

Indonesia's air quality: Decline in 2023 due to lack of intervention and El Niño. What about 2024?

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Contents

| | |
|--|-----------|
| Key findings | 1 |
| Introduction | 3 |
| Jakarta's pollution level worst since 2019 | 4 |
| Trends | 4 |
| Public responses | 6 |
| Similarly, forest and land fires in Sumatra and Kalimantan have grown worse over four years | 8 |
| Thermal anomalies | 8 |
| Pollution peaks to hazardous levels | 12 |
| Impacts on public health | 14 |
| Conclusion | 18 |
| Policy recommendations | 19 |

Indonesia's air quality:

Decline in 2023 due to lack of intervention and El Niño. What about 2024?

Key findings

- The overall 2023 air pollution level in Jakarta is arguably the worst since 2019. Despite the improvements between 2020 and 2022, the rise of pollution in 2023 is a notable setback. Over 29 million people residing in the Jakarta Metropolitan Area were exposed to unhealthy levels, for over half of last year.
- Jakarta air quality monthly trend shows that the PM_{2.5} concentration stayed in the 'unhealthy' range of 40-50 µg/m³ from June to the end of the year. This is equivalent to 8 to 10 times the 2021 WHO Air Quality Guideline (annual PM_{2.5} recommendation at 5 µg/m³). In addition, Indonesia's capital holds the 7th position in the 2023 IQAir worldwide capital city ranking for the most polluted cities based on PM_{2.5} annual average.
- In the period when the air pollution issue in Jakarta took centre stage, the conversation was mainly steered towards interventions in the transportation sector. Shown by how the trend progressed throughout the year, it is clear that the issue will not be solved without comprehensive actions to all major sources.
- The 2023's drier-than-normal dry season induced by El Niño, has resulted in the return of forest and land fires in Southeast Asia, including Indonesia. Thermal anomalies in the fire-prone regions had significantly risen in 2023, reaching over half the 2019 record in Kalimantan, and one third in Sumatra.

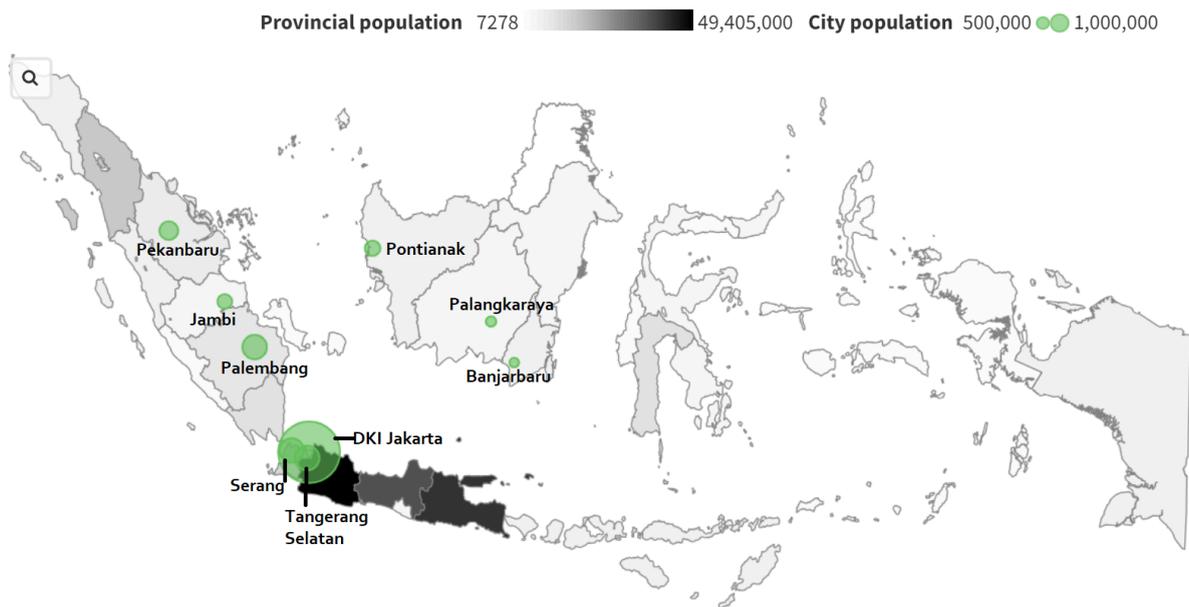
- Air quality of the selected cities in Kalimantan and Sumatra were severely affected by the fires occurring in the respective nearby regions. Levels rapidly increased with higher hotspot counts, reaching very unhealthy levels in a matter of a few days or immediately depending on distance and climate conditions.
- Due to its nature, forest and land fires smoke aerosols can be transported over long distances. The analysis confirms varying contribution shares attributed to other regions, which further highlights the need to prioritise comprehensive actions for clean air, especially in anticipation of anomalies induced by climate change.
- Citizens living in the evaluated Sumatra and Kalimantan cities, as well as in Jakarta and the nearby cities, were exposed to unhealthy and hazardous PM_{2.5} levels. In spite of the difference in the length of exposure and the variations in 24-hour levels in 2023, air pollution brought quantifiable health harm to the public health.

Introduction

Jakarta, the capital of Indonesia located on the island of Java, and a number of major cities on the island of Sumatra and Kalimantan, were exposed to high levels of air pollution throughout 2023’s drier-than-normal dry season with the return of El Niño. This briefing analyses trends from the available public data and utilises CREA’s in-house tools to provide insights on Indonesia’s past year air pollution trends, focusing on major cities shown in Figure 1.

Six Indonesian cities in review for 2023 dry season air pollution trends

Jawa: Jakarta, Tangerang Selatan, Serang
 Sumatra: Palembang, Pekanbaru, Jambi
 Kalimantan: Palangkaraya, Banjarbaru, Pontianak



Source: Indonesia Bureau of Statistics - 2022., GeoJSON provincial map, City list

Figure 1. Indonesian cities in review

Jakarta’s pollution level worst since 2019

Trends

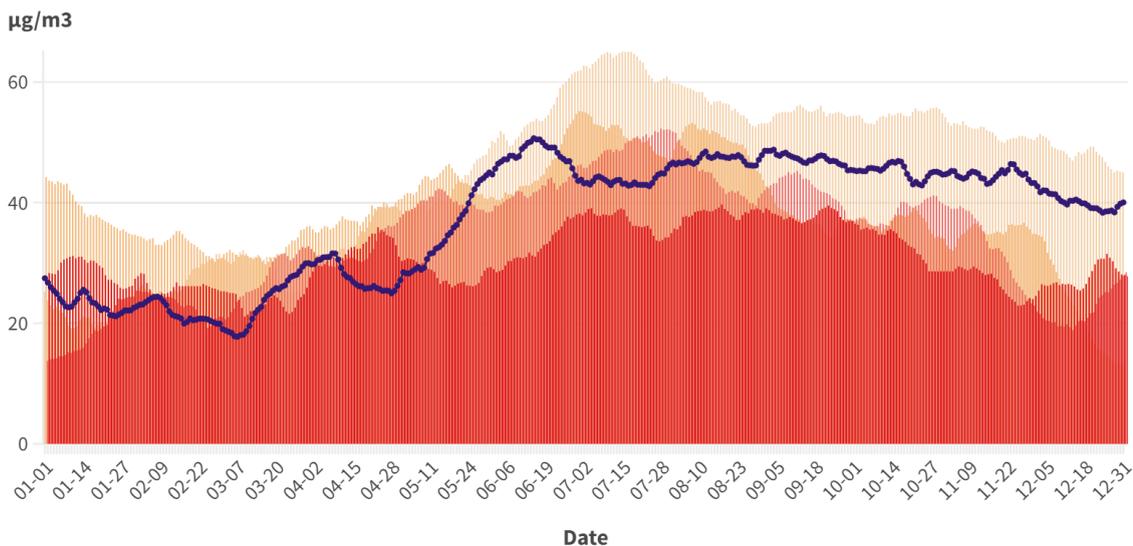
Air quality in Jakarta has been poor for the past several years, with a significant number of days when peak concentrations have exceeded Indonesia’s [national ambient air quality standards](#), enforced under Government Regulation No. 22 Year 2021 (PP 22/2021). [There is no single culprit behind this issue](#), as sources include power generation, transportation, industry, open burning (including waste and agriculture), among other sources within Jakarta and its surrounding areas.

Looking closer into the past five years’ PM_{2.5} trends in Figure 2, levels arguably improved between 2020 and 2022. Last year, however, between April and May 2023, the PM_{2.5} level increased sharply, nearly reaching the 2019 trend. Despite the subsiding trend by June, the concentration remained relatively unchanged through the end of the year, staying in the unhealthy range of 40-50 µg/m³.

Past five-year trend of Jakarta PM_{2.5} concentrations

30-day running average (2019-2023)

■ 2023 ■ 2019 ■ 2020 ■ 2021 ■ 2022



Source: AirNow. Value represents the average of Jakarta South and Jakarta Central stations

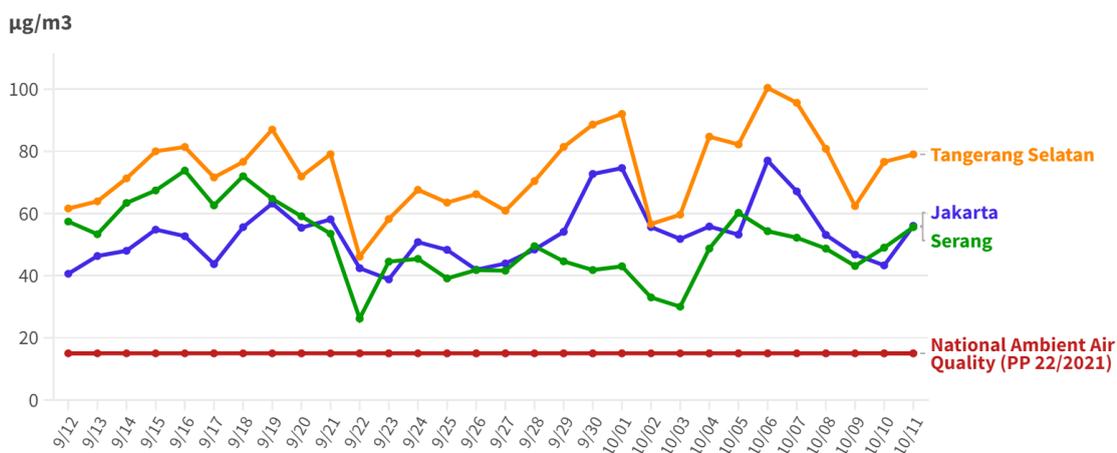
Figure 2. PM_{2.5} trend in Jakarta from 2019 to 2023

Despite the strong influence of seasonal patterns over pollution dispersion, there is clear evidence for [a persistent transboundary pollution problem](#). Major emissions sources are located across the Jakarta Metropolitan Area, Banten, and West Java, which include [136 registered industrial facilities](#) including power plants in highly-emitting sectors operating within a 100-km radius of the city borders. CREA’s analysis illustrates that the ‘airshed’ covering the urban capital of Jakarta and industrial zones across Banten and West Java regularly extends beyond its borders, strongly affecting regions within several hundred kilometres radius and even reaching Lampung, South Sumatra, and Central Java.

In 2023, CREA carried out a health impact assessment exclusively for [the Banten-Suralaya complex](#), one of Indonesia’s largest complexes of coal-fired power plants, located on the northwest tip of Java near the cities of Serang and Cilegon, about 150 km west of Jakarta. The study shows that the 6-GW complex contributes to annual mean PM_{2.5} concentrations of 0.2-0.4 µg/m³ in Jakarta, which should not be underestimated especially during high pollution days.

To better understand the extent of sustained pollution days over the Jakarta Metropolitan Area, PM_{2.5} measurements in three relevant cities: Central Jakarta, Tangerang Selatan, and Serang, were collected for analysis (see Figure 3). Tangerang Selatan is located 25 km from the southwest perimeter of Jakarta, and Serang about 85 km away from Central Jakarta.

24-hour average PM_{2.5} trends in Jakarta, Tangerang Selatan, and Serang



Source: IQAir Historical Air Quality Data

Figure 3. Daily average of PM_{2.5} levels in Jakarta, Tangerang Selatan, and Serang (12 September to 11 October 2023)

The level of PM_{2.5} between 12 September and 11 October 2023 was relatively worse in Tangerang Selatan compared to Jakarta and Serang. The average PM_{2.5} concentration in Tangerang Selatan was $74 \pm 13 \mu\text{g}/\text{m}^3$ for this period, while values for Jakarta and Serang were closer to $53 \pm 10 \mu\text{g}/\text{m}^3$ and $51 \pm 12 \mu\text{g}/\text{m}^3$, respectively.

Recent release of IQAir's [2023 World Air Quality Report](#) lists Indonesia as the 14th country with the highest average PM_{2.5} concentration in 2023, population weighted, with Jakarta in 7th position in the worldwide capital city ranking by country, region, and territory, in descending order. The report includes that **Indonesia experienced a 20% increase in PM_{2.5} levels compared to 2022, and was again ranked as the most polluted country in Southeast Asia**. Among the regional cities, South Tangerang makes the top of the list as the most polluted, followed by Tangerang in 3rd place, Bekasi in 7th, and Jakarta in 9th — all located within *Jabodetabek* or the Jakarta Metropolitan Area.

Public responses

The air pollution issue in the Jakarta Metropolitan Area did take centre stage during the 2023 high pollution season. Public pressure has grown as cases of respiratory diseases and pneumonia [spiked by 30% in March](#), reportedly reaching [over 200 thousand cases in August 2023](#), double the monthly average in 2022 (below 100 thousand cases). Not to mention, there has been a significant increase in children having persistent coughs and acute respiratory infections (*Infeksi Saluran Pernapasan Akut*, ISPA) with case counts [100% higher in September 2023 from June 2023](#).

The Government's decisions thus far have been criticised as [counterproductive, showcasing lack of commitment to address air pollution](#).

13 August 2023 – The Director General of Pollution and Environmental Damage Control (PPKL) of the Ministry of Environment and Forestry released a statement in [a media briefing](#) that the share of coal use as an energy source within Jakarta was only 0.42%, and the major shares are coming from gas and oil. In addition, the Director General stated that 44% of emissions come from transportation, residential energy use, manufacturing, and commercial activities in buildings.

14 August 2023 – [Another media briefing](#) was held where the Minister of Environment and Forestry reiterated that coal-fired power generation does not contribute to ongoing pollution in the Jakarta Metropolitan Area, highlighting that the percentage of coal use

within Jakarta is less than 1% and showcasing the plume from the 4,025-MW Banten Suralaya coal-fired power station complex dispersing towards the Sunda Strait, strictly between 27 July and 9 August 2023.

28 August 2023 – [An updated statement](#) was released by the Minister of Environment and Forestry. This time, the Minister stated that 44% of the shares came from transportation, 34% from coal-fired power plants, and the rest from residential fuel use, open burning, and other sources.

Instead of comprehensively tackling all the major pollution sources, the conversation was mainly steered towards interventions in the transportation sector, the sector that has been solely blamed as the main pollution source. [Policy interventions specifically applied to the Jakarta Metropolitan Area](#) were issued by related agencies in this time period, including a work-from-home policy, a [“4-in-1” policy](#) (persons per vehicle), stricter emissions testing, use of fuels with higher octane rating in vehicles with higher engine capacity, use of electric vehicles in operational procurement in government and private institutions, and increased use of public transport.

9 September 2023 - A newly formed Greater Jakarta Air Pollution Control Task Force identified [32 companies around Jakarta](#) as contributors to pollution – from coal stockpile companies, coal-fired power plants, boiler operators, manufacturing companies, cement plants, to metal smelting facilities. While coal-fired power plants and industrial emissions have been recognized as one of the main contributors to Jakarta’s high pollution episodes, the Task Force has yet to implement inter-provincial actions beyond monitoring, temporary suspensions, and administrative sanctions to effectively mitigate pollution coming from power and industrial sectors.

Unless there is commitment from all high-level officials, ultimately a strong push from the President, it will be difficult for air pollution to be properly addressed. Considering how the Citizens' Lawsuit from the Ibu Kota Coalition¹ evolved over the last few years since the Court decided in favour of **the 32-citizen demand for Clean Air in September 2021**, the Government has only been stalling and avoiding real actions.

Two weeks after the Court ruling in October 2021, the President, the Minister of Environment and Forestry, Minister of Environment and Forestry, the Minister of Home Affairs, and Minister of Health, as well as the Governor of Banten and the Governor of West Java [submitted the first appeal to the decision](#). To note, only the Governor of DKI Jakarta

¹ *Inisiatif Bersihkan Udara Koalisi Semesta (Koalisi Ibu Kota)*

accepted the September 2021 ruling. In October 2022, [the High Court of DKI Jakarta rejected the appeal](#).

In **January 2023**, the President and the Minister of Environment and Forestry submitted another appeal for the ruling, which can be perceived as a rejection to the citizens' appeal or a means to avoid accountability or both. In November 2023, [this second appeal was rejected by the Supreme Court](#).

Proceedings of the Citizens Lawsuit submitted by the Ibu Kota Coalition shows how urgent the topic of air pollution is, where even when people's demands have been legally accepted, to date there have been no consistent or concrete efforts to deal with pollution sources. Now that the Supreme Court has established that the Government must set and implement a comprehensive action plans for Jakarta, people living not only in Jakarta but also throughout the country should seize this opportunity to unite their voices to demand the right to blue skies and clean air – especially as the country transitions to the new administration towards the end of 2024.

Similarly, forest and land fires in Sumatra and Kalimantan have grown worse over four years

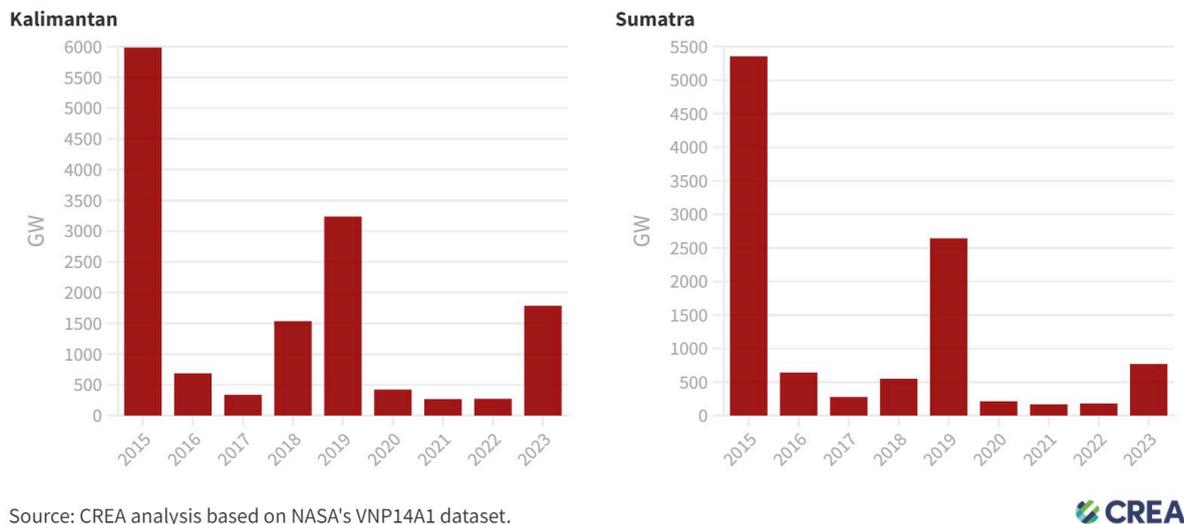
Thermal anomalies

The growing forest and land fires phenomenon has returned to the southern region of Southeast Asia, gradually becoming worse throughout [2023's drier-than-normal dry season brought on by El Niño](#). Forest and land fires in these regions have a widespread and harmful impact on air quality. Smoke from these fires is hazardous, and tends to be transported by wind for hundreds of kilometres, potentially reaching [Indonesia's neighbouring countries, Malaysia and Singapore](#).

Shown in Figure 4, thermal anomalies in Indonesia's fire-prone regions, Sumatra and Kalimantan. The radiative power detected by the satellite-borne sensors VIIRS between July and November remained low from 2020 to 2022 in both regions. **Unfortunately, fire activity rose in 2023, reaching over half the radiative power in 2019 in Kalimantan, and one third of the 2019 record in Sumatra.**

Thermal anomaly in Kalimantan and Sumatra during dry season

July - November



Source: CREA analysis based on NASA's VNP14A1 dataset.



Figure 4. Cumulative thermal radiative power in Kalimantan and Sumatra (July 2015 to November 2023)

Depending on wind speed and direction, not all biomass burning hotspots affect cities' air quality equally. CREA used the HYSPLIT model to compute the daily trajectory of air reaching the relevant cities in review, and count the number of hotspots along these trajectories. With this methodology, it is then possible to have an indication of the contribution to air pollution from biomass burning originating from different regions.

The analysis provided in Figure 5 shows shares of radiative power, isolated for the contributing biomass burning spots in various parts of Indonesia, namely Sumatra, Kalimantan, Nusa Tenggara, Java, as well as other neighbouring countries.

Origin of biomass burning affecting air quality in selected Indonesian cities

Fire radiative power (MW)



Source: CREA analysis. • Detected fires by VIIRS within 50km of 4-day air trajectories.
Download data



Figure 5. Biomass burning contribution to selected Indonesian cities' air quality

Prior observation implies that there was a significant increase in 2023 across all cities in review, especially compared to prior years of 2020, 2021, and 2022. For the selected cities in Sumatra (Jambi, Palembang, and Pekanbaru), nearly all isolated shares over the years came from burning spots located in Sumatra. Same applies to the selected cities in Kalimantan (Palangkaraya and Pontianak), where biomass burning pollution comes almost exclusively from spots in Kalimantan.

The data also shows linkages of air pollution contribution from other regions, indicating long-range transport of pollutants. In Palembang, there was about 10% share from both Nusa Tenggara and Java in 2023. In Pontianak, growing share of biomass burning pollution from Nusa Tenggara when comparing 2019 share against 2023. Most interesting is the share for Jakarta. While isolated radiative power is much lower compared to forest and land fires in Sumatra and Kalimantan, there were almost equal shares coming from within Java, and long distance contributions from Nusa Tenggara and even Australia.²

The return of El Niño in 2023 led to a dryer landscape, making areas more prone to fires. A series of images from [the US National Aeronautics and Space Administration's \(NASA\) Terra satellite](#) serves as a striking visual for the rising fire activities in Kalimantan. The article highlights that while fires were expected to rise during the dry season, typically lasting from June to December, activities peaked from August into October in 2023. In October 2023, Indonesia's Meteorology, Climatology and Geophysics Agency (*Badan Meteorologi, Klimatologi dan Geofisika*, BMKG) released statements [regarding El Niño's development](#) and its impacts on clean water availability, agricultural activities, and forest and land fire management. **The agency stated that most areas in Indonesia had [very low rainfall between July to October 2023](#).**³

While the Minister of Environment and Forestry claimed that [994,300 hectares of total forest and land fire area in 2023](#) was 30% lower than the 2019 total area of 1,436,000 hectares, **efforts to strengthen fire prevention should be pursued given the variability in natural climatic phenomena.** The Minister further stated that while El Niño occurred in both 2019 and 2023, it was possible to mitigate its impacts in 2023 thanks to improvements in forest and land fire management through anticipatory actions and landscape management. Despite this fact, it should be noted that fire activities in 2023 were indeed much more significant compared to those in 2022, which were recorded at 198,600 hectares, or less than one-fifth of the 2023 total affected areas.

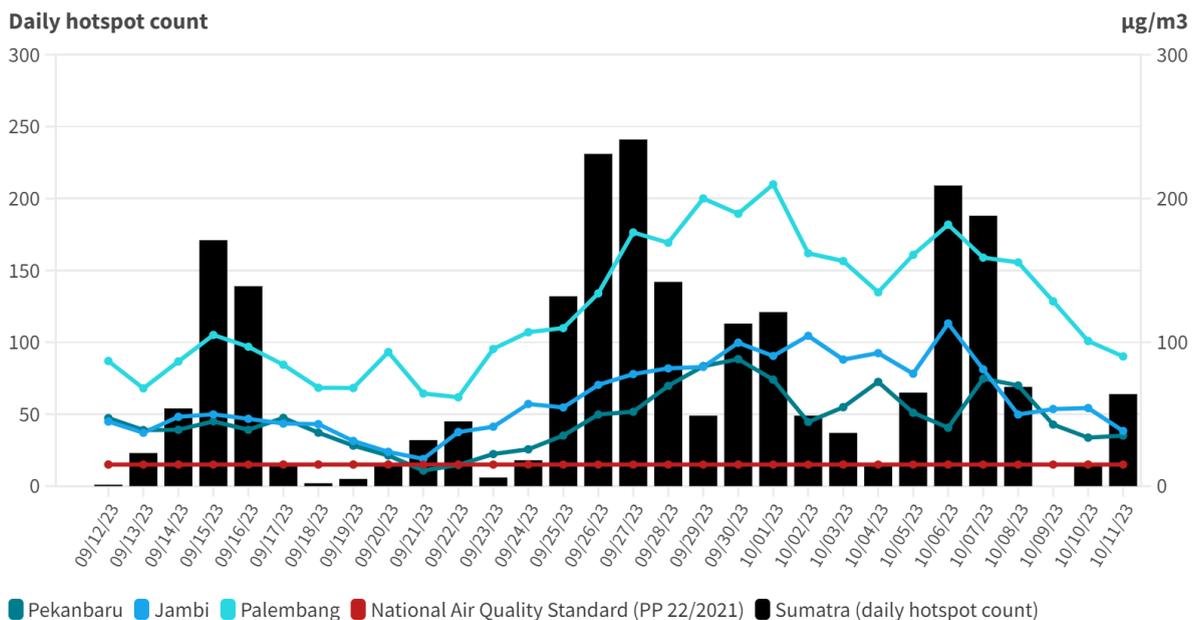
² NASA's animation, ["Global transport of Australian bushfire smoke"](#) based on August 2019 to December 2020 data, illustrates long-range transport of pollutants around the globe. [Global Forest Watch](#) highlighted that Australia has seen nearly twice the number of fire alerts by mid-December 2023, compared to the same point in the 2019-2020 season, also known as the "Black Summer".

³ Areas in South Sumatra, Java, Bali, Nusa Tenggara, South Kalimantan, North Sulawesi, South Sulawesi, Maluku, and South Papua went from 21 to 60 consecutive days without rain. Longer periods over 60 days of no rainfall were reported in Lampung, West Java, Banten, DKI Jakarta, Central Java, Yogyakarta, East Java, Bali, Nusa Tenggara, Central Kalimantan, South Sulawesi, Southeast Sulawesi, Maluku, and Papua.

Pollution peaks to hazardous levels

As thermal anomaly rises in 2023, air quality worsens. For the selected cities during the period of 12 September to 11 October 2023, PM_{2.5} peaks were seen to be nearly synchronised with increase in hotspot counts. The Sumatran cities of Pekanbaru, Jambi, and Palembang are located in relatively close proximity to the island’s fire zones. As illustrated in Figure 6, levels rapidly increased with higher hotspot counts, reaching unhealthy levels in Jambi and Pekanbaru, and very unhealthy levels in Palembang in a matter of a few days or immediately.

Daily hotspot count in Sumatra, and 24-hour average PM2.5 trends in Pekanbaru, Jambi, and Palembang



Source: IQAir - Historical Air Quality Data, ASEAN Specialised Meteorological Centre - Hotspot Information



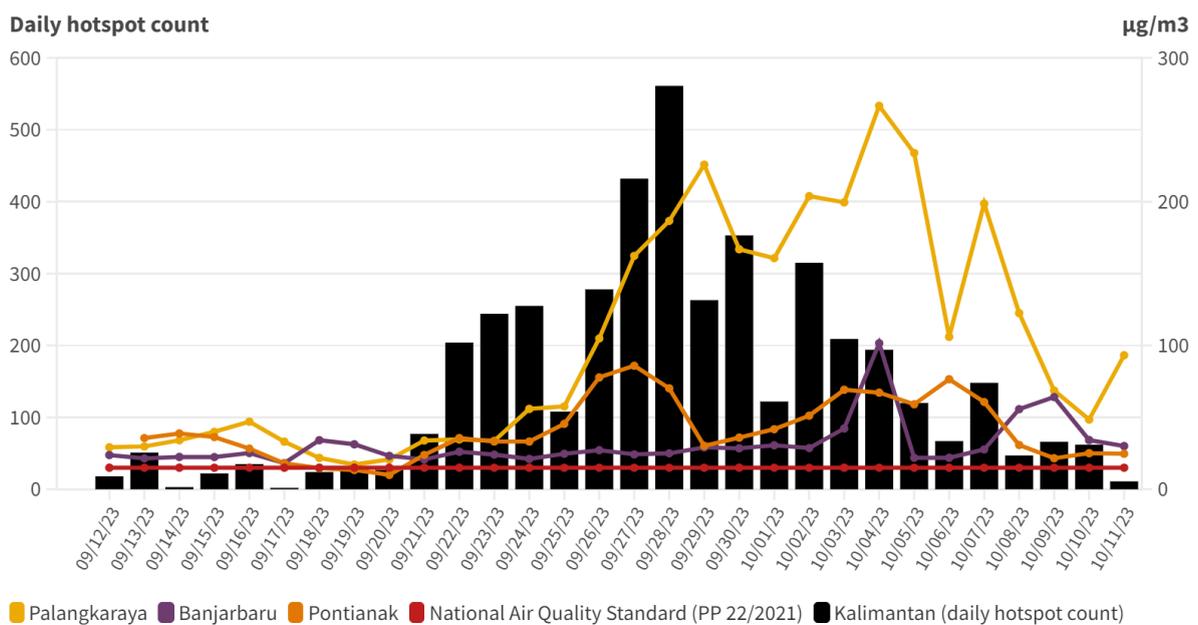
Figure 6. PM_{2.5} levels against daily hotspot counts in Sumatran cities of Pekanbaru, Jambi, and Palembang (12 September to 11 October 2023)

Among the Kalimantan cities in review, only Palangkaraya and Banjarbaru are located near the island’s fire zones in Central and South Kalimantan. Pontianak is located in West Kalimantan, about 1,200 km northwest of Palangkaraya and Banjarbaru. Fire spots were also identified in the West Kalimantan region, directly affecting Pontianak’s air quality. On

top of this, air pollutants with longer atmospheric lifetimes originating from Central and South Kalimantan were also likely to reach other parts of Kalimantan, including Pontianak.

Illustrated in Figure 7, Palangkaraya was exposed to an exceptionally high PM_{2.5} level daily, surpassing the hazardous level set at the 250 µg/m³ threshold, going even beyond 500 µg/m³ at its worst. Levels in Pontianak and Banjarbaru were comparatively similar, where citizens were exposed to unhealthy levels between 75 to 150 µg/m³ during the same period.

Daily hotspot count in Kalimantan, and 24-hour average PM_{2.5} trends in Pontianak, Palangkaraya, and Banjarbaru



Source: IQAir - Historical Air Quality Data, ASEAN Specialised Meteorological Centre - Hotspot Information



Figure 7. PM_{2.5} levels against daily hotspot counts in Kalimantan cities of Pontianak, Palangkaraya, and Banjarbaru (12 September to 11 October 2023)

Impacts on public health

In 2021, the World Health Organization (WHO) firmly called for a global response on air pollution by tightening the recommended levels for major air pollutants in [updated global air quality guidelines](#). While there is no ‘safe level’ of exposure, the levels are health-based, ultimately designed to protect the global population from health burdens and risks posed by air pollution.

[The current 2021 WHO global air quality guidelines](#) (AQG) set an annual PM_{2.5} average concentration at 5 µg/m³, and a 24-hour average concentration at 15 µg/m³, not to be exceeded for more than 3-4 days per year. The guidelines also specify recommended levels for ground-level ozone (O₃), coarse particles (PM₁₀), carbon monoxide (CO), sulphur dioxide (SO₂), and nitrogen dioxide (NO₂).

To inform the public on air quality, a number of government agencies utilise colour-coded index values based on health concerns. The index rating corresponds to each country’s national air quality standards.

The United States Environmental Protection Agency (US EPA) refers to [the US Air Quality Index \(AQI\)](#), which presents a normalised scale for air quality based on measured concentrations of the five regulated major air pollutants (SO₂, NO₂, ground-level O₃, Particulate Matter including PM_{2.5} and PM₁₀, and CO). At an AQI of 100, pollutant levels are meeting the short-term national ambient air quality standard. As the AQI value exceeds 100 and grows higher, air pollutant levels have exceeded the national standard, indicating exposure to higher health risks.

Indonesia’s Ministry of Environment and Forestry established [a national air quality index system for Indonesia](#) in [2020](#) to inform the public on ambient air quality levels, referred to as *Indeks Standar Pencemar Udara* (ISPU). Indonesia’s ISPU considers the same five air pollutants, and also includes hydrocarbon (HC) in the calculation. There are five colour-coded categories to help the public identify health risks at different levels (see Figure 8).

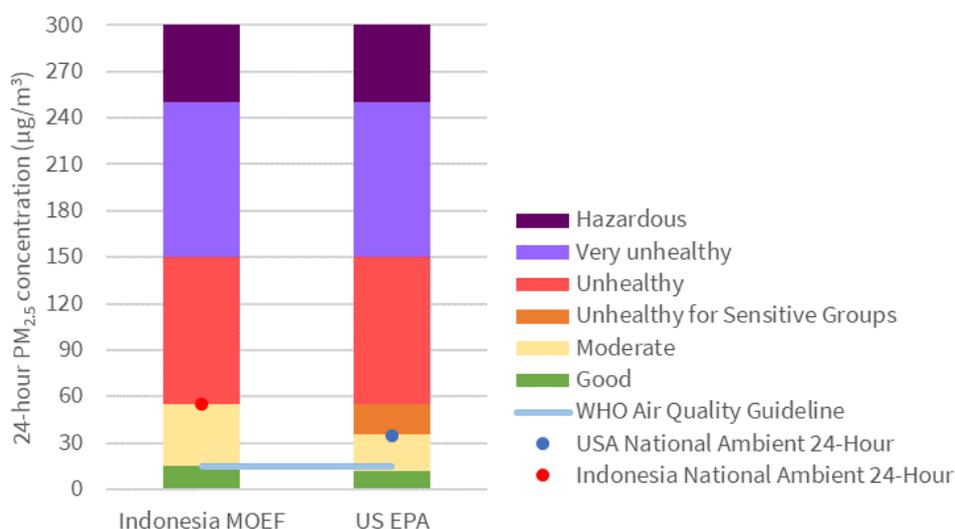


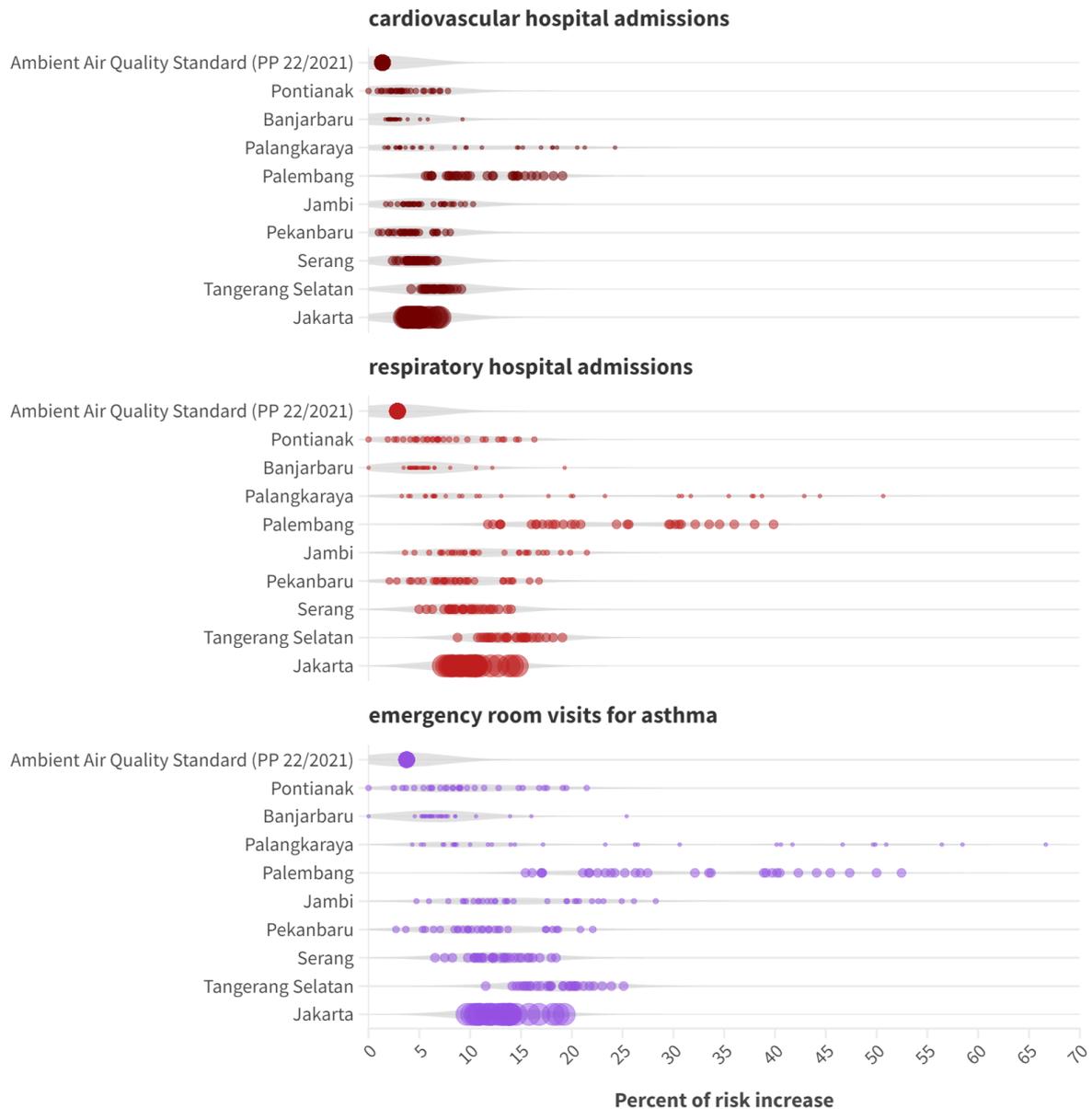
Figure 8. Comparison of PM_{2.5} concentration categories in Indonesia’s ISPU and the US AQI, along with the WHO 24-hour AQG and national ambient standards in Indonesia and the United States

The major difference between the two index systems is the additional sub-category under the ‘unhealthy’ category in the US AQI, which indicates exposure to PM_{2.5} concentration between 33.5 to 55.4 µg/m³ as ‘unhealthy for sensitive groups’. The threshold of 35 µg/m³ is also set as the national ambient 24-hour standard for PM_{2.5} in the United States.

Indonesia’s ISPU categorises the same range as ‘moderate’. In addition, the national ambient 24-hour standard for PM_{2.5} in Indonesia is set at 55 µg/m³, which is nearly four-fold higher than the WHO guidelines at 15 µg/m³. In order to protect public health from harmful air pollution impacts, a strong commitment to meet the set national standards and continued efforts to align with the WHO guidelines becomes more and more important as [changes in climate unfavourably affect global air quality](#).

The WHO’s statement, ‘clean air is fundamental to health’ is indisputable. There has been overwhelming scientific evidence proving the harmful effects due to both short-term and long-term exposure to PM_{2.5}. [Epidemiological studies](#) have quantified positive associations with respiratory, cardiovascular, and nervous system effects, as well as cancer and mortality.

CREA’s analysis of the risk increase associated with the PM_{2.5} peaks recorded in the evaluated cities across Sumatra and Kalimantan, as well as Jakarta and its two neighbouring cities, is illustrated in Figure 9 below.



Source: CREA Analysis for 12 Sep - 11 Oct 2023. Risk ratio functions for cardiovascular and respiratory hospital admissions refer to WHO, 2013; emergency room visits for asthma refer to Zheng et al., 2015., World Health Organization (WHO) 2013: Health risks of air pollution in Europe – HRAPIE project Recommendations for concentration–response functions for cost–benefit analysis of particulate matter, ozone and nitrogen dioxide., Zheng, X., Ding, H., Jiang, L., Chen, S., Zheng, J., Qiu, M., Zhou, Y., Chen, Q., & Guan, W. (2015). Association between air pollutants and asthma emergency room visits and hospital admissions in time series studies: A systematic review and meta-analysis. PLOS ONE, 10(9), e0138146.

- Each dot represents each day's risk, and dot size represents population

Figure 9. Percent of health risk increase associated with exposure to elevated 24-hour PM_{2.5} levels in the evaluated cities across Indonesia (12 September to 11 October 2023)

The average risk increase for the analysed cities and time period is summarised in Table 1.

Table 1. Average of risk increase in the evaluated cities associated with exposure to elevated 24-hour PM_{2.5} levels (12 September to 11 October 2023)

| Percent of incident risk increase | Cardiovascular hospital admissions | Respiratory hospital admissions | Emergency room visits for asthma |
|---|------------------------------------|---------------------------------|----------------------------------|
| Ambient Air Quality Standard (PP 22/2021) | 1.4% | 2.9% | 3.8% |
| <i>Kalimantan</i> | | | |
| Palangkaraya | 9.2% | 19.2% | 25.3% |
| Pontianak | 3.6% | 7.6% | 10.0% |
| Banjarbaru | 2.9% | 5.8% | 7.6% |
| <i>Sumatra</i> | | | |
| Palembang | 11.2% | 23.5% | 30.9% |
| Jambi | 5.6% | 11.6% | 15.3% |
| Pekanbaru | 4.2% | 8.8% | 11.6% |
| <i>Jakarta Metropolitan Area</i> | | | |
| Tangerang Selatan | 6.7% | 14.0% | 18.5% |
| Jakarta (Central) | 4.8% | 10.1% | 13.3% |
| Serang | 4.6% | 9.6% | 12.7% |

During the 2023 dry season, citizens living in the evaluated Sumatra and Kalimantan cities were exposed to severe health risks from exposure to unhealthy and hazardous PM_{2.5} concentration levels due to sharp rises in biomass burning. Risks of cardiovascular and respiratory hospital admissions increased by 3 to 24%, and asthma-related emergency room visits by 8 to 31%, with Palangkaraya and Palembang exposed to the upper ranges.

In Jakarta, Serang, and Tangerang Selatan, levels remained in the unhealthy range throughout the 2023 dry season, which prolonged exposure to higher PM_{2.5} concentrations. The Jakarta Metropolitan Area or Jabodetabek (Jakarta–Bogor–Depok–Tangerang–Bekasi) is home to [over 29 million people](#) or about 11% of Indonesia's entire population.

Given the high density of the megapolitan area, the risk increase is prevalent, especially when such a significant portion of Indonesian citizens are exposed to higher health risks. Analysis shows that the increase of risks ranges between 5 to 14% for cardiovascular and respiratory hospitalisation cases, and 13 to 19% for asthma-related emergency room visits in the evaluated cities of the Jakarta Metropolitan Area, with Tangerang Selatan exposed to the upper ranges.

Conclusion

Declining air quality in the evaluated cities across Sumatra, Kalimantan, and the Greater Jakarta Area in the latter half of 2023 is clear and concerning. While air pollution peaks in Indonesia tend to occur annually during the dry season, the lingering urban pollution problem across the Jakarta metropolitan area and the persistent seasonal risks of forest and land fires in Indonesia's fire-prone regions of Sumatra and Kalimantan only became greater with the return of El Niño in 2023.

PM_{2.5} is the most harmful air pollutant that penetrates deep into the airways, and has a well-studied and quantified association with various diseases and premature mortality. Citizens across Indonesia are exposed to higher health burdens and risks, having been exposed to high concentration levels of fine PM_{2.5} particles at different time periods, both short-term and long-term.

These air pollution-related health impacts and economic costs remain largely unaccounted for, and will continue to harm public health and economic development unless interventions for clean air are taken. Air pollution is a pressing threat not only in light of this, but more importantly due to its strong linkage to the natural climatic phenomenon, El Niño.

Policy recommendations

Meaningful interventions to systematically reduce air pollution nationwide and enforce a strict forest and land fire management framework must be prioritised to avoid foreseeable national risks in the coming years.

To effectively address air pollution, CREA calls for the nationwide implementation of the National Air Quality Standards set in [Government Regulation No. 22 Year 2021](#), through the following measures:

First, the National Government as well as the Regional Government must agree on a time-bound target, to be met collectively nationwide. Commitments within the official duties specified in the Jakarta Citizens Lawsuit's ruling would cement this effort for Jakarta and the neighbouring provinces of Banten and West Java. Such effort should also be replicated and implemented in all provinces across the country.

Second, the Government should develop sector-specific action plans that would effectively reduce, minimise, and eliminate point sources. Existing knowledge of key sources and its contribution — namely transportation, power generation, industrial sources, biomass burning, and others that might be region-specific, should be the basis of this effort, keeping in mind further pursuit to expand this information through source apportionment studies.

CREA highlights that actions in all sectors are essential in tackling air pollution, and recognizes industrial thermal power plants as one of the sectors with great potential in pollution reduction. These large, stationary point sources are considered as the low hanging fruit in air pollution mitigation efforts, considering [the well-established regulatory framework](#) enabling close monitoring and coordination with regulatory bodies in Indonesia and other countries across the globe.

CREA recommends the following policy interventions:

- 1. Enforcement of the updated 2019 emissions standards for all planned thermal power plants, including ones currently under construction**, to ensure that plants can still be retrofitted to fit stricter and safer emissions standards. Installation of Continuous Emission Monitoring Systems (CEMS) in all relevant facilities for all major pollutants should be pursued as part of compliance requirements.
- 2. Establishing real-time and time-averaged emissions reporting systems that can be easily accessed by the public.** This national platform will serve as a tool to help understand the air quality issues, and will become an asset for regulators and monitoring bodies to formulate and enforce evidence-based policies.
- 3. Review of emissions standards for industries based on sector-specific Best Available Technology.** Monitoring and enforcement of emission standards needs to be improved so that emitters have a strong incentive to comply. In addition to this, policymakers and enforcement agencies would be able to assess and determine the most suitable implementation pathway.