| | LAT | LON | DFMAO(Km | CITY | REF POINT | MARKER PO | DATE | DAY | MONT | TIME PER GM | SAT | INST | CO | BT | BT | XB | FR | FI (C2-adapted Laurent, 201 | D | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | -3.434 | -59.585 | 63 | Careiro | Purupuru - Anexo da EscolaMCSC | AVPAD | Sunday, October 29, 2023 | Sun | Oct | 12:00 - 18:00 PM | G16FRP | GOES | 100 | 410.3 | 301 | 355.65 | 1538 | VH (FRP>600) | D | 1 |
| 3 | -3.434 | -59.585 | 64 | Careiro | Purupuru - Anexo da EscolaMCSC | AVPAD | Sunday, October 29, 2023 | Sun | Oct | 12:00 - 18:00 PM | G16FRP | GOES | 100 | 399.9 | 299.5 | 349.7 | 1208 | VH (FRP>600) | D | 1 |
| 4 | -3.434 | -59.566 | 60 | Careiro | Purupuru - Anexo da EscolaMCSC | AVPAD | Sunday, October 29, 2023 | Sun | Oct | 12:00 - 18:00 PM | G16FRP | GOES | 100 | 387.3 | 302.5 | 344.9 | 858.3 | VH (FRP>600) | D | 1 |
| 5 | -3.434 | -59.566 | 60 | Careiro | Purupuru - Anexo da EscolaMCSC | AVPAD | Sunday, October 29, 2023 | Sun | Oct | 12:00 - 18:00 PM | G16FRP | GOES | 100 | 386.7 | 303.6 | 345.15 | 845.6 | VH (FRP>600) | D | 1 |
| 6 | -3.379 | -59.529 | 60 | Careiro | Purupuru - 1,9 KM far from Mercadinho WR & J | AVPAD | Sunday, October 29, 2023 | Sun | Oct | 12:00 - 18:00 PM | G16FRP | GOES | 100 | 386 | 297.6 | 341.8 | 841.9 | VH (FRP>600) | D | 1 |
| 7 | -3.44841 | -59.57164 | 60 | Careiro | Purupuru - Anexo da EscolaMCSC | AD | Sunday, October 29, 2023 | Sun | Oct | 12:00 - 18:00 PM | Aqua | MODIS | 100 | 447.55 | 319.76 | 383.66 | 717.3 | VH (FRP>600) | D | 1 |
| 8 | -3.434 | -59.566 | 60 | Careiro | Purupuru - Anexo da EscolaMCSC | AVPAD | Tuesday, September 5, 2023 | Tue | Sep | 6:01 - 11:59 AM | G16FRP | GOES | 100 | 372.6 | 297.3 | 334.95 | 561.8 | HIGH (100<FRP<=600) | D | 1 |
| 9 | -3.379 | -59.529 | 60 | Careiro | Purupuru - Mercadinho WR & J | AVPAD | Sunday, October 29, 2023 | Sun | Oct | 12:00 - 18:00 PM | G16FRP | GOES | 90 | 363.8 | 293.8 | 328.8 | 435.1 | HIGH (100<FRP<=600) | D | 1 |
| 10 | -3.452 | -59.585 | 60 | Careiro | Purupuru - Anexo da EscolaMCSC | AVPAD | Sunday, October 29, 2023 | Sun | Oct | 12:00 - 18:00 PM | G16FRP | GOES | 93 | 362.7 | 293.1 | 327.9 | 409.4 | HIGH (100<FRP<=600) | D | 1 |
| 11 | -3.434 | -59.624 | 60 | Careiro | Purupuru | AD | Sunday, October 1, 2023 | Sun | Oct | 12:00 - 18:00 PM | G16FRP | GOES | 100 | 363.1 | 299.9 | 331.5 | 408.6 | HIGH (100<FRP<=600) | D | 1 |
| 12 | -3.452 | -59.642 | 59 | Careiro | Purupuru | AVPAD | Saturday, September 2, 2023 | Sat | Sep | 12:00 - 18:00 PM | G16FRP | GOES | 100 | 358.6 | 299.7 | 329.15 | 349 | HIGH (100<FRP<=600) | D | 1 |
| 13 | -3.525 | -59.603 | 60 | Careiro | Purupuru | AVPAD | Monday, October 9, 2023 | Mon | Oct | 12:00 - 18:00 PM | G16FRP | GOES | 92 | 358.6 | 298.9 | 328.75 | 346.8 | HIGH (100<FRP<=600) | D | 1 |
| 14 | -3.452 | -59.585 | 60 | Careiro | Purupuru - Anexo da EscolaMCSC | AVPAD | Sunday, October 29, 2023 | Sun | Oct | 12:00 - 18:00 PM | G16FRP | GOES | 88 | 358.2 | 294.9 | 326.55 | 342.4 | HIGH (100<FRP<=600) | D | 1 |
| 15 | -3.379 | -59.567 | 62 | Careiro | Purupuru | AVPAD | Sunday, October 1, 2023 | Sun | Oct | 12:00 - 18:00 PM | G16FRP | GOES | 100 | 357.5 | 292 | 324.75 | 337.7 | HIGH (100<FRP<=600) | D | 1 |
| 16 | -3.452 | -59.566 | 60 | Careiro | Purupuru - Anexo da EscolaMCSC | AVPAD | Tuesday, September 5, 2023 | Tue | Sep | 6:01 - 11:59 AM | G16FRP | GOES | 100 | 356.7 | 301.1 | 328.9 | 333 | HIGH (100<FRP<=600) | D | 1 |
| 17 | -3.44585 | -59.57251 | 65 | Careiro | Purupuru - Anexo da EscolaMCSC | AVPAD | Sunday, October 29, 2023 | Sun | Oct | 12:00 - 18:00 PM | N | VIIRS | n | 353.67 | 302.76 | 328.22 | 307.2 | HIGH (100<FRP<=600) | D | 1 |
| 18 | -3.44532 | -59.56885 | 60 | Careiro | Purupuru - Anexo da EscolaMCSC | AVPAD | Sunday, October 29, 2023 | Sun | Oct | 12:00 - 18:00 PM | N | VIIRS | h | 367 | 296.76 | 331.88 | 307.2 | HIGH (100<FRP<=600) | D | 1 |
| 19 | -3.44174 | -59.57311 | 60 | Careiro | Purupuru - Anexo da EscolaMCSC | AVPAD | Sunday, October 29, 2023 | Sun | Oct | 12:00 - 18:00 PM | N | VIIRS | n | 336.42 | 306.85 | 321.64 | 307.2 | HIGH (100<FRP<=600) | D | 1 |
| 20 | -3.379 | -59.606 | 60 | Careiro | Purupuru - EM Maria da Conceição - Ramal do Cobra II | AVPAD | Friday, October 06, 2023 | Fri | Oct | 12:00 - 18:00 PM | G16FRP | GOES | 98 | 355.2 | 296.2 | 325.7 | 304.3 | HIGH (100<FRP<=600) | D | 1 |
| 21 | -3.434 | -59.566 | 60 | Careiro | Purupuru - Anexo da EscolaMCSC | AVPAD | Tuesday, September 5, 2023 | Tue | Sep | 6:01 - 11:59 AM | G16FRP | GOES | 98 | 354.4 | 302 | 328.2 | 300 | HIGH (100<FRP<=600) | D | 1 |
| 22 | -3.597 | -60.307 | 47 | Careiro | Igarapé Janauacá Grande | AVPRio | Monday, August 21, 2023 | Mon | Aug | 12:00 - 18:00 PM | G16FRP | GOES | 98 | 353.7 | 299.2 | 326.45 | 289.6 | HIGH (100<FRP<=600) | D | 1 |
| 23 | -3.453 | -59.528 | 60 | eiro da Vá | Rio Mutuca | AVPAD | Saturday, September 2, 2023 | Sat | Sep | 12:00 - 18:00 PM | G16FRP | GOES | 85 | 353.9 | 305.6 | 329.75 | 283 | HIGH (100<FRP<=600) | D | 1 |
| 24 | -3.452 | -59.566 | 60 | Careiro | Purupuru - Anexo da EscolaMCSC | AVPAD | Sunday, October 29, 2023 | Sun | Oct | 12:00 - 18:00 PM | G16FRP | GOES | 80 | 353.1 | 302.3 | 327.7 | 279.4 | HIGH (100<FRP<=600) | D | 1 |
| 25 | -3.453 | -59.528 | 60 | eiro da Vá | Rio Mutuca | AVPAD | Saturday, September 2, 2023 | Sat | Sep | 12:00 - 18:00 PM | G16FRP | GOES | 84 | 353.7 | 306 | 329.85 | 279.3 | HIGH (100<FRP<=600) | D | 1 |
| 26 | -3.379 | -59.625 | 56 | Careiro | Purupuru - EM Maria da Conceição - Ramal do Cobra II | AVPAD | Friday, October 06, 2023 | Fri | Oct | 12:00 - 18:00 PM | G16FRP | GOES | 97 | 352.6 | 293.3 | 322.95 | 273.8 | HIGH (100<FRP<=600) | D | 1 |
| 27 | -3.379 | -59.625 | 56 | Careiro | Purupuru - EM Maria da Conceição - Ramal do Cobra II | AVPAD | Friday, October 06, 2023 | Fri | Oct | 12:00 - 18:00 PM | G16FRP | GOES | 96 | 352 | 292.8 | 322.4 | 272.5 | HIGH (100<FRP<=600) | D | 1 |
| 28 | -3.434 | -59.624 | 60 | Careiro | Purupuru | AD | Sunday, October 29, 2023 | Sun | Oct | 12:00 - 18:00 PM | G16FRP | GOES | 100 | 350.6 | 297.9 | 324.25 | 267.8 | HIGH (100<FRP<=600) | D | 1 |
| 29 | -3.47 | -59.642 | 60 | Careiro | Purupuru | AVPAD | Saturday, September 2, 2023 | Sat | Sep | 12:00 - 18:00 PM | G16FRP | GOES | 100 | 350.4 | 300.5 | 325.45 | 260.1 | HIGH (100<FRP<=600) | D | 1 |
| 30 | -3.525 | -59.603 | 60 | Careiro | Purupuru | AVPAD | Monday, October 9, 2023 | Mon | Oct | 12:00 - 18:00 PM | G16FRP | GOES | 87 | 350.9 | 299.2 | 325.05 | 258.8 | HIGH (100<FRP<=600) | D | 1 |
| 31 | -3.9549 | -60.59129 | 78 | Careiro | BR319 - São Francisco | AV | Sunday, October 29, 2023 | Sun | Oct | 12:00 - 18:00 PM | Aqua | MODIS | 100 | 398.73 | 299.69 | 349.21 | 256.3 | HIGH (100<FRP<=600) | D | 1 |
| 32 | -4.07041 | -60.68139 | 97 | Careiro | BR319 - Miracema | AVPAD | Sunday, October 29, 2023 | Sun | Oct | 12:00 - 18:00 PM | qua | MODIS | 100 | 370.52 | 302.24 | 336.38 | 256 | HIGH (100<FRP<=600) | D | 1 |
| 33 | -3.434 | -59.624 | 60 | Careiro | Purupuru | AD | Sunday, October 29, 2023 | Sun | Oct | 12:00 - 18:00 PM | RP | GOES | 96 | 349.7 | 298.8 | 324.25 | 253.7 | HIGH (100<FRP<=600) | D | 1 |
| 34 | -3.37678 | -59.42514 | 60 | eiro da Vá | AV | AV | Sunday, October 29, 2023 | Sun | Oct | 12:00 - 18:00 PM | | VIIRS | n | 350.67 | 307.21 | 328.94 | 253.5 | HIGH (100<FRP<=600) | D | 1 |
| 35 | -3.452 | -59.566 | 60 | Careiro | Purupuru - Anexo da EscolaMCSC | AVP | Sunday, October 29, 2023 | Sun | Oct | 12:00 - 18:00 PM | P | GOES | 76 | 350.4 | 296.1 | 323.25 | 251.6 | HIGH (100<FRP<=600) | D | 1 |

# Article on the Brazilian Amazon Region

# The traces of the destruction from the wildfires in Careiro region


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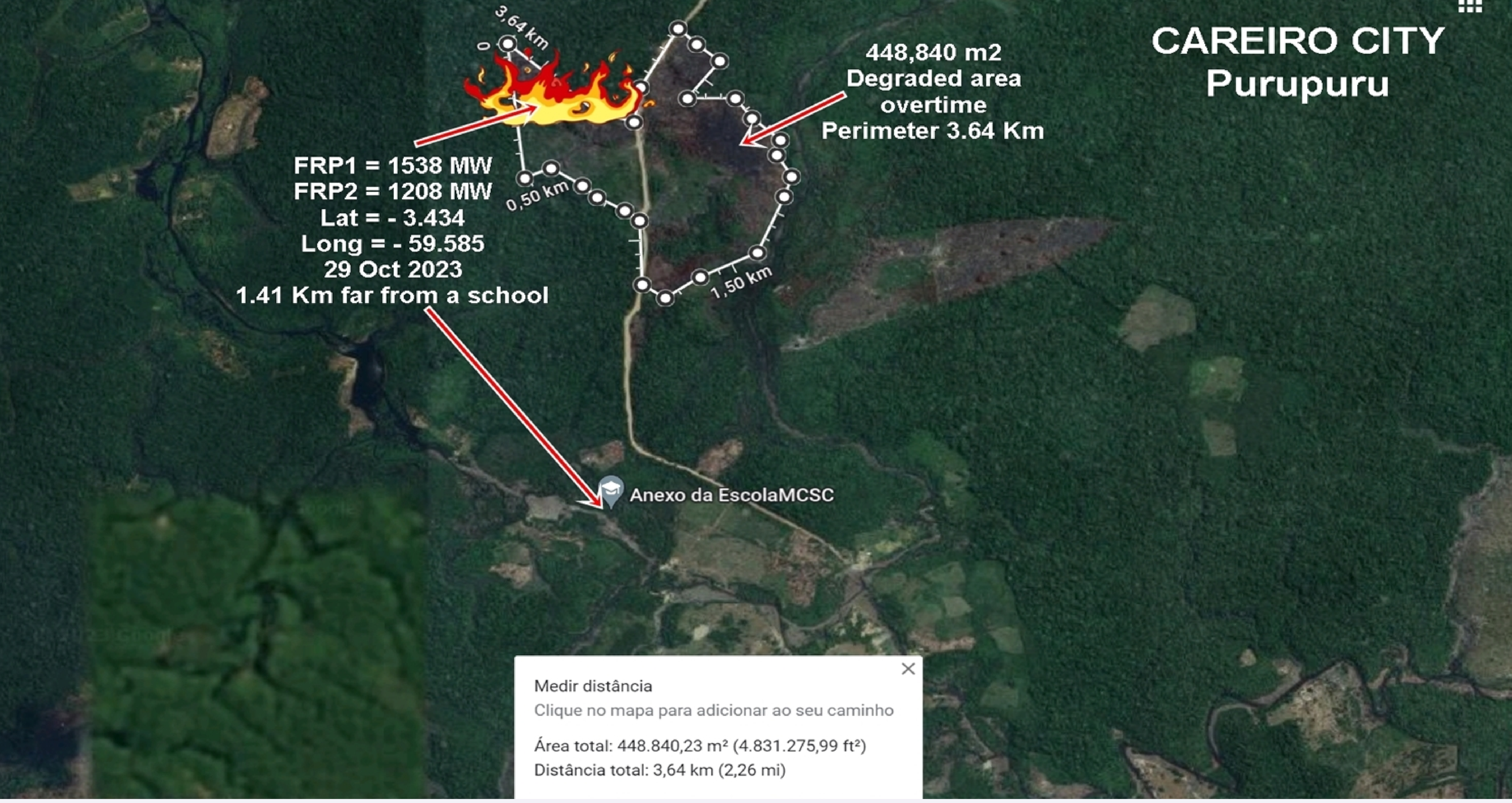


Figure 16: Burned green area in Purupuru, Careiro city - 29/Oct/2023
Source: NASA FIRMS, da Silva (2023) and Google Maps

The article presents an alarming analysis of 278 records of large wildfires detected by NASA satellites (Figures 16, 17, 18 and 19) in the Careiro region, near Manaus city, Amazon capital, during the critical period from August to October 2023.

The Careiro region, divided into Careiro da Várzea and Careiro (or Careiro Castanho), is marked by its proximity to Manaus and its rich river geography. Careiro da Várzea, just 29 km from Manaus, covers 2,627 km2 and has about 19,637 inhabitants, standing out for its floodplains along the Amazon River. Careiro Castanho, located 102 km from Manaus and with a population of 30,792 inhabitants, occupies 6,096 km2 along the Solimões River and is notable for its connection to BR-319 road. Both cities, with roots dating back to 1870, became autonomous municipalities from 1955. In addition, the region is close to Autazes, Manaquiri, Iranduba, Manaus and Itacoatiara cities, and is interlaced by a network of waterways, including the Solimões, Amazon, Castanho, Mamori rivers, among others.

Economically, according to the 2019 SEDECTI report, Careiro and Careiro da Várzea ranked 22nd and 24th in GDP in Amazonas states. In 2021, according to IBGE, Careiro da Várzea stood out in the Agricultural (49.39% of GDP) and Public Service (41.68%) sectors, while in Careiro, the most relevant sectors were Public Service (55.97% of GDP) and Commerce and Services (18.56%).

Continuing with the JCAM series on wildfires near Manaus, the analysis of 2,253 critical records obtained from NASA/FIRMS indicated that 278 occurred in the Careiro region, with 222 (80%) in Careiro Castanho and 56 (20%) in Careiro da Várzea. This puts the region as the third most affected, behind Autazes and Itacoatiara cities.

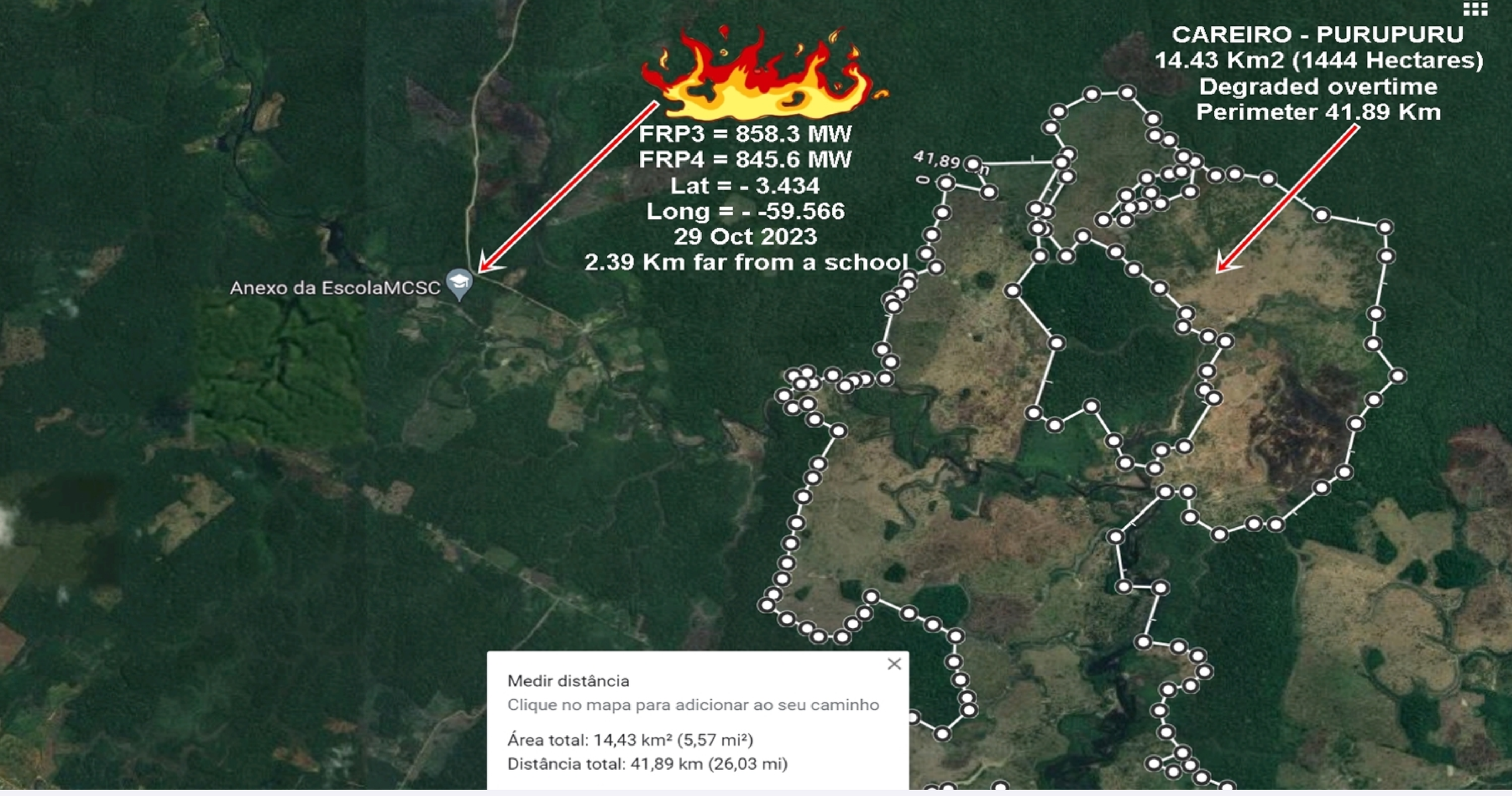


Figure 17: Intense wildfires in Careiro city - 29 October 2023
Source: NASA FIRMS, da Silva (2023) and Google Maps

And the analysis revealed the following results:
1. In terms of Fire Radiative Power (FRP), the majority (272; 97.84%) was high, that is, above 100 MW and equal to or below 600 MW. While six records (2.16%) were considered very high (FRP>600MW), representing large fires.
2. The most critical days in terms of number of outbreaks were Sunday (70; 25.18%), Saturday (42; 15.11%), Tuesday (32; 11.51%) and Monday (28; 10.07%). As for the average FRP (XFRP), the most critical days were Sunday (XFRP=249.32MW), Saturday (XFRP=166.59MW) and Tuesday (XFRP=165.68MW), followed by Monday (XFRP=158.68) and Wednesday (XFRP=158.56MW).
The majority of events were recorded by NASA satellites during the day (276; 99.28%), while only two were at night (0.72%). In addition, the time when the highest number of records detected is between 12:00 and 18:00, with 258 cases observed (92.81%), followed by the time from 06:01 to 11:59 (18; 6.47%) and from 18:01 to 23:59, representing only two cases (0.72%). There was no record between 00:00 and 06:00 in the morning.
In terms of numbers of outbreaks and thermal anomalies per month, it was observed that October (161; 57.91%) was the most critical, followed by September (79; 28.42%) and August with 38 cases (13.67%).
When analyzing the average FRP per month, October was the most critical (XFRP= 196.03 MW), with 155 high outbreak records (100 <FRP ≤ 600) with XFRP equal to 164.85 MW, followed by six large fire records (FRP> 600 MW) which had XFRP equal to 1001.42 MW. September was the second month (XFRP=168.2MW) with 79 high outbreak records (100<PFR<=600).

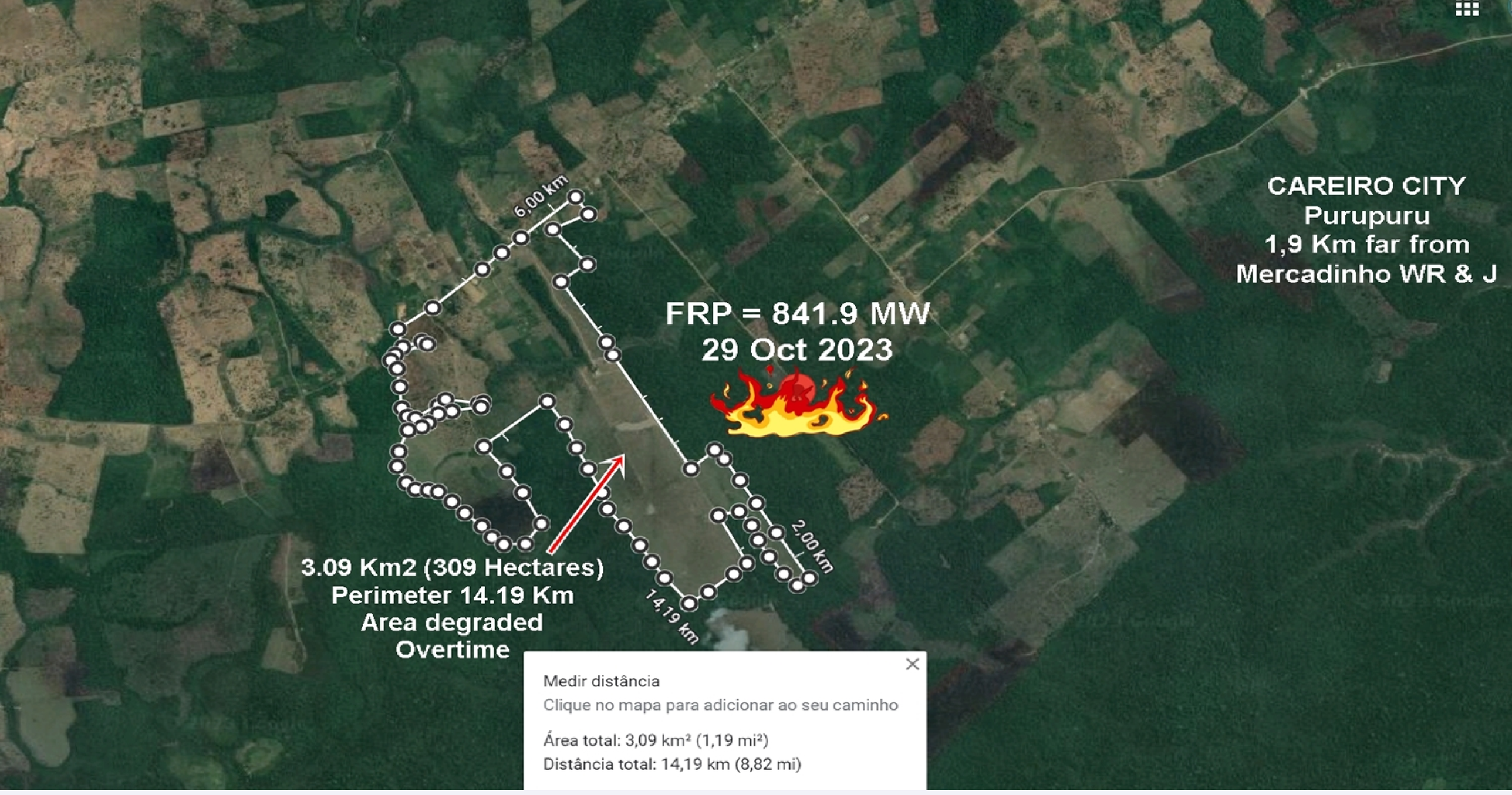


Figure 18: Intense wildfire in Purupuru - Careiro city - 29 October 2023
Source: NASA FIRMS, da Silva (2023) and Google Maps

3. Regarding the profile of the locations, of the 278 fire records, the majority (209; 75.18%) occurred in green areas. Of these, 125 (44.96%) were near already devastated areas, while 84 (30.22%) happened near rivers, lakes or streams. The most affected locations include: Mutuca River (17 records), Apipica Lake (10), Paraná do Castanho Mirim (9), Janauacá Grande Stream (5), Capivara Grande Stream (3), Palhetinha Lake (2 ), Purupuru Lake (1), Janauacá Lake (1), Juma Lake (1) and the Paraná River Mouth (1).

4. In relation to communities or regions, some notable points deserve highlighting.

Firstly, attention is drawn to the high concentration of fires in a specific area called Purupuru (Figures 16 to 19), accounting for more than half of the records (160; 57.55%). Then there were incidents in other communities, such as São Francisco (21), Nossa Senhora do Carmo (5), Janauacá (7), Salgada (6), Miracema (3), Gavião (2) and Urbano Sebastião Borges (2).

Another intriguing point relates to the extensive areas that were destroyed over time, identified near the green areas where the fires occurred. This suggests a persistence of events in the region, possibly due to leniency or inadequate punishment by state or municipal agencies, including control entities and the Public Ministry.

An additional significant finding was the identification of several fires occurring near annexes or schools, adversely affecting the educational life of both teachers and students in the region. The most critical cases were recorded near the EMCSC Annex (45 records), the Maria da Conceição EM (14), the Afonso de Souza EM (9), the Coronel Fiuza EE (4), the Paulo Gomes Cardoso EM (2) and the Alberto S. Migueis EE (1).

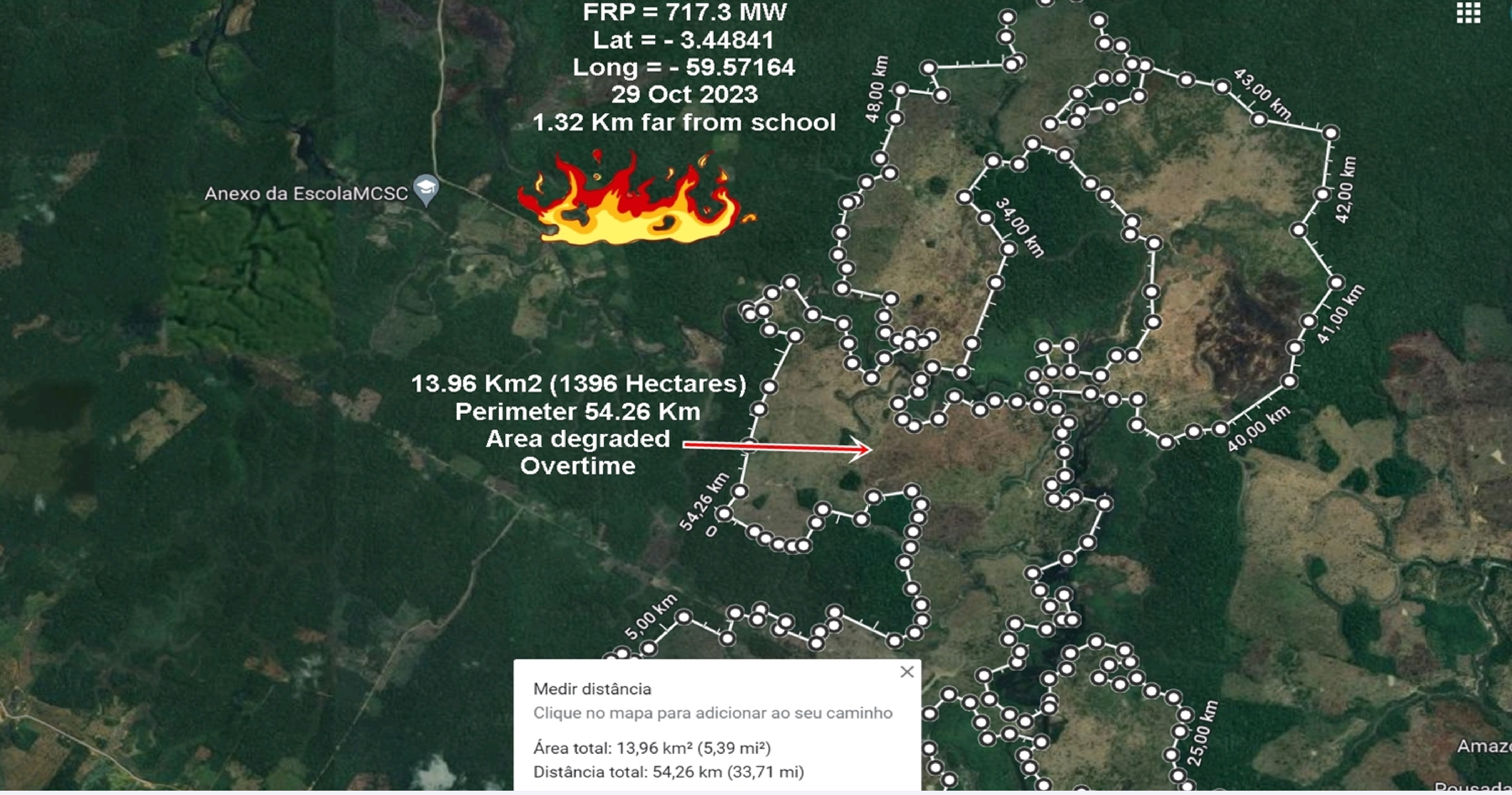


Figure 19: Intense fires in Careiro city - 29 October 2023
Source: NASA FIRMS, da Silva (2023) and Google Maps

To see the magnitude of the damage, it is advisable to examine Figures 16, 17, 18 and 19, which highlight the geolocation of fires and the size of the area degraded over time. In addition, the spreadsheet and basic statistics can be accessed via the DOI **https://doi.org/10.7910/DVN/UOZQ5O**.

5. The geolocation of large fires

Figure 16 displays two records, with FRPs of 1538 MW and 1208 MW, at Lat. -3.434 and Long. -59.585, 1.41 Km from the MCSC School. This event occurred in a green area surrounded by a degraded area of 449,000 m2. Figure 17 reveals another alarming situation with two more records, with FRPs of 858.3 MW and 845.6 MW, located 2.39 Km from the same school, at Lat. -3.434 and Long. -59.566, near a vast degraded area of approximately 14.43 km2 and a perimeter of 41.89 km. Figures 18 and 19 show two fires near already degraded areas, all captured on 29/10/23, in Careiro, Purupuru region, approximately 61 km from Manaus. It is important to note that in October Manaus recorded several peaks of air pollution harmful to health, accompanied by intense smoke that resulted in the hospitalisation of hundreds of local residents.

The analysis shows a continuous environmental degradation in the Careiro region, with most fires occurring on weekends, in green areas and near bodies of water and riverside communities, including near schools. Given this alarming scenario, it is necessary to intensify supervision and punish environmental crimes with more transparency, in addition to implementing environmental education programs in schools and other organisations, improve fire monitoring and prevention, foster sustainable economic activities and monitor the effects of air pollution on the health of the population.