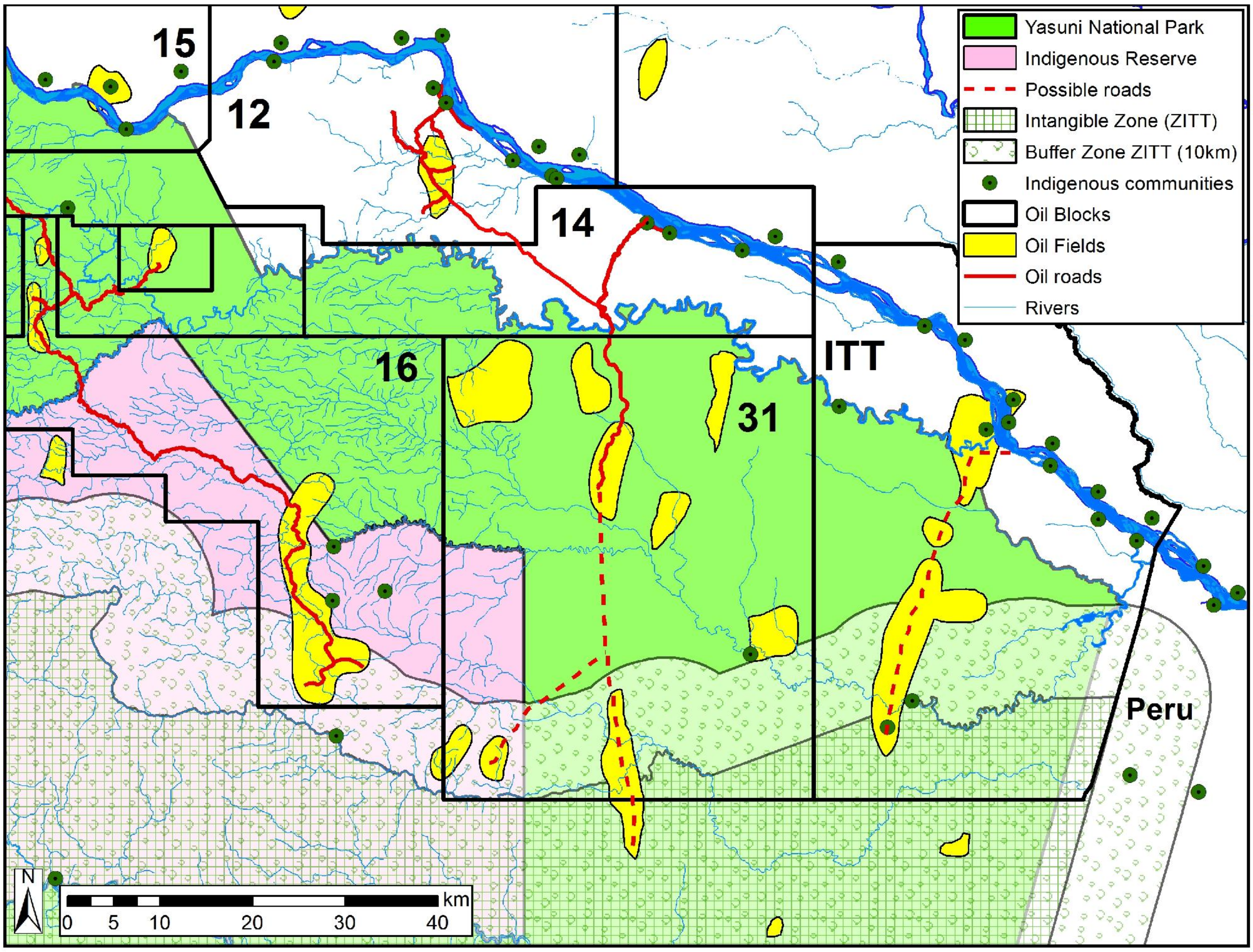


Figure 2. New and planned access routes within and around Yasuní National Park for development of Blocks 31 and 43 (ITT).

In 2007, the Environment Ministry issued the critical environmental license to Petrobras to operate within the national park. This license stipulated that the company must fully comply with the EIS. In

2009, this license was transferred to Petroamazonas following the departure of Petrobras. In 2012, the Environment Ministry issued the logging license for the project, authorizing the total deforestation of only 94.5 ha for the ROW, drilling platforms, and processing facility.

Thus, the EIS presented by Petrobras in 2006 and approved the Ecuadorian government in 2007 represents technical best practice in terms of developing hydrocarbon reserves without building access roads and minimizing project-related direct and indirect deforestation. Evidence has recently emerged, however, suggesting that Petroamazonas deviated from this planned technical best practice and instead continued with the business-as-usual practice of building traditional access roads in 2012 and 2013. Recent aerial photos and satellite images indicate that the new flowline/pipeline corridors have a wide ROW[3].

In recent testimony and documents directed at the Ecuadorian Congress, officials, including the head of Petroamazonas, denied that they are building roads, but instead referred to the new access routes as "ecological trails"[3]. This issue of "road vs ecological trail" is a critically important distinction at the moment because Petroamazonas is now planning to expand production activities much deeper into Yasuní National Park to drill the southern section of Block 31 and the adjacent ITT Block (Figure 2).

In this study, we analyze high resolution (0.5 m) Worldview-2 satellite images from September 2013 to document whether Petroamazonas is implementing the approved roadless design, or instead operating business-as-usual with destructive access roads. Specifically, we aimed to answer the following two key questions:

1) Is Petroamazonas building new access roads within and around Yasuní National Park?

2) Did Petroamazonas violate the terms of the EIS and environmental and logging licenses?

For the first question, we analyzed the satellite imagery for indicators that the access routes are roads or trails. We defined roads as being characterized by drivable surfaces, permanent water body crossing structures designed for vehicles, and signs of actual vehicle traffic. We defined trails as being characterized by non-drivable surfaces, water body crossings not designed for vehicles, and no signs of actual vehicle traffic.

For the second question, two independent analysts took over 2,300 detailed measurements every 10 m along both routes to generate a robust estimate of the average ROW. We also calculated the total new deforestation along the ROW, drilling platforms, and processing facility. See Methods section at the end of the text for more details.

Results and Discussion

Is Petroamazonas building new access roads within and around Yasuní National Park?

Figure 3 illustrates the study area within and around Yasuní National Park analyzed with high resolution satellite imagery and the locations of items highlighted in Figures 4 - 14.

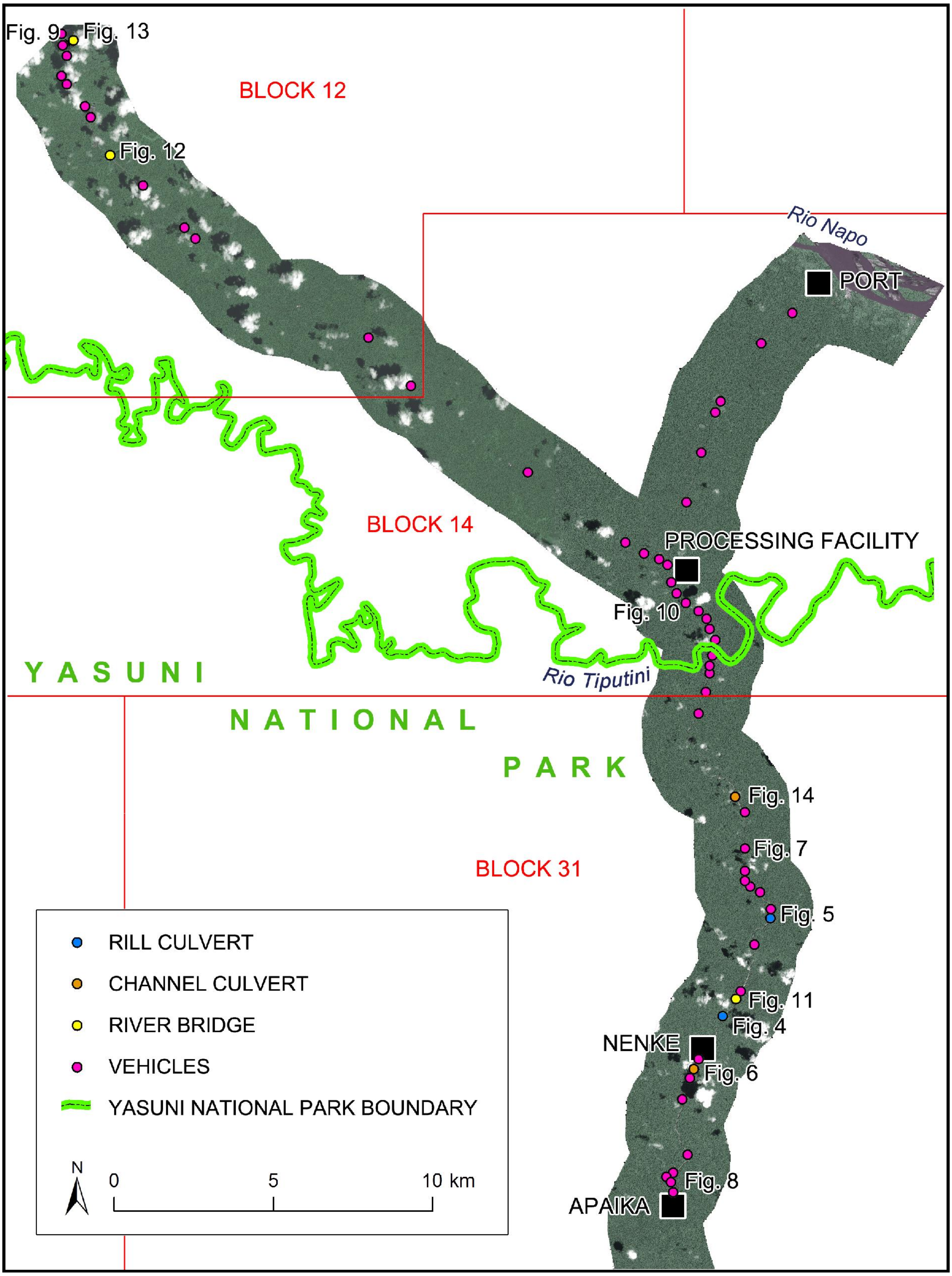


Figure 3. Study area of both access routes within and around Yasuní National Park.

The route surface within the park clearly appears to be drivable and road-like and not in an active state of closure (Figure 4). In fact, we documented at least 22 vehicles all along the route surface within the park (Figures 3, 5, 6, 7 and 8). We documented at least nine additional vehicles along the route outside of the park, including a large truck and traffic moving in both directions (Figures 9 and 10).

Figure 4. Route surface within Yasuní National Park.

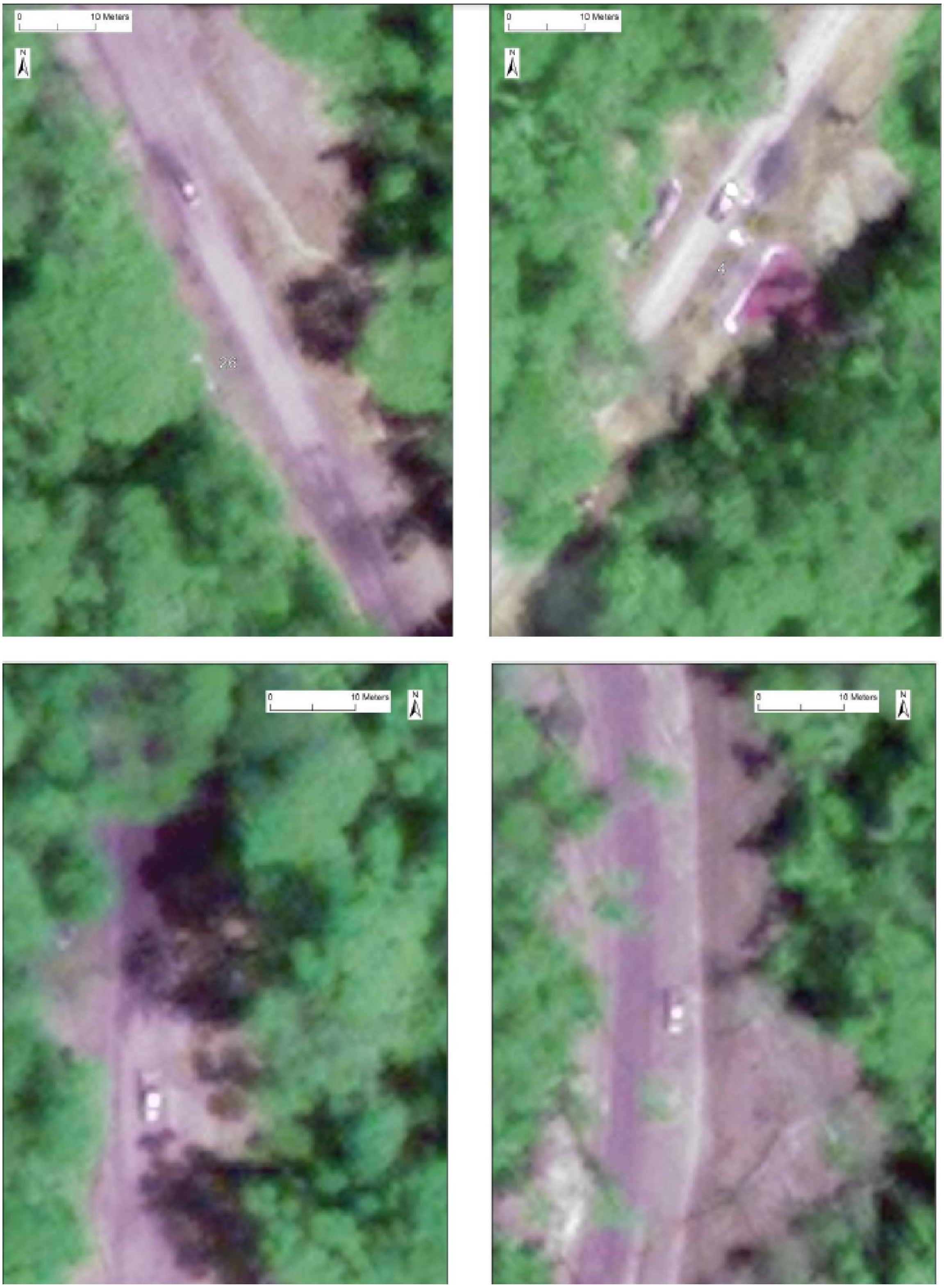
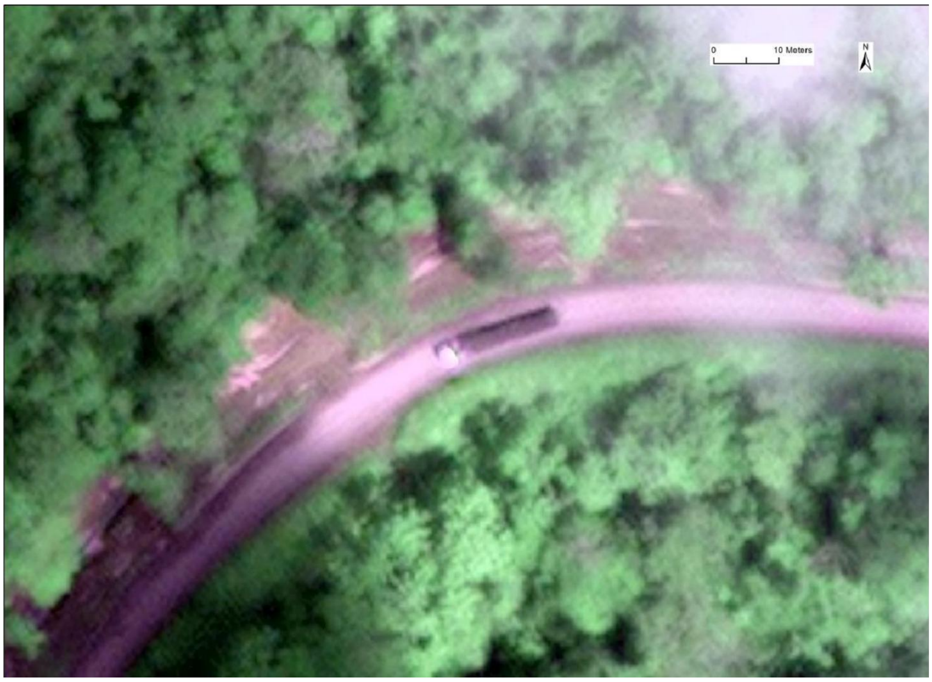
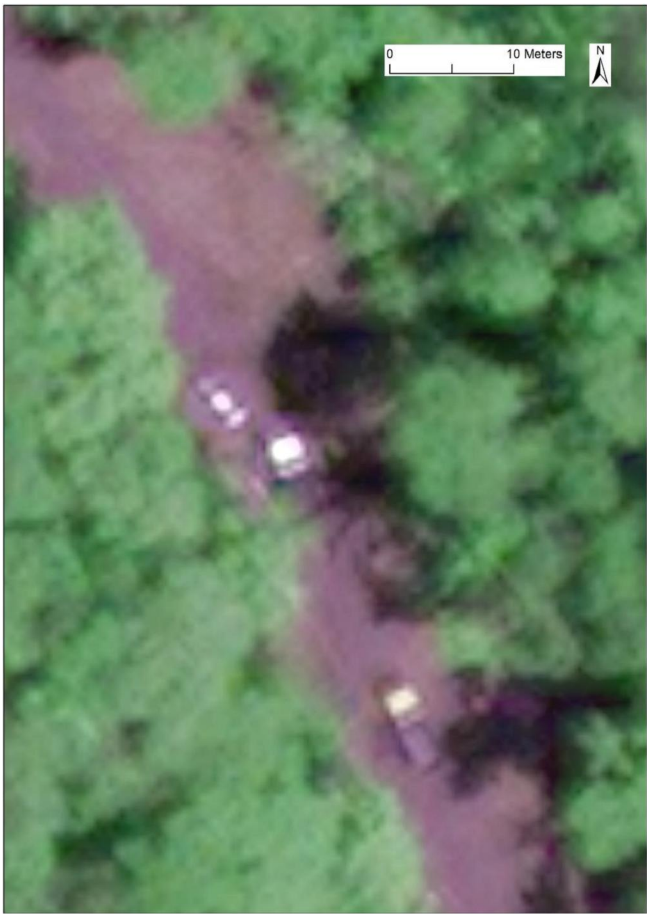


Figure 5, 6, 7 and 8. Vehicles identified along route within Yasuní National Park.

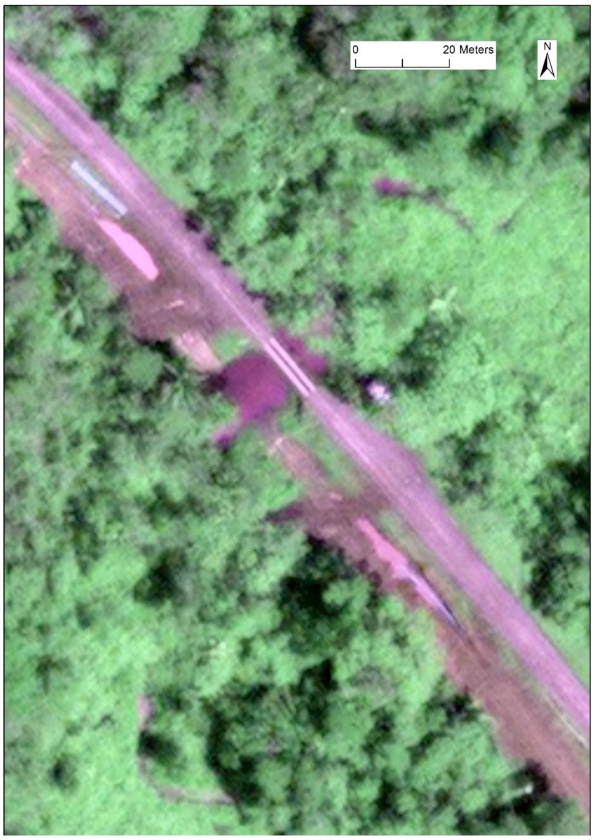




Figures 9 and 10. Vehicles identified along route outside park.

In the access route within the park, we detected 36 water body crossings designed for vehicles. Most notably, there is a major steel bridge structure crossing the Pindoyacu River[4], the largest water crossing along the route (Figure 11). In the pipeline corridor outside the park, there are three more major bridge structures. These bridges have lengths of 14 m (Figures 12), 16 m, and 63 m (Figures 13), respectively.

Figure 11. Steel bridge crossing the Pindoyacu River within Yasuní National Park.



Figures 12 and 13. Major bridge structures along the pipeline corridor outside Yasuní National Park.

In addition to the major bridge, there are 15 medium-sized (6 – 12 m) and 20 smaller (<5 m) waterway crossing structures within the park (Figure 14). For most of these structures (16 of 36), it is possible to see the water body in the image.

Figure 14. Example of a medium-sized culvert within the park.

Did Petroamazonas violate the terms of the EIS and environmental and logging licenses?

According to the supervised classification of two independent analysts, the access route from Rio Tiputini (boundary of Yasuní National Park) to the Apaika platform has an average ROW of 26 m (Analyst 1 = 25.9 m and Analyst 2 = 26.7 m). In other words, the average width of the flowline corridor within the park is 2.5 times greater than what was approved in the EIS, and more than 1.5 times greater than what is described in the EIS as destructive and not viable.

Frequency distribution of the ROW shows that less than 6% of the access route within the park complies with the EIS: 0.6% is ≤ 10 m and 5% is < 15 m. Thus, more than 94% of the route violates the parameters established in the EIS; 74% is between 20 and 30 m and 20% is between 30 and 68 m (Figure 15). The higher width values (30 - 68 m) are related to the geomorphological features of the Pindoyacu valley, characterized by wide flooded areas and swampland (Figure 16 and 17).

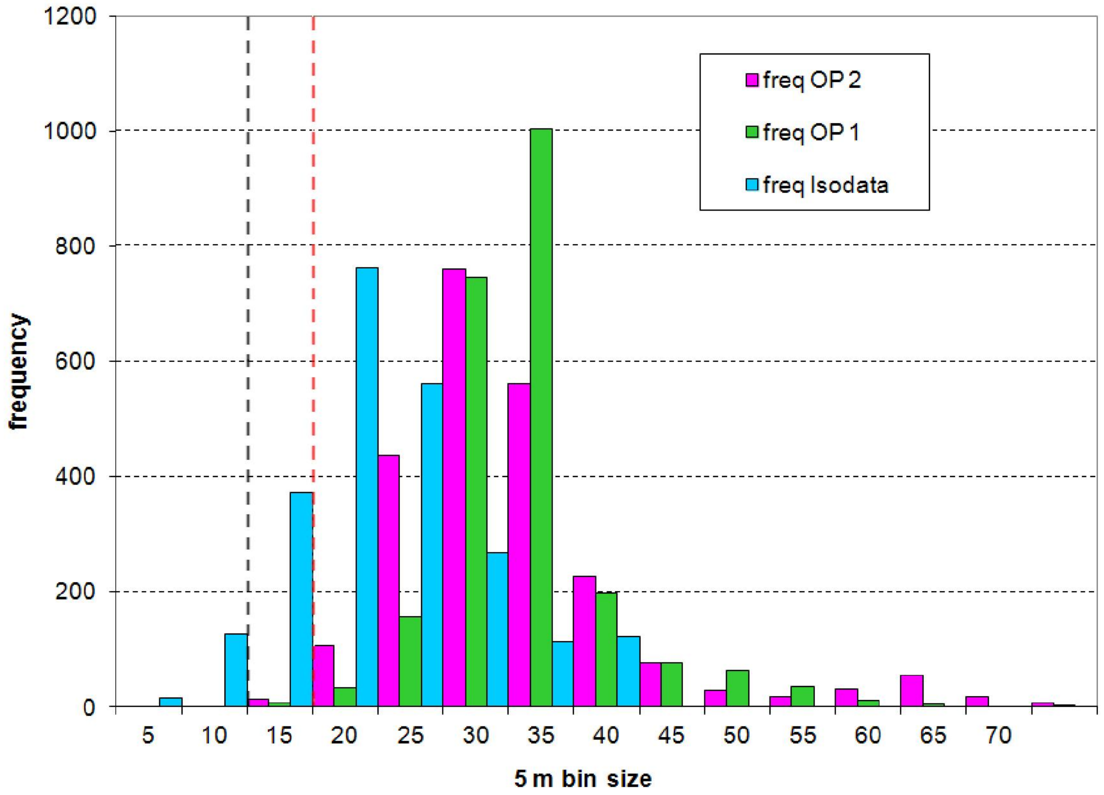


Figure 15. Frequency distribution of ROW from Rio Tiputini to Apaika drilling platform. The tail of histogram corresponds to the flooded ecosystems of the Pindoyacu valley crossing.

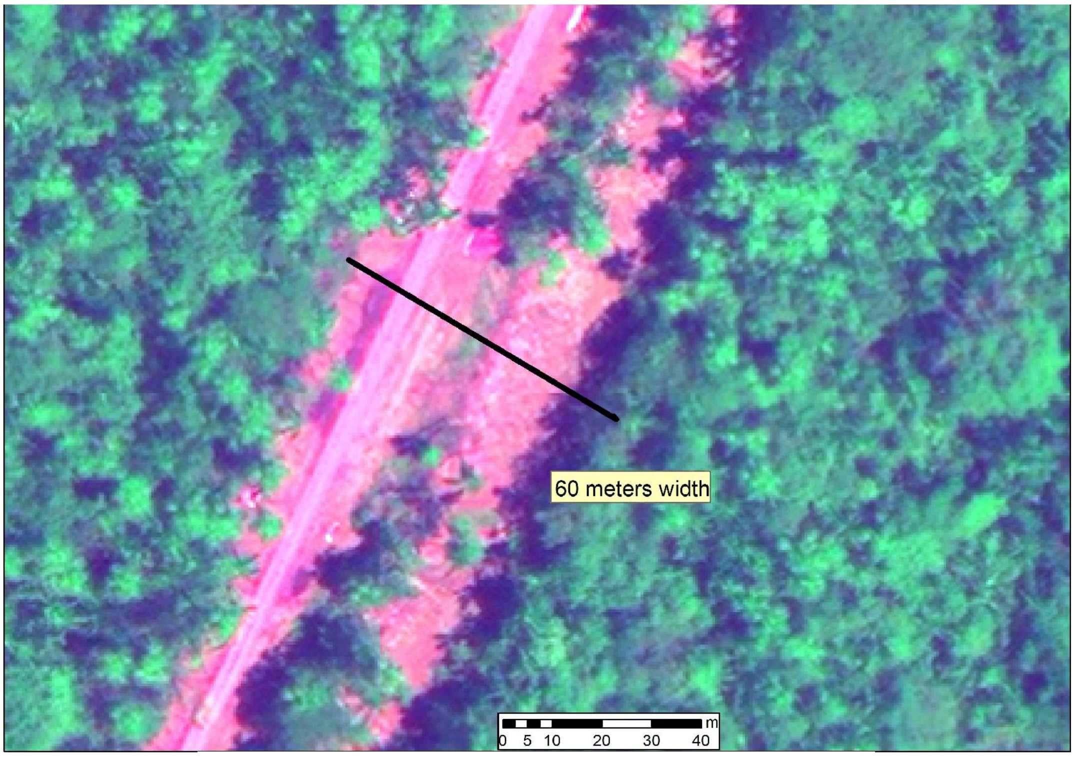


Figure 16. ROW within the Pindoyacu swampland.

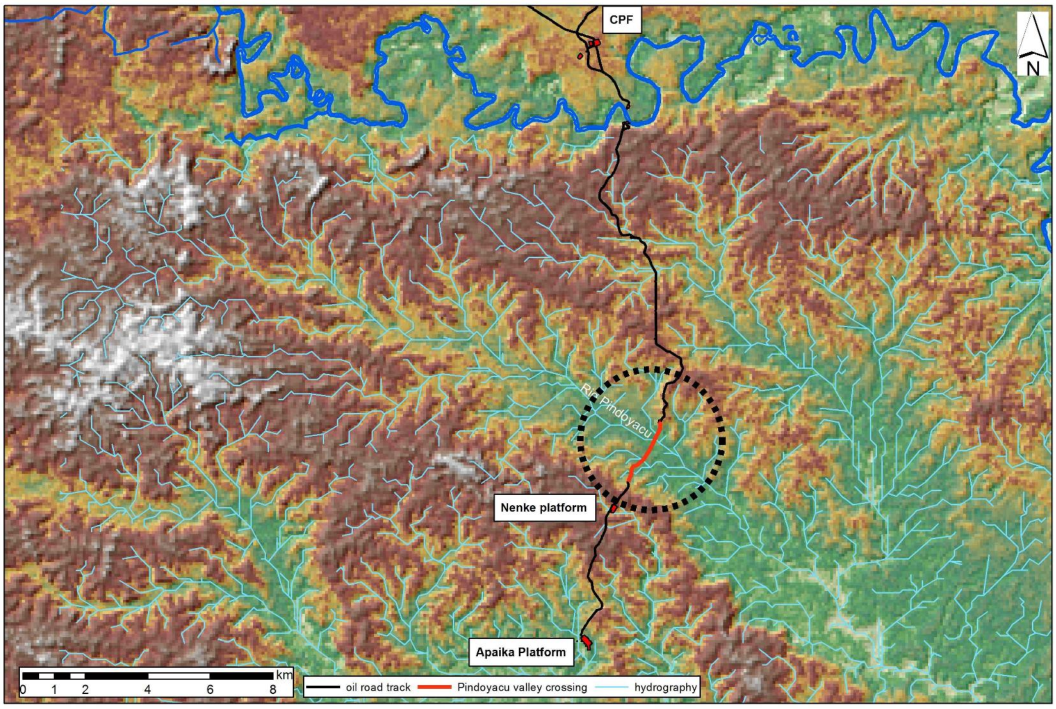


Figure 17. Pindoyacu valley crossing in swampland (Digital Elevation Model, SRTM).

The pipeline corridor outside the park has an average ROW of 17.6 m. However, the standard deviation is high because of the different types of road tracks. From the Tiputini Processing Facility to the boundary of the Block 12 the ROW is narrower (14.2 m average width, 2.4 m standard deviation). Within Block 12 the ROW is wider (29.8 m average, 5.4 m standard deviation) and seems to have double lanes (Figure 18).

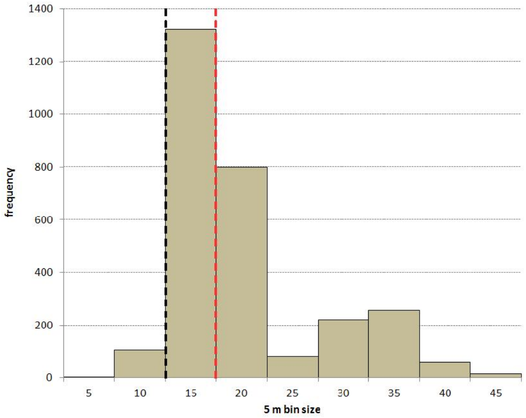


Figure 18. Frequency distribution of ROW for pipeline corridor outside the park. Note the clear bimodal distribution.

The total deforestation associated with the 2006 EIS – including the flowline and pipeline corridors, drilling platforms, docks and processing facility – is 163.3 ha (Table 1).
This area exceeds the 104,98 ha declared in the *Informe técnico de la Subsecretaria de Calidad Ambiental, Ministerio del Ambiente del 2 de septiembre 2013*.
Inside the park, the total deforestation is 63.64 ha, 34.4 % greater than the 47.33 ha authorized by the logging licence (Table 2).

Table 1. Total deforestation associated with the 2006 EIS.

Deforestation for operations in Block 31	hectares	%
ROW (Tiputini CPF- Block 12)	31.80	19.47%
Deforested areas (platforms, camps, deposit sites, docks, port)	66.02	40.41%
Access road to Tiputini Processing Facility	0.71	0.43%
ROW (Rio Tiputini - Apaika drilling platform)	50.96	31.19%
Rio Napo – Tiputini Processing Facility	13.87	8.49%
TOTAL deforested surfaces	**163.36**	**100.00%**

Table 2 Deforested surfaces inside the Yasuní National park (Block 31).

	Deforested areas by Logging Licence 2012 (ha)	Deforested areas by Satellite analysis (ha)
Apaika platform	5.75	7.61
Nenke platform	3.53	3.71
Rio Tiputini docks	0.09	1.36
Flowline Nenke-ECB (85% inside YNP)	15.97	
Flowline Apaika Nenke	5.25	50.96
Civil areas	8.74	
Ecological trail Rio Tiputini-Apaika	8.00	
TOTAL	**47.33**	**63.64**

Methods

We processed Worldview-2 images in GIS environment combining panchromatic band (0.5 m resolution) with color composite BGR in blue, NIR1 and red bands (2 m resolution).

We measured the Tiputini – Apaika flowline route both by display analysis and by unsupervised classification of spectral bands using ArcGIS™ and IdrisiGIS™ software. In the display analysis, two independent analysts drawn a polygon corresponding to the road, with no digitalization rules defined beforehand. Road width from Tiputini to Apaika was calculated every 10 m along the route, obtaining 2341 measures. We calculated and measured ROW of pipeline corridor outside the park in the same way: on screen digitalization and width calculation every 10 m. The measures were performed by GIS software, using the same raster resolution of the panchromatic image: 0.5 m.

Deforestation has been quantified by supervised analysis at 0.5 m resolution, pansharpening spectral bands with panchromatic band and creating color composite of NIR1, red and green respectively for red, green and blue values. Such combination emphasizes forest-non forest interface.

Acknowledgements

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