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GROWING UP IN THE HAZE

Addressing air pollution and its impact on children in East Asia and the Pacific: an agenda for action

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The deadly impact of air pollution on children's health and wellbeing

Air pollution is one of the greatest threats to children's health and wellbeing.

In 2021, **over 100 children under 5 died every single day** in East Asia and the Pacific due to air pollution-linked causes.[1]

Children in all countries in East Asia and the Pacific are exposed to unhealthy levels of air pollution.

This is not only alarming. It is unacceptable. When children breathe toxic air, it harms their health and jeopardizes their future. Air pollution causes both immediate and long-term health effects in children that can be irreversible.

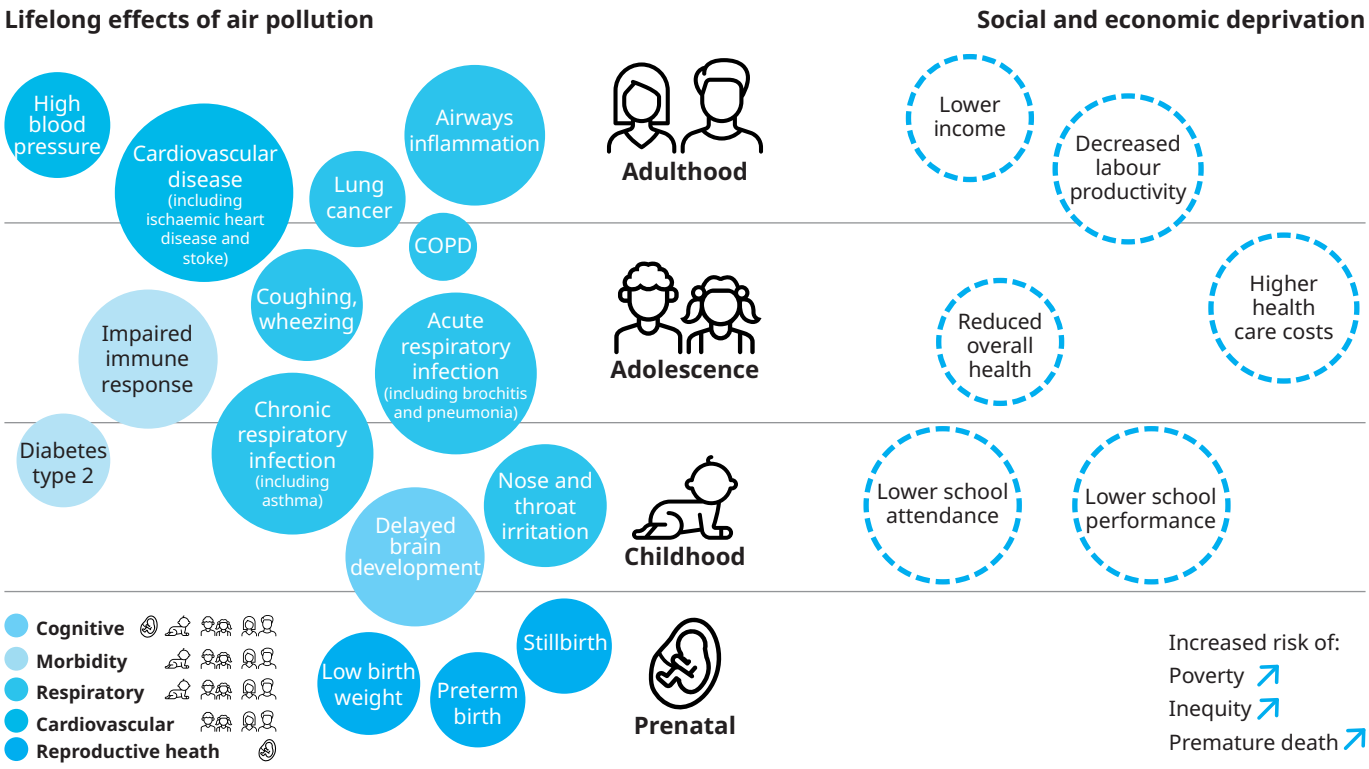
The effects of air pollution impact every stage of the life cycle. Damage caused by air pollution starts in the womb, as air pollutants can impair fetal growth and development. Evidence shows that air pollution can contribute to low birth weight, preterm birth, miscarriage, and still birth.

Young children are uniquely vulnerable to air pollution, as their bodies and brains are still developing. Young children breathe more rapidly than adults and take in more air relative to their body weight. They often spend more time outdoors and breathe air that is closer to the ground, which puts them in closer proximity to dust and vehicle exhaust. Children living in low-income and marginalized communities are often more exposed due to living near factories, highways, or industrial zones.

The toxic combination of high vulnerability and exposure to pollutants can result in damaged lung functions, asthma, developmental delays, disabilities, cancer and even death. According to the Institute for Health Metrics and Evaluation data, nearly 1 in 4 deaths of children under 5 in East Asia and the Pacific was linked to air pollution in 2021.[2] Later in life, air pollution is linked to cardiovascular disease, diabetes and impaired immunity.

[1] (Institute for Health Metrics and Evaluation, 2021)
[2] (Institute for Health Metrics and Evaluation, 2021)

The impact of air pollution on child health



Note: These infographics are meant to be illustrative only. The impacts off air pollution on children varies considerably depending on the context, exposure and treatment options.

The cost of inaction

Despite the devastating evidence, hundreds of millions of children in the region continue to breathe air laced with dangerous pollutants every day.

The impact of air pollution, while not always immediately apparent, is far-reaching, going beyond an individual child's health. It can also have dire consequences on children's learning due to illness-induced absenteeism from school, cognitive impact, and the risk of school closure – limiting children's potential and lifelong productivity before adulthood has even begun.[3]

Furthermore, when parents are forced to stay home to care for sick children, their ability to contribute to the economy is hampered, resulting in significant losses in economic growth and national development. A recent study from Mongolia revealed private sector companies in Ulaanbaatar incurred a loss of $7.5 million due to air pollution-related absenteeism over a period of five years.

The World Bank has estimated that the cost of premature deaths and disease caused by exposure to PM2.5 air pollution was 9.3 per cent of Gross Domestic Product (GDP) in East Asia and Pacific in 2019, equivalent of over $2.5 trillion.[4]

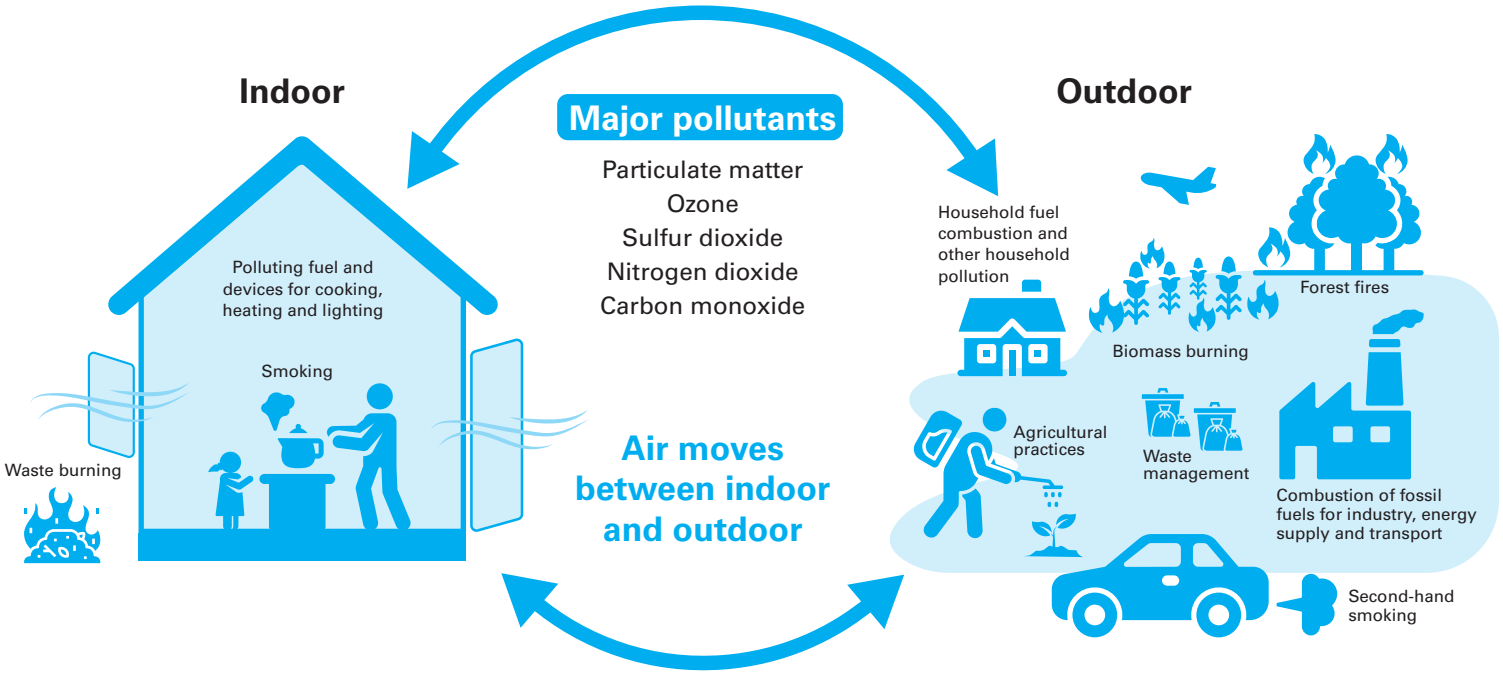
Despite the burden on child health, learning loss, and the extent of economic impacts, substantial gaps remain in government responses and regulations to prevent or cope with the growing burden of air pollution-related diseases in children.

The cost of inaction is immense. More than ever, robust government action is needed to protect children's health and learning. This means taking bold and decisive action to eliminate the deadly sources of air pollution, without delay. When exposure is unavoidable, the risks that children face must be minimized.

The Convention on the Rights of the Child (CRC), which has been ratified by all countries in East Asia and Pacific, requires states to consider environmental pollution as part of fulfilling the rights of children to health24. More recently, the CRC General Comment No. 26 (GC 26), launched in 2023, states that 'climate change, pollution and biodiversity loss clearly represent urgent examples of global threats to children's rights that require States to work together, calling for the widest possible cooperation by all countries and their participation in an effective and appropriate international response.[5]

[3] (WHO , 2023) (Siyu Chen, 2018) (Watanabe, Noma, Kurai, Kato, & Sano, 2021) (The Sydney Morning Herald, 2019) (BBC, 2019).
[4] (World Bank, 2022) (World Bank Group, 2019 – accessed 2025).
[5] United Nations Framework Convention on Climate Change, preamble; and Human Rights Council resolutions 26/27 and 29/15.

Pollutants in indoor and outdoor air pollution



Major air pollutants and their sources: a regional snapshot

Here is a brief analysis of the major pollutants and their sources.

- **Household air pollution:** more than 35 million children6 in East Asia and the Pacific live in countries where the majority of the population use solid fuels for cooking, exposing children to an array of pollutants (such as PM2.5 and its constituent black carbon and carbon monoxide) and health hazards7. Household air pollution from solid fuels has been linked to over half (56 per cent) of air pollution-related death among children under five in East Asia and the Pacific.[8]
- **Outdoor air pollution:** particulate matter, nitrogen dioxide, and ozone found in outdoor air are among the major air pollutants linked to poor health.[9]
- **Particulate matter (PM 2.5)[10]:** all of East Asia and the Pacific's over 500 million children live in countries where the average annual[11] outdoor PM 2.5 level exceeded the World Health Organization (WHO) air quality guideline levels of 5 micrograms per cubic meter (µg/m3) in 2020, and over 325 million children live in countries where the average annual PM2.5 level exceeded WHO guideline levels by over five times.[12] Amongst the five countries in East Asia and the Pacific with the highest levels of average annual outdoor PM2.5 pollution – China, Myanmar, Thailand, the Democratic People's Republic of Korea, and Mongolia – nearly half (47 per cent) of PM2.5 in 2019 came from the burning of fossil and biomass fuels, and agriculture waste burning that also generate the greenhouse gases driving climate change. PM2.5 is also generated by fires, the risk of which are increased in a warming climate.[13]

6 Under 18.
7 (Health Effects Institute, 2024) (UNICEF, 2023).
8 (Institute for Health Metrics and Evaluation, 2021).
9 (WHO, 2023).
10 PM2.5 are fine particle air pollution that are airborne particles measuring less than 2.5 micrometers in diameter that are emitted from fossil fuel powered vehicles, residential fossil and biomass fuel use, coal-burning power plants, agricultural and industrial activities, waste burning, wildfires – as well as from other human and natural sources. Among air pollutants that are currently measured, long-term exposure to PM2.5 is the most consistent and accurate predictor of poor health outcomes across populations. (Data source: Health Effects Institute, 2024)
11 Average annual population weighted.
12 (Health Effects Institute, 2024) (UNICEF, 2023).
13 (McDuffie EE, 2021)

> *Most of the sources of air pollution are also contributing to or are worsened by climate change – another deadly threat for children.*

- **Nitrogen dioxide:** eight countries, with over 373 million children, had average annual Nitrogen dioxide (NO2) pollution levels that exceeded WHO annual air quality guideline levels of 10 µg/m3 in 2020. NO2 pollution is generated through the burning of fossil fuels in vehicles, power plants, and industrial facilities and is most consistently related to asthma incidence in children.[14] Recent evidence shows an increase in NO2 average levels in 18 countries in East Asia and the Pacific between 2000 and 2020.[15] Concentrations of NO2 are typically higher in urban areas.
- **Ozone:** in 2020, 91 per cent of the children (453 million children) in East Asia and the Pacific lived in countries with average peak-season ozone levels higher than the WHO air quality guideline levels of 60 µg/m3.[16] Ozone, produced from burning fossil fuels in vehicles, power plants, factories, and homes and through industrial activities, harms humans, damages plants, and is also a greenhouse gas that contributes to climate change. Between 2000 and 2020, average peak-season ozone levels increased in 63 per cent of countries in East Asia and the Pacific.[17]

[14] (Health Effects Institute, 2024) (UNICEF, 2023)
[15] Ibid
[16] Or 31 ppb
[17] (Health Effects Institute, 2024) (UNICEF, 2023)

Critical gaps in protecting children from air pollution

Countries in East Asia and the Pacific have gaps in the key policies and regulations needed to protect children from the harmful effects of air pollution.

1. Gaps in Nationally Determined Contributions (NDCs) on climate change

The same sources of air pollution harming children's health in East Asia and the Pacific also produce greenhouse gases. Nationally Determined Contributions (NDCs) on climate change are a tool for countries to strengthen the ambition of net-zero planning.

The transition to net zero is also a clean air transition. Stronger and legally binding commitments to decarbonization are critical to protecting children from the harmful effects of air pollution.

2. Gaps in national policies on household energy

National policies on household energy can support the transition to cleaner fuels and technologies – such as renewable electricity for cooking, heating, and lighting. These changes can reduce children's exposure to household air pollution.

Currently most countries in East Asia and the Pacific[18] lack clear policies on clean household energy. This is especially concerning in countries with high rates of child under five deaths linked to household air pollution from solid fuels.

3. Gaps in legal standards on air pollution

Adopting legal standards on air pollution that are aligned with WHO Air Quality Guidelines can help protect children from the harmful effects of ambient/outdoor air pollution.

Currently half of the countries in East Asia and the Pacific[19] have no recorded legal standards for PM2.5, despite many having high rates of child under five deaths linked to ambient particulate matter pollution. Of the seven countries in the region with legal standards for PM2.5, none meet WHO Air Quality Guideline levels[20].

[18] Of the 14 countries in the region for which data available (WHO, 2023).
[19] Of the 14 countries in the region for which data available (WHO, 2023).
[20] (WHO, 2023).



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UNICEF's clean air agenda

UNICEF and the United Nations Environment Programme (UNEP) have jointly developed recommended actions for governments, caregivers, the health sector, private sector, civil society, and children and young people to address air pollution (UNICEF and UNEP, 2024).[21]

In East Asia and the Pacific UNICEF is:

- Working with governments to support the implementation of NDCs on climate change.[22]
- Supporting governments with measures to reduce children's exposure to household air pollution. For instance, in China UNICEF introduced chimney ventilation, fans and air purifiers to reduce exposure to pollutants;[23] and in Mongolia through the Cooking, Heating and Insulation Products (CHIP) package for ger[24] insulation, heating, and ventilation, which reduces indoor air pollution previously created by burning raw coal.[25]
- Partnering with governments, the private sector, health systems, children, young people, and civil society to advocate for improved air quality monitoring and public reporting. For instance, in Mongolia UNICEF has helped install small, affordable air quality sensors[26] to measure PM2.5 levels across the country.[27]
- Strengthening the capacity of the health sector to assess, screen, prevent, and treat air pollution-related illnesses, improve data collection on the effects of air pollution on children's health; and invest in cleaner, net-zero medical waste management in Cambodia, China, Mongolia and Viet Nam.[28]
- Working closely with civil society to engage parents, caregivers, educators and communities on understanding the impact of air pollution on children and demanding stronger policies and regulations for cleaner air, and engaging children and young people to monitor air quality in schools, raise awareness about air pollution and advocate for clean air policies with national and local governments. For instance, in Mongolia, UNICEF is supporting young people to be clean air champions, collecting, analyzing and disseminating air quality data; taking action to reduce exposure to air pollution; and advocating for effective policies.[29]

> *"UNICEF's vision is for every child in East Asia and the Pacific to grow up in a healthy environment, safe from air pollution and its harmful effects."*

[21] (UNICEF, 2024).
[22] (UNICEF, 2023).
[23] (UNICEF, 2021).
[24] Circular, domed tent-like dwelling.
[25] (UNICEF, 2023).
[26] Purple air.
[27] (UNICEF, 2023).
[28] (MoH & UNICEF, 2024), (Vital Stratergies & UNICEF, 2022), (UNICEF, 2023), (UNICEF USA, 2024).
[29] (UNICEF, 2021) (UNICEF Cambodia, 2023) (UNICEF, 2023) (UNICEF, 2024).



Ms. Handarmaa opening ventilation where there used to be chimney of stove previously

©UNICEF Mongolia/2019/Purevjav T

MONGOLIA

> ***"I'm so happy that I switched to electric heating. I never imagined the benefits of getting rid of the stove and coal. No more smell of burning coal. No more getting out of bed in the middle of the night to refill the stove. Now we have cleaner air indoors and warmer ger."***

UNICEF Mongolia, in partnership with local government and international donors, is transforming Bayankhongor into Mongolia's first smog-free city. The CHIPS (Cooking, Heating, Insulation, Products, and Services) initiative equips traditional Mongolian gers with energy-efficient solutions such as electric heaters, insulation, and ventilation systems to replace coal stoves. This aims to improve air quality, particularly benefiting vulnerable households.

Ms. Handarmaa, a mother of three, highlights the transformative impact of CHIPS. Her family enjoys a cleaner, warmer, and more cost-efficient living environment, spending less on heating while avoiding coal dust and smoke. Her 10-year-old son, Usukhjargal, takes pride in managing the thermostat and appreciates waking up to a warm home.

With over 200 households already equipped and local government committing further support, UNICEF aims to scale CHIPS, ensuring every child in Bayankhongor breathes cleaner air and grows in a healthier environment.



Chirawan Oranratmanee and her family

©Chirawan Oranratmanee

THAILAND

> ***"Sharing my story isn't just about coping with my loss. It's about raising awareness of the deadly consequences of air pollution."***

For 20-year-old student Chirawan Oranratmanee from Chiang Mai, Thailand, the effects of PM2.5 are heartbreaking. Her mother, once a healthy professor, succumbed to lung cancer—not caused by smoking, but by prolonged exposure to toxic pollutants. Chirawan's tragedy is part of a much larger crisis affecting Thailand. As Thailand grapples with air pollution and the broader challenges of climate change, the stakes have never been higher for its younger generations.

Grieving her mother's death, Chirawan found a sense of purpose through her collaboration with UNICEF Thailand's #CountMeIn campaign, which amplifies the voices of young people affected by climate change and other manmade environmental harms.

Chirawan is particularly focused on ensuring that children and young people are part of the conversation. Despite the profound loss, Chirawan's journey is one of resilience and hope. She is determined to carry on her mother's legacy through her advocacy.

UNICEF Thailand is working together with young people like Chirawan by promoting climate education and ensuring they are prepared for a climate-impacted future while being included in the conversations and solutions surrounding the climate crisis.

A call to action:
prioritizing clean air for every child

UNICEF calls for the following actions to reduce air pollution for every child in East Asia and the Pacific:



National governments hold the primary accountability for protecting children's right to clean air and a healthy environment. UNICEF urges governments to:

- Strengthen the level of ambition to reach net zero and accelerate the clean air transition through Nationally Determined Contributions on climate change and national legislation.
- Develop and support the implementation of national policies on household energy to speed the transition to cleaner fuels and technologies – such as renewable electricity for cooking, heating, and lighting, and reduce children's exposure to household air pollution.
- Develop and enforce legal standards on air pollution that are aligned with WHO Air Quality Guidelines, to protect children from harmful outdoor air pollution.



Businesses have a responsibility to protect children and families from any potential environmental and health risks linked to their business practices, processes or products. UNICEF urges them to:

- Set clear goals and plans to reduce emissions by adopting clean technologies and educating employees and customers about air pollution.
- Ensure compliance with environmental and health regulations to undertake due diligence to ensure children are protected throughout the supply chain.
- Create new business opportunities offering green technology and green services to partners and consumers.



The **health sector** is critical in addressing the health impacts of air pollution on children. UNICEF urges the health sector to:

- Strengthen health workers' capacities for assessment and early screening to detect air pollution-related illnesses and advise families on reducing children's exposure to air pollution.
- Develop health sector readiness in advance of air pollution seasons, in terms of information, human and financial resources, medicine and equipment.
- Invest in 'net-zero' health systems, reducing pollution and emissions, by managing medical waste responsibly and adopting renewable energy in healthcare facilities.



Parents and educators have the responsibility to ensure that children are informed and protected from air pollution as much as possible. UNICEF urges them to:

- Help raise awareness on the sources of air pollution and promote practices to reduce children's exposure (e.g. wearing masks and staying inside during spikes in pollution levels).
- Encourage children and young people to find local solutions to monitor, prevent and address air pollution.
- Advocate with local authorities for pollution-free zones near schools, kindergartens, and health facilities.
- Adopt cleaner and greener energies for cooking, heating, waste management, transport and lead by example.

> ***Climate and environmental action today must center child health and well-being and the need to protect our children's futures.***

> ***The solutions exist. Our collective future depends on implementing them.***

Four steps to cleaner air, for every child

1. National government: develop and implement policies on climate and the environment to protect children from the harmful effects of air pollution.

2. Business: set ambitious emission reduction targets and create green business opportunities.

3. Health sector: strengthen the capacity of health system to identify, treat and rais awareness of the heath impacts of air pollution on children.

4. Parents and educators: incorporate air quality into children's education and actively involve young people in the development and implementation of air quality policies.

"Addressing air pollution will lead to enormous improvements in children's health, education and wellbeing – with ripple effects on entire societies and economics.

The solutions exist. Our collective future depends on implementation them".

June Kunugi, Reginal Director for UNICEF East Asia and the Pacific

For more information on the impact of air pollution on children's health and wellbeing, please explore the following resources:

Video: Air pollution threatens the health of children globally | UNICEF

Video: Toxic air for children? Take a deep breath | UNICEF

Teen advocates for clean air in Mongolia | UNICEF

Implications of the extremely hot summer of 2022 on urban ozone control | China

State of Global Air | Report

Child-centred clean air solutions | UNICEF East Asia and Pacific

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For every child

Whoever she is.
Wherever he lives.
Every child deserves a childhood.
A future.
A fair chance.
That's why UNICEF is there.
For each and every child.
Working day in and day out.
In more than 190 countries and territories.
Reaching the hardest to reach.
The furthest from help.
The most excluded.
It's why we stay to the end.
And never give up.

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