BARA

Burning Activity Record Almanac

One fire record across MODIS and VIIRS, from 2000 to today.

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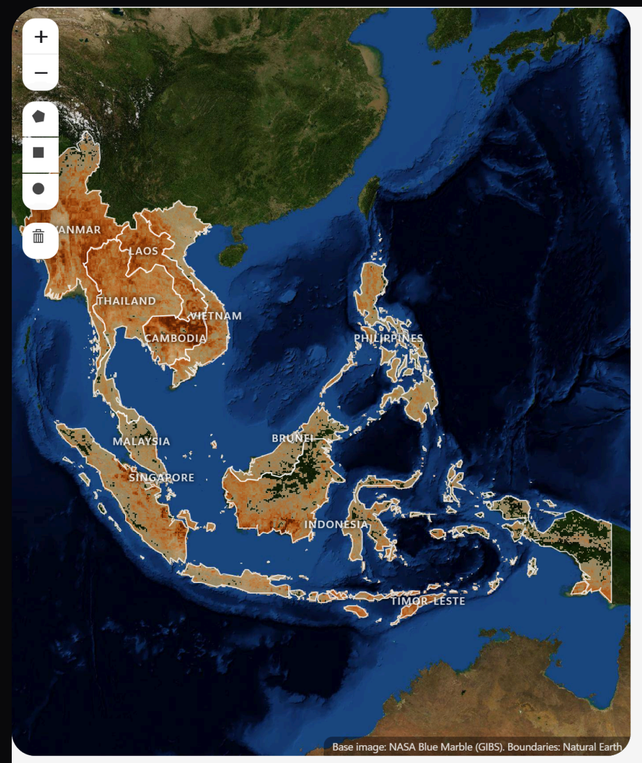
Challenge: **Harmonization of MODIS and VIIRS Hot Spots**

Live app: harithnabilf.github.io/bara

30.0 million NASA FIRMS detections

27 years · 11 ASEAN countries

6.3% error on unseen years



Map shows all burning, 2000 to 2026 — fewer … more

Hotspots per 0.1 degree cell (top of scale: 6,038)

All of ASEAN

11 countries

Latest full month: October 2026

197,259

Above normal

423% above the median (37,733). 3rd highest October of 26.

This month so far: 1 to 14 November 2026

19,431

Above normal

224% above the median (5,998) for the same days in past years.

Record year

2015

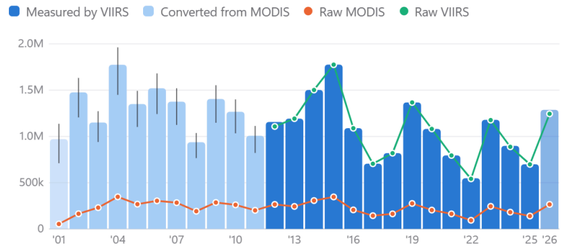
1.78M hotspots.
2026 so far: 1.29M, already more than 15 of 24 full years.

Critical period

Feb to Apr

These three months hold 61% of a normal year's burning. Peak month: March.

Burning by year



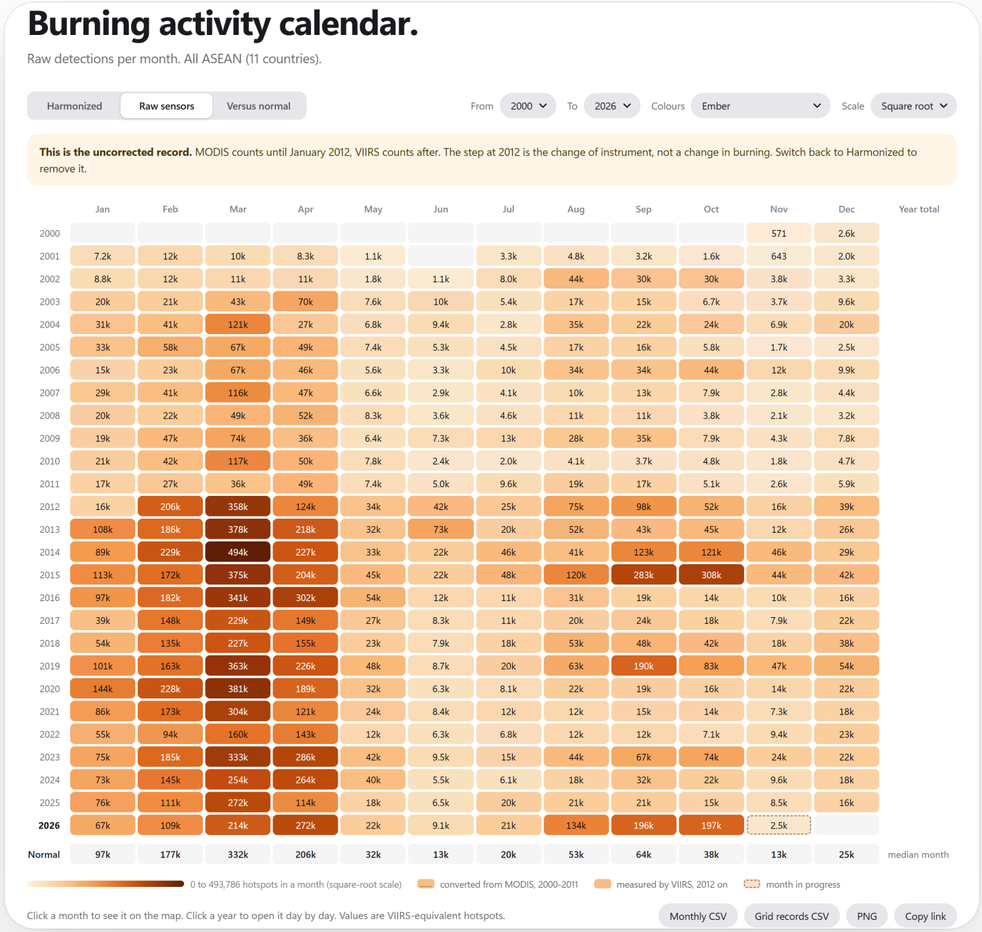
Raw counts would say burning rose 4.1x after 2012, from the orange dots to the green. On one scale the change is 0.79x. Thin lines show the typical range of each converted year.

The problem

The fire record changes rulers in 2012.

MODIS and VIIRS watch the same fires and count them differently.

- VIIRS (375 m) sees small, cool fires that MODIS (1 km) misses. Across ASEAN it reports **4.9 hotspots for every MODIS hotspot**.
- Put the raw records end to end and burning seems to jump in 2012. **That step is the instrument, not the land.**
- The handover is happening now. Suomi NPP left NASA FIRMS in November 2026. Terra and Aqua MODIS are due to stop in 2027.
- Responders in the haze belt need to know one thing fast: **is this month normal?** A broken record cannot answer.



Raw monthly counts, all ASEAN. Rows to 2011 are MODIS, rows from 2012 are VIIRS.

The harmonization

Every year on one scale, learned place by place.

The unit is the VIIRS-equivalent hotspot, because VIIRS is the sensor that continues.

1. Clean

NASA FIRMS vegetation fires only, nominal and high confidence, on a 0.1° grid, counted per day and per sensor.

2. Learn a local factor

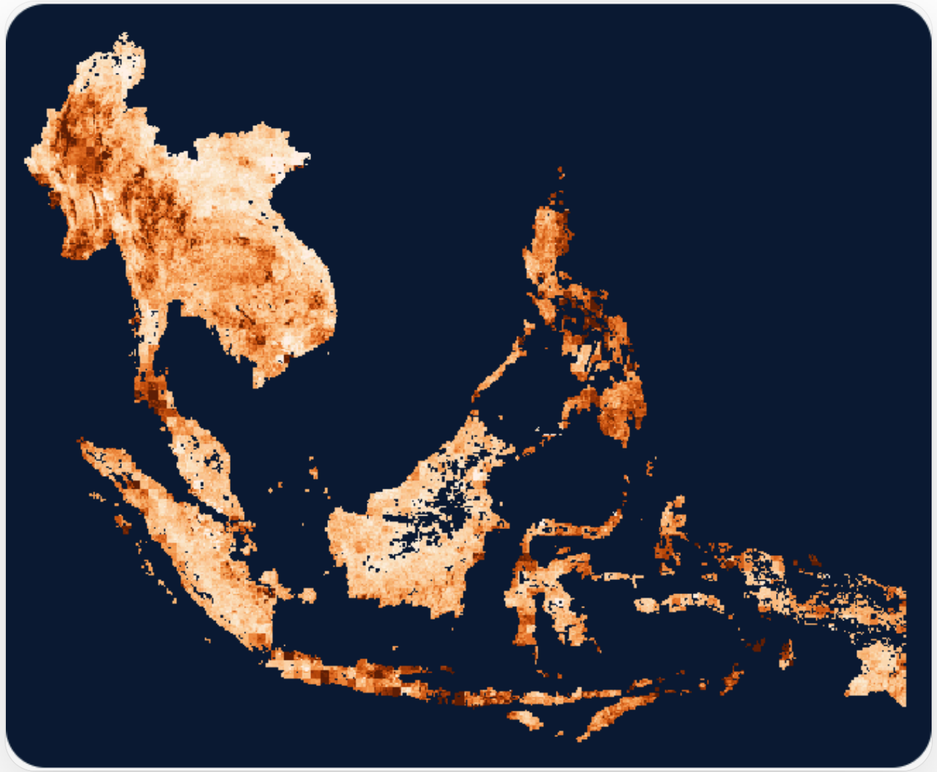
For each cell: how many VIIRS hotspots match one MODIS hotspot, from the ten years both flew (2012-2021). Sparse cells borrow from their neighbourhood.

3. Follow the sensors day by day

Terra only (2000-2002), Terra + Aqua, Suomi NPP, outages, then NOAA-20 after Suomi NPP retired. Each day uses the best set that delivered.

4. Test blind

Hide each year, predict it from MODIS alone, compare with what VIIRS saw. Four models were scored. The simplest winner was kept.



VIIRS hotspots per MODIS hotspot: **3.2x to 9.1x** depending on place. One global number cannot work.

The evidence

Checked against years it never saw.

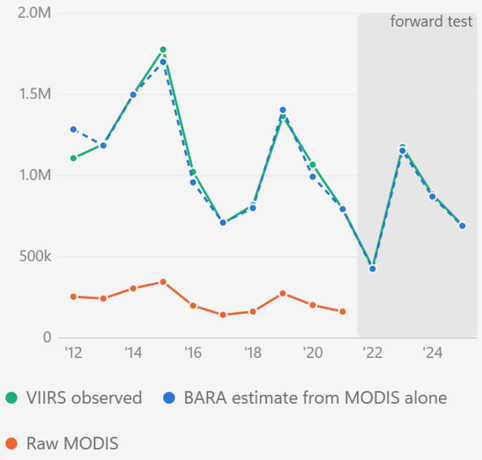
6.3%
average monthly miss for the region, forward test 2022-2025

-1.6%
bias of BARA on those years. Raw MODIS is 80% low

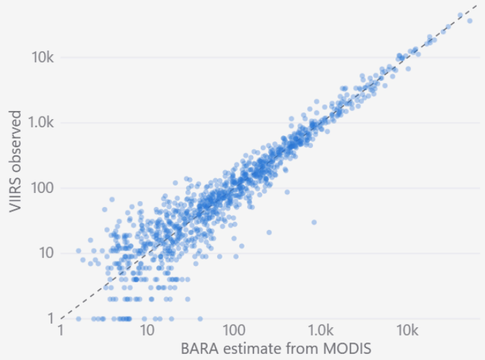
r 0.99
month-by-month agreement with VIIRS for 2.5° areas

1.002
NOAA-20 to Suomi NPP ratio, so the record carries on

Year by year

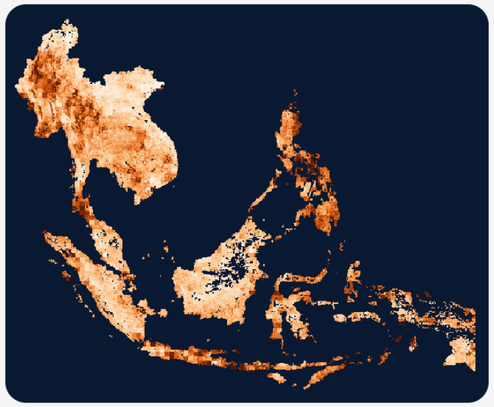


Area by area, month by month



Held-out 2.5 degree blocks, 2012-2021, both axes logarithmic. On the diagonal, the estimate from MODIS equals what VIIRS counted.

Why one conversion number fails



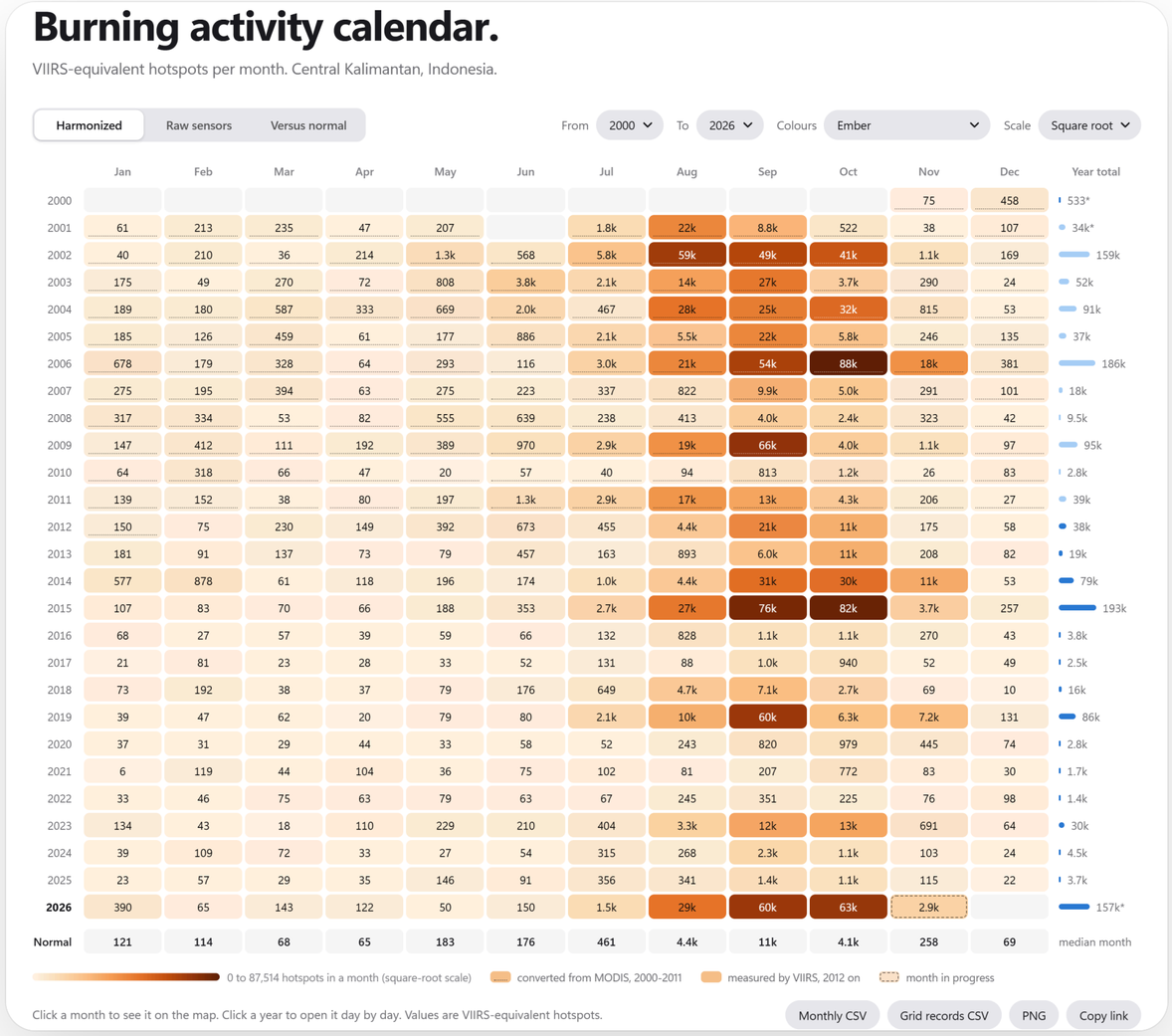
VIIRS hotspots per MODIS hotspot

2x 12x

Left: VIIRS observed (green) against BARA's estimate from MODIS alone (blue, dashed) and raw MODIS (orange). Factors were frozen on 2012-2021.

The web app

A burning calendar anyone can read.

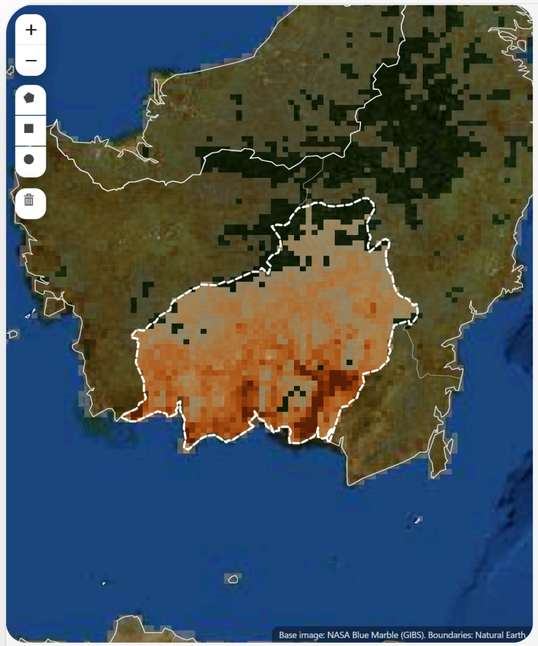


Central Kalimantan reads like an El Niño diary: 2002, 2006, 2015, 2019 and now 2026.

- **Any area:** country, province, a drawn shape, or coordinates.
- **Three views:** harmonized, raw sensors, compared with normal.
- **Accessible colours:** colour-blind safe and greyscale ramps, numbers in every cell.
- **Drill down:** click a month to map it, open any year day by day.
- **Take it away:** CSV (monthly, grid records, daily), PNG, shareable link.

In use

What a responder sees this week.



Map shows all burning, 2000 to 2026 — fewer … more

Hotspots per 0.1 degree cell (top of scale: 6,038)

Central Kalimantan

Indonesia · 1,241 grid cells · about 153,305 km²

Latest full month: October 2026

62,525

Above normal

15x above the median (4,148). 3rd highest October of 26.

This month so far: 1 to 14 November 2026

2,925

Above normal

20x above the median (143) for the same days in past years.

Record year

2015

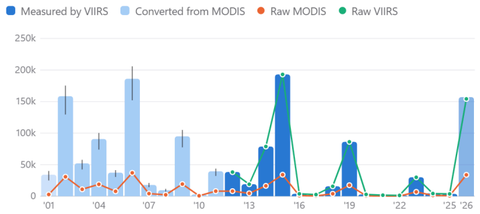
193,058 hotspots.
2026 so far: 157,049, already more than 21 of 24 full years.

Critical period

Aug to Oct

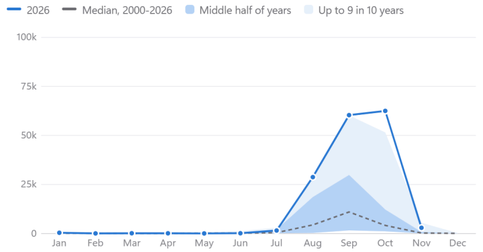
These three months hold 91% of a normal year's burning. Peak month: September.

Burning by year



Raw counts would say burning rose 2.4x after 2012, from the orange dots to the green. On one scale the change is 0.49x. Thin lines show the typical range of each converted year.

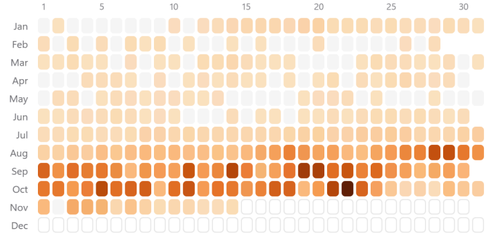
The burning season



In 2026, Jan, Aug, Sep, Oct ran above the level that 9 in 10 years stay below.

Day by day, 2026

Year 2026 · Daily CSV



Central Kalimantan, Indonesia, 2026: 157,047 hotspots. Busiest day 22 Oct (8,767). The middle 80% of the year's burning fell between 25 Aug and 22 Oct.

Central Kalimantan, data to 14 November 2026

- October 2026: **62,525 hotspots, 15x a normal October.**
- 1 to 14 November: **20x the same days** in past years.
- August to October holds **91% of a normal year's burning.** That is the critical period.
- 2026 so far already tops **21 of 24 full years.**

Before 2012 these comparisons were not possible on one scale. Now 27 years of context sit behind every number.

Impact

Built to outlive the sensors.

When MODIS switches off in 2027, the 27-year record keeps its meaning.

Who it serves

- Early warning and emergency responders in the haze belt
- Land and peat managers planning patrols before the critical period
- Scientists who need one consistent record
- Journalists and the public asking "is this normal?"

NASA data at the core

- NASA FIRMS active fires: MODIS Collection 6.1 on Terra and Aqua
- VIIRS 375 m on Suomi NPP and NOAA-20, standard and near-real-time
- NASA Blue Marble base image (GIBS)
- 30.0 million detections, November 2000 to 14 November 2026

Open, cheap, honest

- The whole record rebuilds on GitHub Actions in minutes
- Static site: no server, no login, nothing to maintain
- Stated limits: hotspots are not burned area, and values before 2012 carry a range
- Next: NOAA-21, the rest of the world, daily refresh, alerts

Try it: harithnabilf.github.io/bara · Code and method: github.com/harithnabilf/bara