Many parts of the Asia and the Pacific region, including Thailand, experience very poor air quality levels with a seasonal pattern, which can be attributed to multiple sources. In Bangkok, relatively higher fine particulate matter (PM$_{2.5}$) levels are observed starting November and lasting until April in some years (Figure 1). In addition to vehicles, construction, and industrial sources, open burning of agricultural residues in rural areas and the burning of municipal waste are sources of pollution highlighted in Thailand during this period.

On 7 December 2021, the ASEAN Specialised Meteorological Centre alerted the start of the Northeast Monsoon which is expected to last until March 2022. During this period of dry weather, there may be an increase in hotspots\(^1\) in the northern ASEAN region.\(^2\) Based on the Centre's outlook on 13 January 2022, increased hotspot activities and localised smoke plumes can be expected in dry areas of the Mekong sub-region.

Daily average PM$_{2.5}$ levels in Bangkok and surrounding areas in the last month is illustrated in Figure 2. Elevated levels of PM$_{2.5}$ were observed from 21-25 December 2021. The 7-day forecast by the Pollution Control Department can be accessed here.

As more becomes known about the underlying health conditions that make certain individuals more susceptible to COVID-19 there is also a growing scientific evidence that air pollution which itself affects the more vulnerable and disadvantaged in society could exacerbate and make COVID-19 more severe.

Air quality, including the concentration of fine particulate matter (those of 2.5 micrometers or less in diameter – or “PM$_{2.5}$” which cause significant health impacts), is typically communicated through an air quality Index (AQI), which takes into account concentration of five key pollutants, i.e. PM$_{2.5}$

\(^1\) For more information, visit http://asmc.asean.org/asmc-hotspot/
\(^2\) For more information, visit http://asmc.asean.org/asmc-alerts/
and PM$_{10}$, ground level ozone, carbon monoxide, nitrogen dioxide, and sulphur dioxide. Thailand’s AQI ranges from “Excellent” to “Very unhealthy”.

Figure 1. Daily average PM2.5 levels in Bangkok from 2016 to 2021

Figure 2. Daily average PM$_{2.5}$ levels in Bangkok and surrounding areas from 15 December 2021 to 14 January 2022

Effects of air pollution on human health

Air pollution poses significant health risks to everyone and different pollutants affect our bodies in different ways. Certain groups of people are more vulnerable than others including:

- People with lung diseases such as asthma or chronic obstructive pulmonary disease (COPD)
- Children under five and elderly adults (9 percent of neonatal outcomes such as low birth weight, pre-term birth and lower respiratory infections are attributable to air pollution in Thailand)$^3$
- Pregnant women
- People with a cardiovascular disease or diabetes
- People who work or exercise strenuously outdoors
- People who live or work in close proximity to activities with high levels of air pollution including busy highways, poorly managed demolition and construction sites, open burning of waste, forest fires.
- People who smoke and/or are exposed to second-hand smoke

Thailand recognizes air pollution as one of the causes of non-communicable disease (NCD).$^4$

WHO global air quality guidelines on particulate matter (PM$_{2.5}$ and PM$_{10}$), ozone, nitrogen dioxide, sulfur dioxide and carbon monoxide: Click here


$^4$ More information is available here: https://www.who.int/thailand/activities/un-thematic-working-group-on-noncommunicable-diseases-(ncds)-in-thailand
Three things we can do to reduce exposure to air pollution

1. **Be aware - monitor the Air Quality Index (AQI) in your city and area**

The AQI is a tool for reporting on air quality that links the levels of various air pollutants to a system of colour coding, alerts and public health advice. Thailand’s [air_quality_index](#) system from the Pollution Control Department is available as a mobile application called Air4Thai both [iOS](#) and [Google Play](#) or through web. In addition, a [3-day forecast](#) of air quality is available. The UNEP and AirVisual Air Quality Platform can be used as an additional reference: [https://www.iqair.com/unep](https://www.iqair.com/unep).

Alternatively, levels of key pollutants can be compared to national air quality standards or the WHO Air Quality Guidelines, which identify the concentrations of air pollutants which would not be expected to cause adverse health effects.

2. **Reduce exposure to pollutants in your home**

   - **Identify pathway by which polluted outdoor air enters the indoor environment** such as poorly fitted doors or windows, air conditioning system, etc., and ensure that these are properly sealed.
   
   - **Minimize internally created pollutants** like cigarette smoke and items that burn (candles, firewood, incense), cooking fumes, ozone generating air cleaners, etc. Do not burn leaves, garbage, and other materials in your backyard.
   
   - **Keep rooms inside your home clean** - wet mopping is preferable to sweeping as these stir up additional dust and particles. Consider using a vacuum cleaning with HEPA filter.
   
   - **Consider using an air purifier** (non-ozone generating type) at home, in addition to daily precautions and if indicated. (Refer to the [SEARO FAQ](#) “what to do when there is an air pollution alert and [FAQ](#) on air cleaning devices from California EPA). Recommendations:
      - Suitable cleaning technology: For removing fine particles, highly efficient filters, such as High Efficiency Particulate Air (HEPA) filters (with a rating of HEPA 13 or above), are preferred.
      - Appropriate Size: For effective cleaning, the unit should be sized appropriately for the intended room. The effective floor area, air changes per hour and flow rate of the air purifier are factors to consider for this purpose.

   - **Clean your air conditioner filters regularly** and have the coil regularly serviced.

3. **Personal measures to reduce risk when outdoors**

   - **Limit time and prolonged or heavy exertion outdoors** during periods of, and in areas with, high levels of air pollution.

   - **Appropriate masks may be considered in certain circumstances** such as an [N95 or N99](#) (which filter particulate matter as low as PM2.5) if outdoors for prolonged periods and/or the AQI levels are high (e.g., AQI level above 100). Scientific evidence is still limited on the effectiveness of masks. Disposable surgical masks, bandanas and dust masks should not be relied upon as they are largely ineffective in providing protection against fine particles.
• **COVID-19, pollution, and mask-wearing:** Where available, well-fitted and correctly worn mask types N95, KN95 or FFP2 without an exhalation valve help filtering a large percentage of particles larger than 0.3 microns and can also serve as a COVID-19 mitigation measure.

• **Reduce exposure to pollutants while commuting by car** by minimizing or stopping unnecessary travel, closing the windows, setting the air conditioning to recirculate, and consider using accessory air filters suitable for your vehicle. In addition, air the car during journeys of more than 40 minutes.

**What about our compound’s air quality?**

If you are afraid that the indoor air at our compound may be as polluted as the Bangkok outdoor air, be reassured, our facilities management team have a range of measures to actively control and minimize any pollution indoors!

The UN Compound’s air conditioning and ventilation system has a **two-stage air filtration - primary (fresh air units) and secondary (floor units)** with MERV-13 filters with antimicrobial media, that are able to trap small size contaminants, including fungal and bacterial spores, and keep a very low particulate count.

Building management software **constantly monitors** and controls the concentration **levels of carbon dioxide (CO₂)**, which are kept well below international thresholds for office environments (1000-1200 ppm).

On a weekly basis, our “Particle counter” (AeroTrak TSI 9306 V2) is used to collect accurate information on the compound’s indoor air quality based on ISO 14644-1 a standard used for rating clean rooms and compare our readings against Class 9 which is for offices and commercial buildings. The instrument counts particles per square meter of 0.3 μm, 0.5 μm, 1 μm, 3 μm, 5 μm and 10 μm particles. The reports are analysed by ESCAP facilities team to inspect for presence of airborne contaminants and take corrective measures, if necessary.

During recent days of hazardous pollution levels in Bangkok, the air quality inside the facilities is being checked to ensure we maintain safe levels, thanks to the high-efficiency filters of the Air Handling Units and the Fresh Air Pre-treatment Units.

**Preventive maintenance activities** are carried out, such as regular cleaning and changing of air filters. These filters are also antimicrobial to prevent growth of microbes.

Our indoor air quality **complies with or is well within ASHRAE** and other international standard requirements for office environments, as shown in the tables below:

<table>
<thead>
<tr>
<th>Air quality indicator</th>
<th>ASHRAE requirements</th>
<th>OSHA req.</th>
<th>UN Compound</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Amount of CO₂</td>
<td>1000-1200 ppm</td>
<td>CO₂ &lt; 5,000 ppm</td>
<td>CO₂ &lt; 1,000 ppm</td>
</tr>
<tr>
<td>2. Temperature/humidity</td>
<td>Temperature 22.8 – 26 °C, Humidity &lt;70%</td>
<td>24-26 for offices, 23-26 for Conference Rooms 50-60%</td>
<td></td>
</tr>
<tr>
<td>3. Presence of airborne contaminants</td>
<td>Ventilation 8.5 m³/h/person (5 cfm/person)</td>
<td>8.5 m³/h/person minimum</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Size</th>
<th>Class 9 Cleanroom Maximums (particles per m³)</th>
<th>ESCAP Office Average (particles per m³) Year 2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥ 0.3 μm particles</td>
<td>102,000,000</td>
<td>18,028,450</td>
</tr>
</tbody>
</table>
The results of indoor air quality measurements in the table above showed the good indoor air quality within the range of cleanrooms standard.

For any other related queries and concerns on this topic, please contact the UN Medical Service in Bangkok by email: bkmmedservice@un.org, or the ESCAP Facilities Management Unit.

<table>
<thead>
<tr>
<th>≥ 0.5 μm particles</th>
<th>35,200,000</th>
<th>1,920,322</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥ 1 μm particles</td>
<td>8,320,000</td>
<td>234,259</td>
</tr>
<tr>
<td>≥ 3 μm particles</td>
<td>846,000</td>
<td>58,913</td>
</tr>
<tr>
<td>≥ 5 μm particles</td>
<td>293,000</td>
<td>32,628</td>
</tr>
<tr>
<td>≥ 10 μm particles</td>
<td>69,200</td>
<td>4,683</td>
</tr>
</tbody>
</table>

What you can do to help reduce the air pollution levels?

1. Think seriously before using your car for a journey. Consider the benefits offered by other modes of transport, like cycling, walking or using public transport (for example: increased safety, particularly for children; reduced congestion; better health by ensuring you meet the World Health Organization (WHO) recommended 20 minutes of exercise every day; saved time, it can be much quicker to travel by other forms of transport than by car; saved money).

2. When doing the school run, shopping or going to work, think about car sharing, turn off your engine while stationary, maintain your car properly and reduce your speed.

3. Buy ‘green’ and ‘efficient’ (for example, when buying your next vehicle consider an electric one or a hybrid one with greater fuel economy and lower emissions).

4. Look at reducing your energy consumption at home or switching to clean renewable energy sources.

5. Do not burn solid fuels, particularly rubbish or treated woods.

6. Be careful when burning candles and incense indoors to have good ventilation with outside air.