



European Union



BUSINESS AND HUMAN RIGHTS | ASIA



Asia in Focus: **CLEAN AIR AND THE BUSINESS AND HUMAN RIGHTS AGENDA**

WRITTEN BY

**ECONOMIST
IMPACT**

ACKNOWLEDGEMENTS

Asia in focus: Clean Air and the Business and Human Rights Agenda is a report written by Economist Impact in consultation and with support from UNDP. The findings are based on an extensive literature review, an expert interview programme and data analysis conducted by Economist Impact between January and March 2022.

The report was written by a team of researchers including Shreyansh Jain, Divya Sharma Nag and Minakshi Barman. Levi Heo, Sachin Javale and Cheryl Fuente were responsible for the report's design layout. The report was copyedited by Jan Copeman.

Interviewees

Our thanks are due to the following people for their time and insights:

- + Ahmad Rafay Alam – Environmental Lawyer and Activist
- + Grita Anindarini – Deputy Director, Indonesian Centre for Environmental Law
- + Matthew Baird – Director of Asian Research Institute for Environmental Law and Doctoral Candidate, University of Southern Queensland
- + Victor Bernard – Programme Officer (Human Rights and the Environment)
- + Prarthana Borah – Director, CDP India
- + Dr David Boyd – United Nations Special Rapporteur on Human Rights and the Environment, Associate Professor, Institute for Resources, Environment and Sustainability, School of Public Policy and Global Affairs, University of British Columbia
- + Paulo Burro – Co-Convenor, Bayanihan sa Daan
- + Joan Carling – Executive Director, Indigenous Peoples Rights International (IPRI)
- + Professor Surya Deva, Member – UN Working Group on Business and Human Rights
- + Dr Michael Greenstone – Milton Friedman Distinguished Service Professor in Economics; Director, Energy Policy Institute at the University of Chicago (EPIC); Director, Becker Friedman Institute, University of Chicago
- + Roger Joseph (Rocky) Guzman – Deputy Director, Asian Research Institute for Environmental Law
- + Allan Meso – Environmental Lawyer
- + Polash Mukerjee – Lead, Air Pollution and Climate Resilience, Natural Resources Defence Council, India
- + Brynn O' Brien – Executive Director of the Australasian Centre for Corporate Responsibility (ACCR)
- + Kevin Punzalan – former Senior Policy Officer, Embassy of the Kingdom of the Netherlands in the Philippines. Currently an International Business Developer for VDE Renewables GmbH.
- + William Schulte – Mekong Region Policy and Legal Advisor, EarthRights International
- + Romchat Wachirattanakornkul – National Human Rights Officer on Climate Change and the Environment, Office of the UN High Commissioner for Human Rights (UN OHCHR) Regional Office for South-East Asia.
- + Christine Wellington-Moore – SDG Integration Advisor, UNDP
- + Hemantha Withanage – Senior Advisor, Centre for Environmental Justice (Sri Lanka)
- + Thailand Clean Air Network

We would also like to extend our gratitude to Sean Lees, Anna Keller, Belinda Hlatshwayo, Jiahuan Yuan and other UNDP staff for the technical support provided during the project.

EXECUTIVE SUMMARY

Approximately 92% of Asia-Pacific's population is exposed to levels of air pollution that violate the human right to live in a clean, healthy and sustainable environment.¹ Yet, air pollution does not affect everyone equally. Polluted air disproportionately impacts low-skilled workers, workers in the informal sector, Indigenous Peoples, women and children.

Air pollution also has negative implications for economies across the region, including loss of potential economic output (3.3% of global GDP, 2018), reduced productivity among workers and increased health care costs.² Moreover, businesses located in countries with high levels of air pollution may face restricted access to capital markets. Businesses may also find it difficult to recruit from a global talent pool, which has grown increasingly mobile, health-conscious and environmentally aware.

Given the extent and criticality of the issue, research is urgently required into the root causes of air pollution and potential solutions. Among other prescriptions, this report concludes that governments must address clean air as a priority policy objective, rooted in the State's duty to protect human rights. In this context, the UN Guiding Principles on Business and Human Rights (UNGPs) offer a useful framework to delineate the State's responsibility to protect the right to clean air and provide access to remedy when abuses have occurred.³

Asia in Focus: Clean Air and the Business and Human Rights Agenda begins by examining the extent of the air pollution challenge in the region. Following this, the report highlights the major sources of air pollution in Asia and explores the cost implications for the region's economies and people. The report then outlines challenges to formulating air pollution policy and charts mitigation measures already in place. The report concludes by exploring the link between air pollution and human rights, and demonstrating how international human rights instruments enable a rights-based approach to addressing environmental violations. Importantly, the report outlines how the three-pillared framework of the UNGPs might be applied to effectively overcome the air pollution challenge.

Key findings

The problem of air pollution is particularly severe in the rapidly growing urban centres of Asia. Mounting scientific evidence has brought the magnitude of the air pollution problem into focus along with the long-term economic and health consequences of prolonged exposure to unhealthy air. Asia is disproportionately affected, with South and East Asia home to 49 of the 50 most polluted cities worldwide.⁴

Vulnerable groups disproportionately bear the costs of air pollution. The global economic and public health cost of air pollutants is estimated to be US\$2.9trn annually or 3.3% of global GDP (2018).⁵ However, the impacts of air pollution are unevenly distributed. This holds true for both low-income and high-income countries. Informal economy workers, Indigenous Peoples, women and low-income families are exposed to far greater levels of pollutants, than other groups.

The health impacts of air pollution put future generations at risk. Air pollution can have significant consequences for maternal and neonatal health, adversely affecting fertility, increasing the risk of preterm births and leading to a higher incidence of infant and maternal mortality, birth defects and breast cancer. Falling birth rates could lead to a reduction in the labour force in the coming years, with knock-on effects for future economic growth.

Health impacts of air pollution on the economy. Labour productivity can be adversely affected by air pollution as rising incidences of air pollution-related illnesses lead to increased absenteeism. Poor air quality has proven impacts too, on agricultural production. Consumer-facing businesses report substantially less revenue as customers stay indoors when air quality is poor. The most sought-after workers tend to shun cities and countries where air pollution is high.

The lack of uniform regulatory frameworks and standardised data contributes to the challenge of addressing air pollution in Asia. The problem of inconsistency in regulatory frameworks among Asian countries is a key obstacle to collaboration in the region. Additionally, the lack of standardised data makes monitoring air pollution more complex and expensive.

Measures to control air pollution in Asia, though underway, still have more to achieve. Regulatory interventions are showing promise, such as government-mandated monitoring of air quality and emissions standards, and the introduction of more stringent enforcement mechanisms. Positive results are found when businesses align operations with industry best practices and increase awareness of environment-friendly policies among members of the general public and local business communities.

Key recommendations

Clean air must be recognised as a basic human right and priority policy objective. Classifying clean air as a human right changes the perspective with which governments and civil society treat this issue. Rooting clean air policy in human rights gives greater urgency to

actions that might mitigate air pollution and generates additional impetus for civil society to demand remedies in courts of law.⁶ However, while air pollution litigation is on the rise, there are few States in Asia that recognise the right to clean air.

Businesses must work to prevent, mitigate and remedy air-pollution-related impacts resulting from their business operations. Businesses have a responsibility to respect human rights, irrespective of their size, location or industry. In Asia, 82% of total urban ambient air pollution resulting from PM2.5 originates from man-made sources such as fossil fuel burning (for electricity generation and transport fuels), agricultural burning, waste burning and industrial operations. It is critical for businesses to understand any adverse impacts of their operations and take steps to mitigate air pollution resulting both directly and indirectly from their operations. Business strategies need to be designed considering any potential adverse impacts on the environment and human rights. Businesses should ensure they conduct

due diligence to better understand the human rights risks they pose through the air pollution emissions of their operations and supply chains.

The challenge of air pollution can be addressed through focused State interventions using the UNGPs as a framework. The solutions to curbing air pollution are well-understood, though measures are difficult to coordinate in practice. The UNGPs can help by providing a framework for enabling State action to address air pollution-related human rights impacts. States should implement laws to monitor air quality and its impact on health, and develop laws and regulations to improve air quality ensuring adequate compliance monitoring and enforcement mechanisms. States should also collaborate with different stakeholders in developing solutions to air pollution, educate businesses and civil society to bring about behavioural change and devise incentives and disincentives to promote more sustainable actions. Lastly, States should ensure adequate access to remedies for affected populations.



CONTENTS

1. INTRODUCTION	1
a. Moving from grey skies to blue: why the noise now?	1
2. UNDERSTANDING AIR POLLUTION	3
a. Air pollution guidelines	3
b. Sources of air pollution in Asia	3
3. AIR POLLUTION AND HUMAN RIGHTS	5
a. International human rights instruments	5
b. UN Guiding Principles on Business and Human Rights	6
c. Clean air litigation at national level	7
4. STATE OF AIR POLLUTION IN ASIA	9
a. The role of industry	9
b. Air pollution statistics	9
c. Costs of air pollution	10
d. Air pollution and poverty	13
e. Cost of inaction	13
f. Challenges in addressing air pollution	14
5. CURRENT MITIGATION MEASURES	15
a. Regional measures	15
b. Country-level measures	16
c. Speeding up the energy transition for better air quality	18
d. Leveraging trade policy to mitigate air pollution	19
6. POLICY RECOMMENDATIONS	20
a. State duties	20
b. Corporate responsibilities	22
c. Access to remedy	23
d. Other recommendations	23
7. CONCLUSION	25
8. ENDNOTES	26

1. INTRODUCTION

On April 3rd 2020, residents of Jalandhar, India, a city in the northern state of Punjab woke to the majestic sight of the glimmering Himalayan peaks against a backdrop of clear blue skies. So rare was this phenomenon that Himachal Tourism—the regional government's official tourism body—posted it as a leading news story of the day. The headline read simply, "Jalandhar residents have a view of snow-capped mountains."^{8,9} According to experts, the sighting of these mountains, some 200km from the city, was due to an unexpected shift in the air quality from "hazardous" to "good". A national lockdown imposed from March 25th 2020 to help control the spread of the covid-19 virus resulted in the immediate suspension of all transport and construction activities, drastically reducing air pollution in urban areas across the country.

The World Health Organisation (WHO) estimates that close to 99%¹⁰ of the global population is exposed to unhealthy air. While air pollution is a challenge in many cities across the world, the problem is much more severe in Asia. Approximately four billion people—92% of the Asia-Pacific region's population—are exposed to levels of air pollution that pose a significant risk to their health.¹¹ South and East Asian locations emerge as the most polluted, with Bangladesh, China, India, and Pakistan sharing 49 of the 50 most polluted cities worldwide and experiencing the worst air quality in the region.¹² Key sources of air pollution in Asia include particulate matter emissions from the burning of fossil fuels—for electricity generation and transportation fuel—and agricultural crop burning, among others. Even with the reduction of economic activity due to covid-19 lockdowns, 32% of cities in India, 67% of cities in Pakistan and 80% of cities in Bangladesh experienced 'unhealthy' air quality.¹³ In 2020, air pollution resulted in a loss of 7.4% of South Asia's GDP and accounted for 13-22% of deaths in the South Asia region.¹⁴

Worsening air quality has significant public health consequences for current and future generations. Data from the Air Quality Index reveals that four South Asian countries—Bangladesh, India, Nepal and Pakistan—account for 60% of the person-years lost globally at current pollution levels and that compliance with WHO air pollution guidelines would increase life expectancy by an average of five years in these countries.¹⁵ Air pollution can also have consequences over several generations as exposure to air pollution among women has been identified as a major risk to female reproductive health. A recent study conducted on women of reproductive age concluded that exposure to atmospheric sulphur dioxide leads to a lower antral follicle count (ovarian

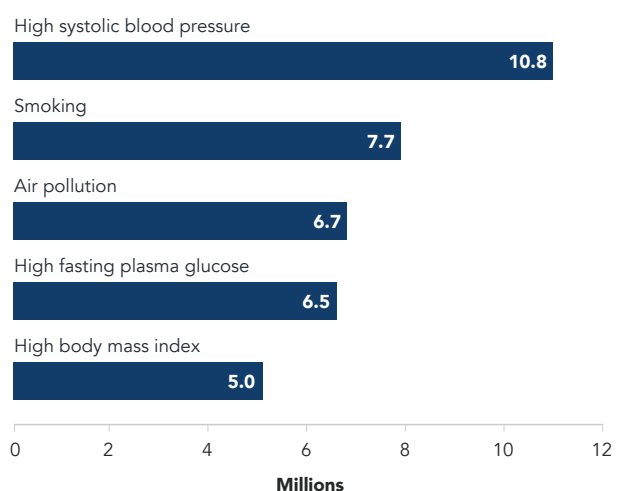
reserve) among women, which adversely affects female fertility.¹⁶ Other risks, such as preterm births, adverse birth outcomes and higher rates of infant mortality have also been linked to high pollution concentration.

Moving from grey skies to blue: why the noise now?

Air pollution is a long-standing environmental issue. However, over the past decade, mounting scientific evidence has cast a spotlight on the long-term economic and health consequences of prolonged exposure to air pollution. Among the most important features of the science include:

+ The magnitude of the problem: Close to 99% of the global population is exposed to air that does not meet WHO air quality standards. Middle-income countries have experienced an alarming rise in air pollution levels as a result of rapid urbanisation and economic development, most of which rely on the burning of fossil fuels. Consequently, middle-income countries also account for more than 80% of global deaths resulting from air pollution. In 2019, air pollution was the third leading cause of premature mortality worldwide.

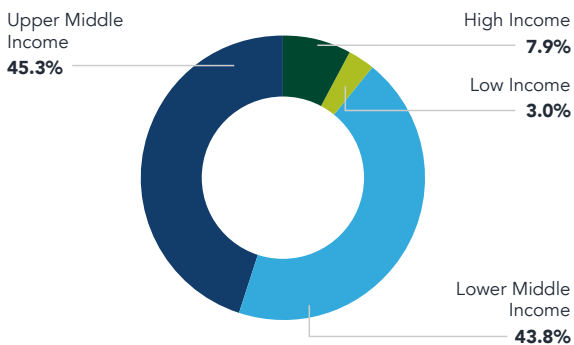
Chart 1: Global ranking of risk factors by the total number of deaths, 2019



Source: Health Effects Institute (2020), State of Global Air 2020. Special Report.¹⁷

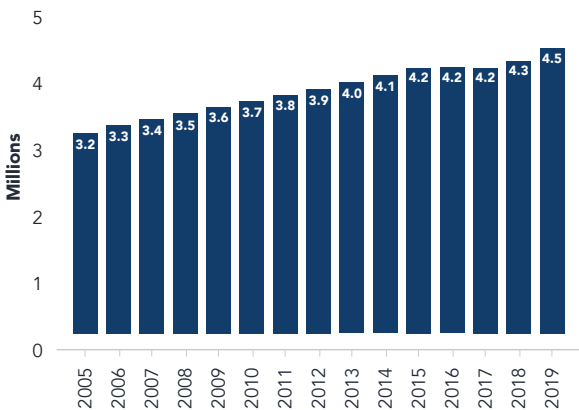
+ The growing evidence of health impacts: Over the past two decades, the body of scientific evidence on the impact of air pollution on human health has grown, making it clear that exposure to ambient air pollution can have long-term adverse health impacts. In 2013, the International Agency for Research on Cancer (IARC) classified outdoor air pollution and particulate matter as carcinogenic.¹⁸ Air pollution has since become a leading cause of lung cancer, affecting even the non-smoking population.¹⁹ Between 2005 and 2019, the total number of global deaths attributable to air pollution increased by 40%.²⁰

Chart 2: Deaths caused by outdoor air pollution, 2019, by income level



Source: Global Burden of Disease Collaborative Network (2021), Institute for Health Metrics and Evaluation (IHME), Global Burden of Disease Study 2019.²¹

Chart 3: Total global deaths from outdoor air pollution, 2005-2019



Source: Global Burden of Disease Collaborative Network (2021), Institute for Health Metrics and Evaluation (IHME), Global Burden of Disease Study 2019.²²

+ The accessibility of the science: Air pollution is a complex issue that requires scientific methodologies to understand. The technical nature of discussions has, until recently, been confined to scientific circles. However, as the debilitating impacts of air pollution have become more evident, matters have shifted into mainstream media, where the science is simplified.

+ The link with climate change: The issues of air pollution and climate change are closely intertwined. The burning of fossil fuels not only releases the greenhouse gases that cause climate change but also the particulate matter, sulphur dioxide, nitrogen dioxide and carbon monoxide that cause air pollution. According to the WHO, *“Improving air quality can enhance climate change mitigation efforts, while reducing emissions will, in turn, improve air quality”*.²³

With these facts in mind, many Asian governments have responded robustly, and have developed policies to address air pollution in a coordinated manner. Still, it is too early to say that the tide is turning on air pollution in Asia. Will the next decade see a reduction in health and environmental risks linked to air pollution? And will people reap the economic benefits that environmental activists have been claiming will surely flow if air pollution is mitigated?

Though the answers are not definitive, it is clear that coordinated action from all stakeholders will be required to implement meaningful air pollution mitigation measures.



2. UNDERSTANDING AIR POLLUTION

Air pollution contributes to around seven million deaths annually²⁴ and costs the global economy upwards of US\$2.9trn per annum.²⁵ Air pollution in the Asia-Pacific region is not only a major health risk but also has damaging impacts on the environment and agricultural crop yields. According to a 2019 report published by the UN Environment Programme (UNEP) in association with Asia Pacific Clean Air Partnership and Climate & Clean Air Coalition, 92% of the population in the Asia and Pacific region is exposed to unhealthy levels of air pollution.²⁶

The WHO defines air pollution as “the contamination of the indoor or outdoor environment by any chemical, physical or biological agent that modifies the natural characteristics of the atmosphere”. Pollutants that are a major public health concern include particulate matter, carbon monoxide, ozone, nitrogen dioxide and sulphur dioxide.²⁷ Of these pollutants, PM2.5—particulate matter with a diameter less than 2.5 microns—is a common proxy for air pollution as it poses the greatest health risk. Given its minute size, it can penetrate the lungs and enter the bloodstream.²⁸ Exposure to high concentrations of PM2.5 leads to increased mortality or morbidity and increases the risk of developing lung cancer or cardiovascular and respiratory diseases.

a. Air pollution guidelines

The WHO has been issuing guidelines relating to air pollution levels since 1987. The organisation released its most recent set of more stringent air quality guidelines in September 2021.

Table 1: WHO recommended air quality guidelines (AQG)²⁹

Pollutant	Averaging Time	2005 AQGs	2021 AQGs
PM2.5 (µg/m ³)	Annual	10	5
	24-hour	25	15
PM10 (µg/m ³)	Annual	20	15
	24-hour	50	45
Ozone (O ₃) (µg/m ³)	Peak Season	-	60
	8-hour	100	100
Nitrogen oxide (µg/m ³)	Annual	40	10
	24-hour	-	25
Sulphur dioxide (µg/m ³)	24-hour	20	40
Carbon Monoxide (mg/m ³)	24-hour	-	4

Source: IQAir (2021), The 2021 World Air Quality Report.³⁰

b. Sources of air pollution in Asia

Broadly, air pollution can be categorised into outdoor (or ambient air pollution) and indoor air pollution. Pollutants originate from a number of natural and man-made activities. Natural events include volcanoes, forest fires and dust storms. Man-made causes include the burning of fossil fuels for electricity generation, transportation fuels and industrial operations. Globally, only 18% of total urban ambient air pollution resulting from PM2.5 originates from natural sources, while 82% is attributable to man-made sources.³¹

- + **Fossil fuel burning:** Rapid urbanisation over recent decades has led to an increase in energy demand—for electricity generation and transport fuels—the majority of which has been met from coal and crude oil derivatives. Burning fossil fuels releases noxious gases such as nitrogen dioxide, sulphur dioxide and carbon monoxide.
- + **Agricultural burning:** Slash and burn agriculture, prevalent in Asia, is a significant contributor to air pollution in the region. Many countries still rely on burning as a cheap means to clear fields post-harvest—a major contributor to seasonal smog in Northern India and South-East Asia.
- + **Waste burning:** Improper waste disposal is another leading cause of air pollution. In developing countries, incineration is a common waste disposal method. Open burning can lead to emissions of particulate matter and poisonous gases.

+ Industrial operations: Manufacturing operations consume vast amounts of electricity, much of which is produced by burning coal. However, the manufacturing process itself can also be a major source of pollution as it releases volatile organic compounds that remain suspended in the air and can cause respiratory illnesses.

The charts below provide a breakdown of ambient air pollution sources in South and South-East Asia.

Chart 4: Contribution to urban ambient PM2.5 by source category, South Asia

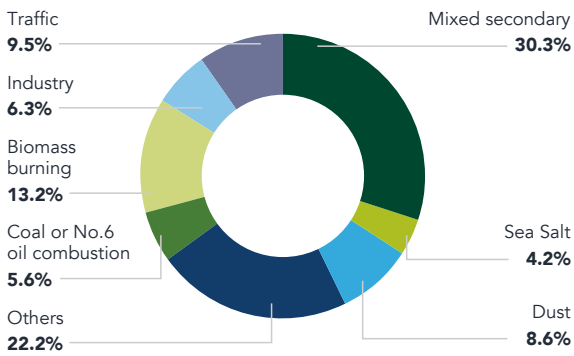
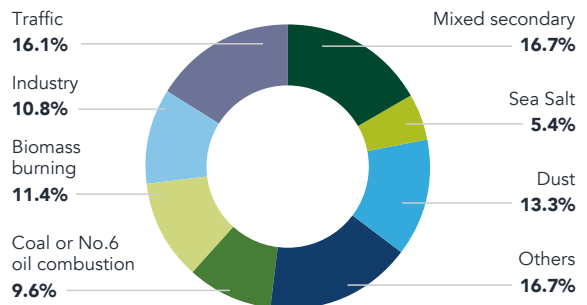


Chart 5: Contribution to urban ambient PM2.5 by source category, South-East Asia



Source: PK Hopke et al. (2020), Science of The Total Environment, Global review of recent source apportionments for airborne particulate matter³²
 * Sea salt represents particles in the air typically resulting from winds blowing off of nearby oceans, but can also originate from anthropogenic sources

Source: PK Hopke et al. (2020), Science of The Total Environment, Global review of recent source apportionments for airborne particulate matter³³



3. AIR POLLUTION AND HUMAN RIGHTS

Current air pollution levels in Asia violate the rights to life and health, the rights of the child, and the right to live in a safe, clean, healthy and sustainable environment.³⁴ Given its importance to human life and well-being, governments and businesses must recognise clean air as a human rights issue and an urgent policy objective. Classifying clean air as a human right changes the perspective with which governments and civil society see this issue. Government authorities now have a clear, legally enforceable obligation to respect, protect and provide for clean air as a human right.³⁵

a. International human rights instruments

Human right to a clean, healthy and sustainable environment (HRC/RES/48/13)

Resolution adopted by the Human Rights Council on 8 October 2021

48/13. The human right to a clean, healthy and sustainable environment³⁶

In July 2022, the UN General Assembly (UNGA) affirmed in resolution A/76/L.75 that a clean, healthy, and sustainable environment is a human right.³⁷ This historic resolution largely adopted the language of the UN Human Rights Council resolution 48/13, on the same matter in October 2021. By extension, the right to a clean, healthy, and sustainable environment includes the right to clean air. Experts interviewed for this report acknowledged the importance of these resolutions, despite their non-binding legal status, as they provide added support to arguments civil society champions bring to courts of law as they fight for remedies. Furthermore, classifying a clean environment (and clean air) as a human right also holds governments accountable for failing to act to prevent air pollution.

The recognition of the right to a clean, healthy and sustainable environment as a basic human right is significant in the following ways:

- + **Recognition promotes a rights-based approach to addressing environmental violations:**³⁸ Classifying a clean, healthy and sustainable environment as a human right opens the doors to identifying both the various attributes of a clean environment as well as groups that are denied access to a clean environment. Such a rights-based approach encourages people to question why there is a 'lack of a clean environment' and who should be held responsible.
- + **Recognition places environmental pollution within the remit of the UN Guiding Principles on Business and Human Rights (UNGPs):** Recognising a clean

environment as a basic human right, brings the issue of environmental pollution, which includes air pollution, directly within the remit of the UNGPs. In their present form, the UNGPs do not mention climate change or nature. By recognising a clean environment as a basic human right, any form of environmental pollution (including air pollution) becomes an abuse of a human right, which necessitates remedial action on the part of both States and businesses.³⁹

“Even non-binding resolutions like these [HRC/RES/48/13] prove to be a good tool for civil society organisations to fight for justice, particularly for the most disadvantaged and under-represented sections of society.”

Hemantha Withanage, Senior Advisor, Centre for Environmental Justice (Sri Lanka)

Human right to water and sanitation (UNGA/RES/64/292)

Resolution adopted by the United Nations General Assembly on 28 July 2010

64/292: The human right to water and sanitation⁴⁰

The potential impact of recognising clean air as a human right can be understood through a review of other such measures, for example, the UN General Assembly's 2010 resolution 64/292, which recognises clean water as a human right. Actions taken following the passing of this resolution demonstrate how non-legally binding human rights instruments can be used as a catalyst to drive solutions on environmental issues.⁴¹

A decade after it was introduced, evidence of the positive impacts of the 2010 resolution were outlined:⁴²

- + **Encouraged further commitments:** The passing of resolution 64/292 encouraged commitments and action from multilateral agencies, strengthening the legal status of the right to clean water. In September 2010, the Human Rights Council passed resolution 15/9 affirming the General Assembly's recognition and clarifying that the rights to water and sanitation are derived 'from the right to an adequate standard of living, which is considered a binding human right in almost all States'. In May 2011, the WHO classified water and sanitation as human rights. In December 2015, the General Assembly passed resolution 70/169,

acknowledging that 'safe drinking water and sanitation constitute two distinct human rights that warrant separate treatment to address the specific challenges in their implementation, and to avoid sanitation being neglected as a secondary human right'.⁴³ Acknowledging the right to water and sanitation influenced the development of the Sustainable Development Goals (SDGs) and led to the adoption of an independent goal on water and sanitation in the 2030 agenda.⁴⁴

- + **Updated legal frameworks:** Several countries updated their legal frameworks to reflect water and sanitation as human rights, including Australia, Costa Rica, Egypt, Fiji, Kenya, Mexico, Morocco, Nepal, Niger, Slovenia, Somalia, Togo, Tunisia and Zimbabwe.⁴⁵
- + **Established independent monitoring:** When implemented at a national level, the inclusion of the right to clean water in the legal framework has led

to the creation of independent regulatory bodies that not only monitor compliance but also drive policy changes and enforce implementation.

b. UN Guiding Principles on Business and Human Rights

The UNGPs are a set of guidelines for States and businesses to follow to prevent and address human rights abuses committed in the context of business operations. The guidelines are based on three pillars, commonly referred to as the 'Protect, Respect and Remedy' framework. The first pillar involves the State's duty to protect against human rights abuses by third parties, including business enterprises. The second pillar focuses on the responsibility of businesses to respect human rights. Finally, the third pillar involves the need for both State and businesses to provide access to effective *remedy*.⁴⁶

UN Guiding Principles

Pillar 1: The State duty to protect human rights

The first pillar of the UNGPs focuses on the State's obligation to respect, protect and fulfil human rights and fundamental freedoms. To implement this duty, the guiding principles recommend the setting of clear expectations, such as relevant legal guidelines for businesses, that must be followed by both domestic and foreign businesses within the State's jurisdiction. Setting clear expectations ensures predictability for businesses by signalling a consistent message applicable to all enterprises.

In the context of the State's responsibility, Foundational Principles 4 and 5 state that:

4. "States must protect against human rights abuse within their territory and/or jurisdiction by third parties, including business enterprises. This requires taking appropriate steps to prevent, investigate, punish and redress such abuse through effective policies, legislation, regulations and adjudication."⁴⁷
5. "States should set out clearly the expectation that all business enterprises domiciled in their territory and/or jurisdiction respect human rights throughout their operations."

Pillar 2: The corporate responsibility to respect human rights

The second pillar of the UNGPs focuses on the corporate responsibility to respect human rights. To carry out this responsibility, business enterprises are required to comply with all applicable local and international laws, but also go further and address any human rights risks or adverse human rights impacts of their operations. The UNGPs provide the necessary context for businesses to understand their responsibilities in taking steps to mitigate air pollution resulting directly from their operations.

Guiding Principle 14 states, "The responsibility to respect human rights requires that business enterprises:

- (a) Avoid causing or contributing to adverse human rights impacts through their own activities and address such impacts when they occur;
- (b) Seek to prevent or mitigate adverse human rights impacts that are directly linked to their operations, products or services by their business relationships, even if they have not contributed to those impacts."⁴⁸

Pillar 3: Access to remedy

The final UNGP pillar outlines State and corporate responsibilities with regard to ensuring the appropriate judicial and legislative mechanisms are set up to address and remediate grievances and regulatory breaches.

Guiding Principle 25 states that: "As part of their duty to protect against business-related human rights abuse, States must take appropriate steps to ensure, through judicial, administrative, legislative or other appropriate means, that when such abuses occur within their territory and/or jurisdiction those affected have access to effective remedy."

However, the onus does not rest solely with the State. Guiding Principle 29 provides that: "to make it possible for grievances to be addressed early and remediated directly, business enterprises should establish or participate in effective operational-level grievance mechanisms for individuals and communities who may be adversely impacted."

Subsequent to the establishment of the UNGPs in 2011, the UN Human Rights Council (HRC) urged States to develop National Action Plans (NAPs) on Business and Human Rights (BHR) that would define how the implementation of the UNGPs would be taken forward. At present, 43 governments and non-state actors (such as national human rights institutions) across Europe, the Americas, Africa and Asia have launched NAPs or NAP-related processes to implement the UNGPs. In Asia, three countries—Japan, Pakistan and Thailand—have successfully launched their NAPs, while India, Indonesia, Malaysia, Mongolia and Vietnam are in the active process of developing these policy initiatives. Promoting the UNGPs in Asia will strengthen internationally recognised standards of responsible business behaviour, based on agreed human rights norms while levelling the playing field for businesses that integrate human rights considerations into their operations and supply chain policies.

c. Clean air litigation at national level

The inclusion of environmental rights in a country's constitution signals the country's commitment to protecting its natural resources and shifts the conversation away from 'whether to protect natural resources' to 'how to protect natural resources'. Using their constitutional environmental rights as leverage, petitioners in Asia have tried to hold governments and business entities accountable for their failure to address environmental issues, including air pollution. The table below highlights some instances of air-pollution-related litigation cases in Asia that have used a rights-based approach to seek redress for the adverse impacts of air pollution.

Notable instances of litigation cases involving air pollution in Asia⁴⁹

+ Jakarta air pollution lawsuit (2019, Indonesia)

In 2019, 32 Jakarta citizens filed a legal challenge against the Indonesian President, three cabinet ministers, the Jakarta governor and two provincial leaders, for being negligent in their responsibility to control air pollution in the Indonesian capital city of Jakarta. The verdict, which followed two years later, found that the Indonesian government had failed to uphold citizens' right to clean air. The court held that the President must establish national air quality standards to safeguard human health and that the health minister and Jakarta governor must design strategies to control air pollution. Other mandates included cross-border emissions analysis and periodic testing of old vehicles.

+ Segovia et al. v. Climate Change Commission et al. (2017, Philippines)

Petitioners took legal action against the government demanding immediate and concrete action to reduce air pollution from transport emissions. The petitioners required the government to take steps to reduce 'personal and official consumption of fossil fuels' by at least 50%, implement road-sharing schemes, allocate open spaces for urban farming and release more financial resources to mitigate environmental pollution. However, the lawsuit was dismissed by the Supreme Court as it failed to fulfil all the legally required criteria for the issuance of writs.

+ Court on its own motion v. State of Himachal Pradesh & Others (2014, India)

India's National Green Tribunal (NGT) issued directives to protect ecologically sensitive areas in the glaciers of Himachal Pradesh. It argued that increased tourism activity in the region, and the resulting pollution from fossil-fuel-powered transport vehicles, was releasing unburnt hydrocarbons and carbon soot into the atmosphere. This was leading to the blackening of snow cover, which was affecting glaciers in the mountains. The NGT ordered the State of Himachal Pradesh to take steps to reduce air pollution in the region, through measures such as restricting transport in some regions to clean fuels or electric vehicles, random pollution checks and a reforestation programme.

+ Henares v. Land Transportation Franchising and Regulatory Board (2006, Philippines)

Petitioners brought a motion to the Supreme Court of the Philippines asking government agencies to mandate that public utility vehicles use clean transportation fuel (compressed natural gas) as a replacement for polluting fossil fuel. They alleged that emissions from fossil fuels were causing serious respiratory problems among citizens and that fossil-fuel-powered vehicles lead to air pollution that violates citizens' right to clean air. In its judgement, the Supreme Court said that while the petitioners had legal standing—stemming from the right to clean air enshrined in the Philippines' constitution—the requested writ of mandamus was inappropriate in this situation. Such a writ can only be issued to enforce a particular duty under law, and no law mandating the use of clean transport fuel exists.⁵⁰

+ Matthew Lukose & Others v. Kerala State Pollution Control Board & Others (1990, India)

Petitioners brought legal action against Travancore-Electro Chemicals Industries Limited in the state of Kerala, for causing water and air pollution in neighbouring regions. They also sued the Kerala State Pollution Control Board for failing to prevent the entity from releasing these effluents and not taking steps to mitigate the harm resulting from them. The court found Travancore-Electro Chemicals Industries guilty of violating the national air pollution act and invasion of citizens' constitutional right to life. As part of the verdict, the court suggested the creation of a national agency with powers to plan and enforce compliance. The court ordered the polluting industrial plant to comply with existing pollution norms within three months or to cease operations.

The above cases highlight how litigation can be a potentially powerful tool in raising awareness of the failure of the State and businesses to limit air pollution and its adverse impacts. However, few institutions or firms have been held accountable thus far. Citizen-led litigation might be more effective in the future where it is complemented by State commitments to the UNGPs through a NAP on Business and Human Rights.

Where States adopt a NAP on Business and Human Rights to implement the UNGPs, States can focus attention and consolidate the work of the many ministries that might regulate air quality. A NAP also offers a means of bringing public attention and inputs into planning and enforcement measures. Where States adopt a NAP on Business and Human Rights, they also send a clear message to businesses to respect human rights related to air quality. NAP processes may also encourage inputs from industry and lead to public commitments.

Finally, under Pillar 3, the UNGPs recognise that judicial mechanisms are a powerful tool providing for access to remedy. Clean air litigation can be complemented where the judiciary is also apprised of the concrete measures that government is taking to address air pollution in the context of a NAP on Business and Human Rights.

“ ...We shouldn't have to rely on legal action. When we recognise that people have the right to a healthy environment, that creates obligations on the part of the government, and governments should fulfil those obligations. Governments themselves need to respect, protect and fulfil the right. They need to respect the right by not violating it themselves through government projects that generate air pollution.”

Dr David Boyd, United Nations Special Rapporteur on Human Rights and the Environment, Associate Professor, Institute for Resources, Environment and Sustainability, School of Public Policy and Global Affairs, University of British Columbia



4. STATE OF AIR POLLUTION IN ASIA

a. The role of industry

Some of the leading causes of air pollution in Asia are transport emissions, industrial operations, coal-powered energy production and crop burning. Transboundary air pollution is also a critical issue in South-East Asia, often caused by forest fires linked to the clearing of forests to make way for cash crop plantations, such as palm oil and rubber.

This section discusses the role of key contributing business sectors to air pollution in Asia.

Industrial operations

Industries such as iron and steel plants, cement factories, glass production and brick kilns release large amounts of particulate matter, emissions that are among the most dangerous forms of pollutants. Brick kilns burn low-grade coal in the process of manufacturing bricks, making brick kilns an important source of particulate matter emissions. In certain South Asian cities, brick kilns account for almost 91% of total particulate matter emissions.⁵¹ Another major contributor to air pollution in Asia is cement production, which involves the use of minerals such as limestone, bauxite or gypsum. The burning of these substances emits large volumes of carbon dioxide and other gases, including nitrous oxide.⁵² The manufacturing processes of many consumer goods also emit a significant volume of pollutants, such as volatile organic compounds, sulphur dioxide and nitrogen oxide. In the absence of effective post-combustion control measures, emissions can lead to persistently high levels of air pollution in the regions in which these manufacturers operate.

Transport

The transport sector has been widely recognised as a key source of air pollution⁵³ as it is a major consumer of liquid fossil fuels, such as petroleum, diesel and aviation fuel. Vehicular emissions from the burning of these fuels contain particulate matter and other polluting gases that cause a range of respiratory and cardiovascular diseases. The growth in private vehicle ownership across Asia—a sign of growing economic prosperity and rising urbanisation—has led to an increase in emissions from the transport sector. Between 2005 and 2015, the car ownership rate increased to 87% in Asia, which is nearly three times the global average of 27%.⁵⁴ Over the same period, PM2.5 emissions from road transport activity rose significantly in some Asian countries: 43% in Bangladesh, 22% in China, 94% in India, 47% in Indonesia, and 27% in Vietnam.⁵⁵

Fossil-fuel-based electricity generation

Another significant contributor to air pollution is the power generation industry. The combustion of coal, oil and natural gas, which is used to generate electricity, releases by-products such as carbon dioxide, carbon monoxide, sulphur dioxide, nitrogen oxide and particulate matter.⁵⁶ Asia accounts for 75% of the world's coal demand,⁵⁷ much of which is used to generate electricity for the energy-intensive manufacturing processes of the key industries described above. In the absence of large-scale, affordable, clean (or renewable) energy sources, much of this electricity demand is met by coal-fired thermal power plants.

b. Air pollution statistics

Table 2: Average annual population-weighted PM2.5 mean exposure (µg/m3), select Asian countries

Country	2010	2015	2019
South Asia			
Afghanistan	51.8	60.6	52.4
Bangladesh	56.4	69	63.4
Bhutan	39.7	44.5	40.3
India	76.7	88.4	83.2
Maldives	13.7	10.2	10.9
Nepal	77.1	88.7	83.1
Pakistan	59.6	66.9	62.6
Sri Lanka	24.7	19	20
South-East Asia			
Brunei	6.39	7.93	7.68
Cambodia	29	24.1	22.1
Indonesia	22.3	19.9	19.4
Laos	26.4	20.8	20.5
Malaysia	18.2	18.1	16.6
Myanmar	37.5	31.2	29.4
Philippines	24.1	19.5	18.8
Singapore	15.1	18.3	18.8
Thailand	35.4	28	27.4
Timor-Leste	17.2	15.8	15.7
Vietnam	27.1	21.8	20.4
North Asia			
China	53.1	56.2	47.7
Japan	11.5	13.4	13.5
Mongolia	30.1	37.2	38.1

Source: Health Effects Institute (2020), State of Global Air 2020. Special Report.⁵⁸

Table 3: Age-standardised deaths/100,000 attributable to PM2.5, select Asian countries

Country	2010	2015	2019
South Asia			
Afghanistan	38.1	54.3	56.9
Bangladesh	53.2	56.9	61.8
Bhutan	44.9	54.7	53.6
India	77.9	96.4	95.6
Maldives	22.9	15.6	17.6
Nepal	67.7	89	93.9
Pakistan	78.3	93.3	94.4
Sri Lanka	40.6	32.2	32
South-East Asia			
Brunei	13.5	19.8	17.4
Cambodia	32.8	31.8	33
Indonesia	56.8	55.5	56
Laos	33.9	30.4	33.9
Malaysia	51.1	46.9	43.6
Myanmar	60.9	57	58.3
Philippines	46	44.3	43.9
Singapore	19.2	19.4	18.2
Thailand	41.1	32.6	33.1
Timor-Leste	21.5	26	27.8
Vietnam	51.1	46.2	44.8
North Asia			
China	96.4	89.9	81.3
Japan	9.18	9.76	9.33
Mongolia	96.6	100	107

Source: Health Effects Institute (2020), State of Global Air 2020. Special Report.⁵⁹

c. Costs of air pollution

Cost to the economy

Research published by Greenpeace Southeast Asia and the Centre for Research on Energy and Clean Air (CREA) reported the total economic and health costs of air pollution from fossil fuels (measured in work absences, years of life lost and premature deaths) to be in the region of 3.3% of global GDP, or US\$2.9trn, in 2018.⁶⁰

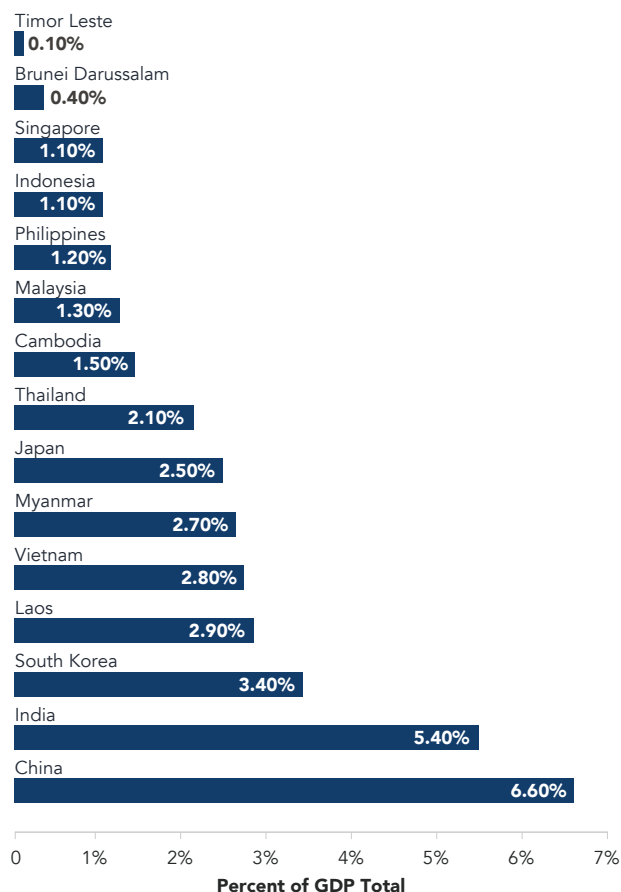
According to the Organisation for Economic Co-operation and Development (OECD), the economic burden resulting from air pollution—loss of productive labour and increased healthcare and welfare costs—could result in a decline in global output of US\$330 per capita and a rise in annual healthcare costs to US\$176bn.⁶¹

Table 4: Global estimated costs of air pollution from fossil fuels, 2018

Pollutant	Impact	Central estimate ⁶²
Nitrous Oxide	Total cost to economy	US\$351 billion
	% GDP	0.4%
Ozone	Total cost to economy	US\$380 billion
	% GDP	0.4%
PM2.5	Total cost to economy	US\$2.2 trillion
	% GDP	2.5%
	Work absences (days)	1,755,200,000
Global cost of pollutants	Total cost to economy % GDP	US\$2.9 trillion 3.3%

Source: Greenpeace Southeast Asia (2020), Toxic air: The price of fossil fuels.⁶³

Chart 6: Welfare losses* due to air pollution, Asian countries 2018⁶⁴



Source: Greenpeace Southeast Asia (2020), Toxic air: The price of fossil fuels.⁶⁵
* Welfare losses refer to the harm incurred to societal well-being and quality of life

For Asia, reducing fossil fuel consumption would have many benefits, including reducing carbon emissions by 18-25%, and deaths linked to air pollution by around 55-60%. The resulting welfare gains (social well-being and quality of life) are also significant, in the range of 5-7% of regional GDP.⁶⁶

Public health costs of air pollution

Air pollution harms cognitive function from prenatal development through childhood and young adulthood to old age.⁶⁷ It is known to cause dementia and attention deficit hyperactivity disorder (ADHD). Research shows that prolonged exposure to excess amounts of PM2.5 increases the risk of dementia by 92%.⁶⁸

Children are at particularly high risk from the debilitating effects of air pollution due to lower immunity. Globally, 93% of children are exposed to air pollution levels higher than WHO-prescribed levels.⁶⁹ Children are also at higher risk from household air pollution in communities that lack access to clean cooking fuel, as being indoors with their mothers while they are cooking exposes them to greater risk from particulate matter.

Air pollution also leads to an increased burden of diseases and premature mortality. A growing body of scientific evidence shows that long-term exposure to air pollution causes ischemic heart disease, lung cancer, chronic obstructive pulmonary disease, lower respiratory infections, stroke and type-2 diabetes. These conditions

lead to many premature deaths and significantly shorten a person's healthy and economically productive lifespan. WHO statistics reveal that air pollution leads to nearly seven million deaths globally each year,⁷⁰ and many more premature deaths. Exposure to air pollution among young children can cause a range of neonatal diseases that can impair brain development and also puts them at greater risk of chronic diseases later in life.⁷¹ Some studies show an increase in lung cancer in South-East Asia, especially in regions with high levels of air pollution.⁷²

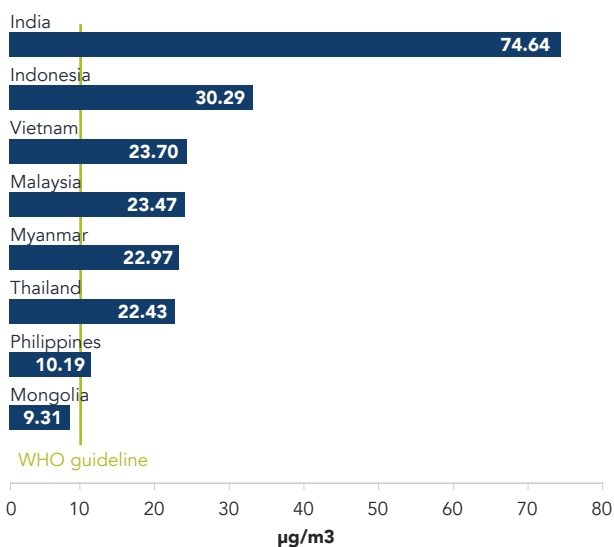
Table 5: Percentage of global deaths from causes attributable to total air pollution, 2019

Disease	Percentage
Chronic obstructive pulmonary disease	40%
Diabetes	20%
Ischemic heart disease	20%
Lower respiratory infections	30%
Lung cancer	19%
Neonatal deaths	20%
Stroke	26%

Source: Health Effects Institute (2020), State of Global Air 2020. Special Report.⁷³

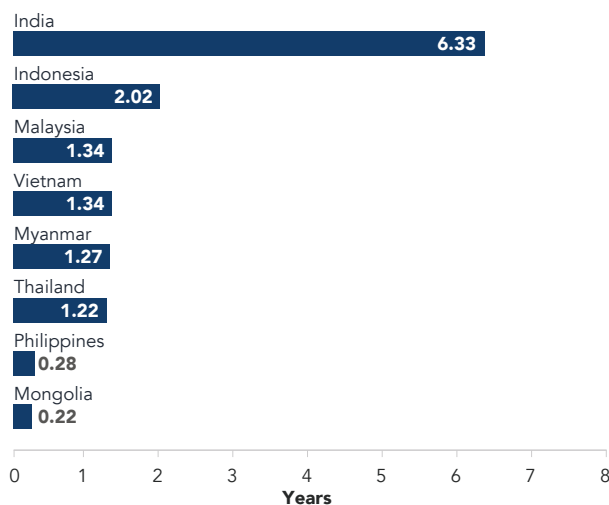
Researchers from the Energy Policy Institute at the University of Chicago have developed a tool that quantifies the health impact of particulate matter pollution on life expectancy in various countries. The index measures the gains in life expectancy if countries reduced their PM2.5 concentration levels to WHO guidelines (2005). Results from this tool reveal that reducing PM2.5 concentrations in select Asian countries might lead to gains of up to 6.33 years of life expectancy.

Chart 7: PM2.5 concentrations (2018) vs WHO guidelines (2005)



Source: Energy Policy Institute, University of Chicago (2018), The Air Quality Life Index.⁷⁴

Chart 8: Potential gains in life expectancy if PM2.5 concentrations are reduced to the WHO guidelines, by country (based on 2018 data)



Source: Energy Policy Institute, University of Chicago (2018), The Air Quality Life Index.⁷⁵

Economic costs of air pollution

- + Income and productivity loss:** Air pollution impacts total income and productivity mainly through two channels: (a) increased absenteeism among adults, either due to illness or to care for sick family members, and (b) a decline in productivity while on the job, as air pollution impairs cognitive function. A recent study by Dalberg Group, consultancy found that in 2019, India's economy lost nearly 1.3 billion working days and US\$6bn in business revenue, attributable to high levels of air-pollution-driven absenteeism.⁷⁶ The same study also found that consumer-facing businesses earned US\$22bn less as consumers stayed indoors due to high levels of air pollution. The most affected sectors were clothing stores and restaurants.⁷⁷ In another study on Chinese cities, it was found that halving the level of air pollution could lead to a 12% increase in incomes in Beijing.⁷⁸
- + Output loss:** Agricultural output and the quality of soybeans, wheat, rice, maize and barley are affected by pollutants such as ground-level ozone.⁷⁹ Pollutants stick to plant surfaces and reduce the amount of sunlight reaching crops, which stunts their growth. A recent study on the impacts of ozone pollution on agriculture in East Asia concluded that surface-level ozone pollution caused annual production losses worth US\$63bn in China, Japan and South Korea, resulting from reduced yields of three major crops—rice, wheat and maize.⁸⁰ Furthermore, crop losses from ozone pollution can have significant implications for food security, leading to a rise in food prices with disproportionate impacts on women-led households.⁸¹ This causes women to bear a larger burden of air-pollution-driven food insecurity.

+ **Loss of investment:** Investors are increasingly facing pressure from regulators, clients and the public to divest from companies involved in activities that contribute to environmental pollution and climate change. Environmental, social and governance (ESG) considerations are also being applied in the finance industry, where they are increasingly viewed as an essential part of investment strategies. Several asset managers have announced their intention to withdraw investments from companies that fail to take adequate actions to address climate risks—including those linked to air pollution—arising from their operations.⁸² This trend is also reflected in the financial performance of climate-conscious investments. In a recent survey of institutional investors carried out by Economist Impact, 74% of survey respondents said that investments that took ESG factors into account performed better financially than equivalent traditional investments in the three years prior to 2020.⁸³

+ **Loss of urban competitiveness:** Air pollution significantly impacts the perception of a city's desirability as a place to live and raise a family. In recent years, a growing body of evidence suggests that the worsening air quality in many Asian cities is driving an outflow of workers from metropolitan areas to cities with cleaner air.⁸⁴ Reportedly, highly educated workers are shunning capitals like Delhi, which experiences severe air pollution, for other cities such as Bengaluru, Pune and Hyderabad.⁸⁵ A study on skilled workers in China revealed similar findings: highly educated workers are much more likely to migrate over time to cities with less pollution than unskilled workers.⁸⁶

+ **Biodiversity loss:** The earth's biodiversity provides a range of essential goods and services that support human needs including economic opportunities, such as tourism and leisure activities.⁸⁷ Pollutants emanating from various sources (industrial manufacturing, transport, power generation, etc.) can have adverse impacts on ecosystems, leading to biodiversity loss.⁸⁸

Impact of air pollution on vulnerable groups

“In terms of the distribution, air pollution in many parts of the world, including in Asia, is not evenly distributed across cities and the landscape. We know from a huge body of scientific research that air pollution is disproportionately affecting people living in poverty and those who are marginalised or in disadvantaged groups.”

Dr David Boyd, United Nations Special Rapporteur on Human Rights and the Environment, Associate Professor, Institute for Resources, Environment and Sustainability, School of Public Policy and Global Affairs, University of British Columbia

“It should also be understood that when waste incineration is common, persistent organic pollutants (POPs), such as dioxins and furans, and the toxic additives found in plastics (e.g. BPA, phthalates, styrene etc.), all convert into toxins that disproportionately affect female fecundity, cancers and other diseases that increase morbidity, as well as birth outcomes, child development and overall health.”

Christine Wellington Moore, SDG Integration Advisor, UNDP

+ **Informal economy workers (occupational exposure to pollutants):** According to the International Labour Organization (ILO), nearly 1.3 billion people are employed in the informal economy in Asia-Pacific, or nearly 70% of Asia-Pacific's employed population.⁸⁹ In urban areas, informal economy workers include street-side food vendors, hawkers and peddlers, rickshaw drivers and tuk-tuk drivers. Their workplaces include temporary shelters, mobile street vehicles placed on busy street corners, roadsides, and crowded city centres. By the nature of their work, these informal economy workers are constantly exposed to pollutants from exhaust gases emanating from city traffic. They lack access to social protections such as health benefits and are often living below the poverty line or suffering from multidimensional poverty.⁹⁰

+ **Co-morbidity patients:** Research from the WHO has increasingly shown that exposure to air pollution at any level can exacerbate existing conditions and can lead to premature death for patients suffering from cardiovascular diseases, cancer and other respiratory infections.⁹¹ Research has also identified air pollution to be a cofactor that led to an increase in mortality from covid-19.⁹²

+ **Women:** Women's exposure to air pollution can have significant consequences on maternal and neonatal health, leading to a higher incidence of infant and maternal mortality, birth defects and breast cancer. This has a direct impact on the health of future generations (and the labour force). The public health costs of adverse birth outcomes and resulting disabilities can be significant. Maternal exposure to ambient particulate matter (PM2.5) has been found to have a link with a higher incidence of pre-term births. In 2010, 2.7 million births—18% (mid-point) of the total pre-term births globally—were associated with maternal exposure to PM2.5.⁹³

+ Indigenous Peoples: The impacts of air pollution are unevenly distributed, with people from low- and middle-income countries bearing a heavier burden compared with those living in high-income countries. However, even within lower-income countries, certain population groups, like Indigenous Peoples, bear a disproportionate burden. Asia is home to two-thirds of the world's Indigenous Peoples⁹⁴ who tie their identities closely to the land and the natural resources on which they depend for their survival and livelihoods.⁹⁵ Indigenous Peoples are more likely to reside in areas that are rich in natural resources such as minerals, coal, oil and gas. These resources are, in turn, targeted for extraction, which can involve the burning of forests, leaving Indigenous Peoples displaced and subject to high levels of air pollution. Given their health vulnerability—life expectancy among Indigenous Peoples is up to 20 years lower than that of non-indigenous people worldwide⁹⁶—Indigenous Peoples are also at a higher risk of death from air pollution-related illnesses. Indigenous Peoples often lack access to formal healthcare systems, compounding the impact of air pollution on health and well-being.

“Indigenous Peoples get triply victimised. First, the infrastructure causing air pollution is built on lands that belong to them, as a result of which they lose their livelihoods. Second, they suffer from the debilitating health impacts of air pollution. Third, they are discriminated against in the access to affordable healthcare and adequate political representation, and thereby suffer from layers of harm.”

Joan Carling, Executive Director, Indigenous Peoples Rights International

d. Air pollution and poverty

Air pollution also has a disproportionate impact on low-income families across countries at each income level. Crowded cities and suburbs bustling with traffic and large-scale industrial operations are more likely to run on fossil fuels, which are a significant contributor to air pollution. According to IQAir's latest World Air Quality Report, 2021, 97% of cities in low- and middle-income countries do not meet WHO-specified international air pollution guidelines for PM2.5.⁹⁷ Of the seven million people who die annually from air pollution, 57% (four million people) are residents of the Asia-Pacific region.⁹⁸ As stated above, the section of the population most exposed to harmful outdoor air pollution in urban areas is workers in the informal economy, such as street vendors, hawkers, daily wage workers and vehicle drivers.

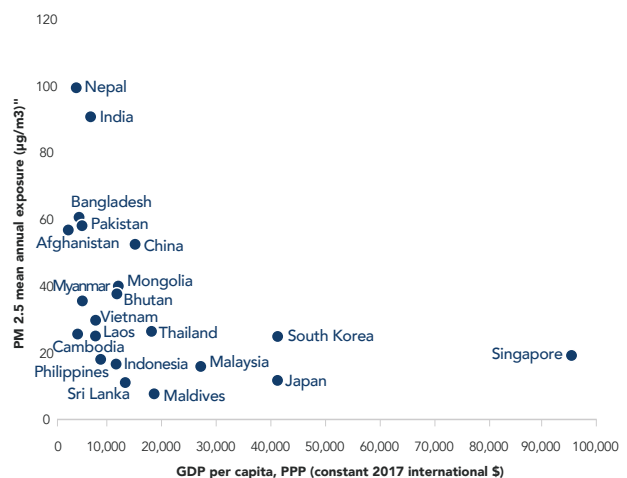
Even in high-income economies, poorer neighbourhoods are often located near busy city highways or close to industrial areas. These locations have higher air pollution levels, increasing exposure to outdoor air pollution among disadvantaged and marginalised families.

“Vulnerable groups such as traffic policemen, taxi drivers and workers in the informal economy, such as street vendors and peddlers, have some of the highest exposure levels to air pollution caused by traffic. Despite their high risk, there is little research to quantify the impact on their health.”

Prarthana Borah, Director, CDP India

The chart below illustrates how people living in low- and middle-income countries are more likely to be exposed to high levels of PM2.5 than people living in higher-income settings. Based on 2017 data, countries with the highest exposure levels to PM2.5 include Nepal, India, Bangladesh, Afghanistan and Pakistan.

Chart 9: PM2.5 exposure vs GDP per capita, selected Asian countries



Source: Brauer et al. (2017), Institute for Health Metrics and Evaluation, World Bank.⁹⁹

e. Cost of inaction

Unchecked air pollution would mean foggier skies and unbreathable air for present and future generations. This means worsening health outcomes coupled with an increase in global temperature, melting polar ice caps and a rise in mean sea levels. The practical implications of this include an increase in food insecurity, increased occurrence of natural disasters and economic instability, to name a few.

According to a recent OECD study, air pollution will shave off 1% of global GDP by 2060 as measured by lost labour productivity, growing health expenditure and falling agricultural crop yields. Additionally, the number of premature deaths due to outdoor air pollution is projected to increase from approximately three million people in 2010 to 6-9 million annually by 2060, with annual global welfare costs associated with premature deaths from outdoor air pollution rising from US\$3trn in 2015 to US\$18-25trn in 2060.

However, while the threat is real, the biggest polluters in Asia are often among the most important industries in the region, as a share of GDP. This means that efforts to curb air pollution could slow economic growth in the near term. As such, governments must explore the trade-offs between the cost of inaction and the benefits gained through expanding GDP under current growth strategies. Slower short-term growth may be the cost of long-term or sustainable economic development, as governments invest in clean air technologies and while preparing citizens to undertake higher-skilled vocations in less-polluting industries.

f. Challenges in addressing air pollution

Lack of uniform regulatory frameworks on air pollution

Interviewees cited inconsistent regulatory frameworks as a key challenge in addressing air pollution, particularly around transboundary haze. For a region as vast and diverse as Asia, this may require sub-regional cooperation through networks such as the Association of Southeast Asian Nations (ASEAN) and the South Asian Association for Regional Cooperation (SAARC). Creating a common governance framework could also pool technical and financial resources and help to disseminate research and knowledge.

“In Asia, regional integration will play a key role in addressing the challenge of air pollution. Pooling resources (technical and financial) and establishing a common and well-coordinated regional governance framework, will help to achieve the desired results in mitigating air pollution.”

Allan Meso, Environmental Lawyer

Lack of data standardisation

Data availability remains a key challenge in most Asian cities. There is a lack of standardised monitoring as the required equipment is often too expensive for developing countries and affordable options do not produce data to the specifications required. As a result, much of the data generated is not useful for measuring air pollution levels or driving policy action.¹⁰⁰

Lack of compliance and clean authority

“Oftentimes, the institutions responsible for creating air pollution standards lack the powers to enforce these standards, which is a serious shortcoming.”

Polash Mukerjee, Lead, Air Pollution and Climate Resilience, NRDC, India

Environmental policies that lack proper implementation measures hinder compliance efforts throughout the Asia-Pacific region. To enforce compliance, environmental agencies require the de facto authority to regulate emission sources. However, this authority is not always provided. Though environmental agencies have seen their status rise across the Asia-Pacific region, they may struggle to advance their agenda when other more powerful agencies have conflicting objectives.

Lack of financial resources

One of the main causes of compliance gaps is a lack of financial resources for pollution prevention and control. Although governments throughout Asia receive development funding to fight air pollution from a variety of sources, these funds are not distributed equitably.¹⁰¹ Even at the national level, there is often a lack of funding to meet the staffing needs of a pollution control office.



5. CURRENT MITIGATION MEASURES

Governments in the Asia-Pacific region are adopting and implementing policies that are reducing pollution levels and will likely continue to do so in future. Without these policy interventions, population-weighted exposure to harmful particulate matter was expected to grow by more than 50% by 2030, based on the region's projected 80% economic growth.¹⁰²

Air pollution mitigation strategies adopted across Asia can be broadly divided into the following categories: vehicular emission standards, energy policies, air quality monitoring and transboundary haze.

a. Regional measures

The table below describes the regional agreements in place to address transboundary haze.

Table 6: Legal instruments set up to manage transboundary haze pollution in ASEAN

ASEAN Agreement on Transboundary Haze Pollution (AATHP), 2002	Signed in 2002 and enforced in 2003, the AATHP was the first regional agreement that brought together a group of contiguous States to tackle transboundary haze pollution emanating from land and forest fires.
The ASEAN Peatland Management Initiative (APMI), 2003	Signed in 2003, the APMI was established to provide a framework for regional cooperation and to discuss measures related to capacity building and fire prevention. The key output of the APMI was a regional strategy for peatland management, the APMS.
ASEAN Peatland Management Strategy (APMS), 2013	The APMS was adopted in 2013 and focuses on the following objectives: ¹⁰³ <ul style="list-style-type: none"> • Enhancing awareness and knowledge of peatlands • Addressing transboundary haze pollution and environmental degradation • Promoting sustainable management of peatlands • Enhancing and promoting collective regional cooperation on peatland issues.

According to some advocates, the ASEAN Agreement on Transboundary Haze Pollution has not yet achieved the desired result of reducing transboundary haze. This is primarily because the agreement lacks the power to penalise countries for non-compliance. Day-to-day management of the environmental agenda remains the responsibility of each ASEAN Member State. In this respect, there is something to learn from the enforceable protocols of the Long-Range Transboundary Air Pollution (LRTAP) treaty signed in 1979 by 32 European countries. The LRTAP resulted in a successful reduction in concentrations of particulate matter through active engagement between scientists and policymakers.

Case Study: Transboundary air pollution in South-East Asia¹⁰⁴

Transboundary haze pollution is a recurring event in South-East Asia, mainly caused by the use of fires to clear vegetation for growing agricultural or cash crops such as corn, and palm oil, rubber or pulpwood. In the absence of legal restrictions in some South-East Asian countries, fires have become a cheap and convenient way to clear forests or agricultural land. This large-scale burning causes major episodes of transboundary haze that travels across borders and into neighbouring countries.

The Association of Southeast Asian Nations (ASEAN) has been working to address the issue of transboundary haze pollution since 1995 when it established the Haze Technical Task Force. The ASEAN Agreement on Transboundary Haze Pollution (AATHP) was signed in 2002 and ratified by six members, Brunei, Malaysia, Myanmar, Singapore, Thailand and Vietnam. Indonesia ratified the agreement in 2015.

The AATHP has several institutional provisions to support actions around managing haze pollution emanating from land/forest fires in the region. However, despite the existence of this legal framework, much remains to be done by member countries as severe haze events have continued in the region over the past decade.

According to Greenpeace Southeast Asia, the AATHP has not been effective.¹⁰⁵ A key shortcoming of the agreement is the lack of a provision for penalties for non-compliance with the stipulated obligations. Despite almost annual occurrences of haze, regional governments have only raised concerns surrounding the lack of action in originating countries.

b. Country-level measures

The table below summarises key mitigation measures that have been implemented to control air pollution in select Asian countries.

Table 8: Country-specific air pollution mitigation measures in place

Focus Country	Measure
Indonesia	<ul style="list-style-type: none"> In 2017, the government required that all gasoline-fuelled vehicles adopt Euro-4 fuel standards by September 2018.¹⁰⁶ The Peatland Restoration Agency (BRG) was established in 2016 after a markedly severe haze season in 2015 with the aim of restoring over 2.6 million hectares of forest and peatlands devastated by the 2015 fires.¹⁰⁷ Presidential Regulation No. 5/2006 concerning National Energy Policy sets the energy mix target for 2025, calling for a reduction of fossil oil from 52% in 2003 to 26.2% in 2025.¹⁰⁸ From 2016 to 2020, Indonesia's public real-time air quality monitoring network grew from a few monitors in Jakarta to 77 stations across 19 cities.¹⁰⁹
Thailand	<ul style="list-style-type: none"> The UNEP is collaborating with the Pollution Control Department (PCD) to leapfrog from Euro-4 vehicle emission standards to Euro-6.¹¹⁰ The PCD coordinates with provincial governments to help them during times of peak pollution. For example, it is helping to find solutions to open burning by developing an air quality forecasting tool that could help to identify the appropriate weather conditions for burning to occur.¹¹¹ From 2017 to 2020, Thailand's public air quality monitoring network grew from 54 to 565 stations. While the Thai government provides the region's largest monitoring network, non-governmental contributors operate 73% of monitoring stations nationally.¹¹² Bangkok plans to amend regulations to allow access to electricity chargers at petrol stations. The excise tax on electric vehicle components has been decreased by 10% as part of a plan to promote electric vehicles in Thailand.¹¹³
Vietnam	<ul style="list-style-type: none"> On June 1, 2016, the prime minister approved a national action plan on air quality management. Vietnam's air quality monitoring network more than doubled between 2019 and 2020, growing from 54 monitoring stations across four cities to 118 stations across 24 cities.¹¹⁴ In 2019, Can Tho became the first Vietnamese city to join the worldwide BreatheLife Network, committing to reaching WHO air quality guidelines for PM2.5 and other pollutants by 2030. With this commitment, Vietnam's fourth-largest city set an air quality control precedent for other Vietnamese cities to follow.¹¹⁵ On April 13, 2022, the prime minister approved the National environmental protection strategy, which includes air quality control standards, targets and timelines.
India	<ul style="list-style-type: none"> In April 2020, the Euro-6 standards came into effect throughout India for all light and heavy-duty vehicles, as well as two- and three-wheeled vehicles.¹¹⁶ The Pradhan Mantri Ujjwala Yojana (PMUY) scheme resulted in an increase in national LPG coverage from 61.9% as of April 1, 2016, to 99.5% as of January 1, 2021, and provided 50 million LPG connections to households with incomes below the poverty line.¹¹⁷ The Graded Response Action Plan (GRAP) was adopted in Delhi to tackle pollution control in the National Capital Territory. Polluters are reportedly facing increasing levels of accountability.¹¹⁸ The National Clean Air Programme (NCAP) is India's flagship scheme for improving air quality. From a 2017 baseline, the NCAP targets PM2.5 reductions of 20-30% in 122 selected cities by 2024.¹¹⁹
Mongolia	<ul style="list-style-type: none"> Air quality monitoring in Mongolia is growing rapidly, largely due to non-governmental organisations and individuals whose community-deployed sensors now supply two-thirds of the national data. There is a high concentration of stations in Ulaanbaatar, which, with 40 stations, has quickly become one of the most densely monitored cities globally.¹²⁰ In May 2019, the government implemented a ban on the burning of raw coal. This has led to a 46% reduction in emissions since implementation.¹²¹ Mongolia's excise tax favours electric and hybrid vehicles.
Malaysia	<ul style="list-style-type: none"> The Ministry of Environment and Water (KASA) has made a strong push for a greener economy in its Strategic Plan 2020-2030: Environmental Sustainability in Malaysia, with improving air quality being among the top ten national priorities.¹²² Malaysia has made progress in tackling local sources of burning through increased governmental cooperation and a well-developed air quality monitoring network.¹²³
Philippines	<ul style="list-style-type: none"> The proposed National Renewable Energy Programme (NREP) 2020-2040 set targets of 35% renewable energy in the power generation mix by 2030, and 50% by 2040.¹²⁴ The Philippines Department of Transportation launched the Public Utility Vehicle (PUV) Modernisation Programme in 2017 with the objective of a comprehensive modernisation of public road vehicles in the Philippines, including jeepneys and buses.¹²⁵ The road-sharing movement "Bayanihan sa Daan" seeks to set aside half of the road for non-motorised transportation, safe and covered sidewalks and all-weather bike lanes while reserving the other half for an organised transport system.¹²⁶
Sri Lanka	<ul style="list-style-type: none"> The purported aim of Sri Lanka's Clean Air 2025 action plan is to reduce urban, industrial and indoor air pollution and maintain air quality at desirable levels by minimising the emission of harmful air pollutants.¹²⁷ Sri Lanka has taken steps to reduce transport-related pollution, including the phasing out of leaded gasoline in June 2002, the introduction of low-sulphur diesel in January 2003, the banning of two-stroke three-wheeled imports in 2008, and the launch of a vehicular emissions testing programme in 2008.¹²⁸
Bangladesh	<ul style="list-style-type: none"> The government's 8th Five Year Plan (July 2020 – June 2025) places significant emphasis on addressing urban air pollution through proposed targets for the reduction of particulate matter levels, taxes on polluting industries and mechanisms for data storage and monitoring.¹²⁹ The Brick Manufacturing and Kiln Installation Act 2013 prohibited the building of brick kilns in residential, preserved or commercial areas. The act was amended in 2019 to make mandatory use of block bricks and introduced phased targets to reduce the use of clay-fired bricks over 2019-2025.¹³⁰

By some measures, China's efforts to stem the impact of air pollution sets an important standard to inform mitigation measures taken elsewhere in the region. In 2014, the Chinese government declared a 'war on pollution', implementing a number of stringent measures to regulate fine particulate matter (PM2.5) emissions.

Between 2014 and 2019, Beijing witnessed a 21% decline in the concentration of particulate matter, while Shanghai witnessed a 31% decline. Though there is more to be done, the measures adopted by the Chinese government set a new standard of commitment and action in the region.

Case study: China's war on air pollution

A timeline charting the Chinese government's efforts to improve air quality:

2013: Government launches the Air Pollution Prevention and Control Action Plan

This five-year plan set the following targets to be achieved by 2017:¹³¹

- + Reduce total PM2.5 concentration levels by at least 10% (compared with 2012 levels) in all areas except the following three clusters, where higher reduction targets apply: Beijing-Tianjin-Hebei (25%); Yangtze River Delta (20%) and Pearl River Delta (15%)
- + Implement fuel standards for gasoline and diesel, mandating sulphur content to be less than 10 micrograms per gram
- + Decommission 15 million polluting motor vehicles
- + Ensure new or upgraded public buses in Beijing, Shanghai and Guangzhou are non-fossil fuelled
- + Reduce the share of coal in the country's energy mix from 68% to 65%
- + Accelerate the monitoring and disclosing of PM2.5 readings across all cities

2014: Government declares a 'war on pollution'—including air pollution

The government introduced several stringent measures and regulatory changes to tackle the challenge of air pollution. These included:

- + Recognising PM2.5 as a primary pollutant and establishing national maximum limits
- + Initiating a national level, real-time air quality monitoring and disclosure programme
- + Executing environmental policies that included pilot carbon cap-and-trade programmes and electrification of the passenger transportation system
- + Expanding the number of air quality monitoring stations across the country
- + Placing restrictions on the number of on-road vehicles
- + Replacing coal-fired power plants with natural gas plants¹³²

2018: Government launches Three-year Action Plan for Winning the Blue Sky War¹³³

The Three-year Action Plan for Winning the Blue Sky War expanded the number of cities under coverage (compared with the Air Pollution Control Action Plan 2013-2017) and set the following key targets to be achieved by 2020:

- + Reduce PM2.5 concentration levels by at least 18% (compared with 2015 levels) in cities where previous targets have not been met
- + Reduce volatile organic compound (VOC) emissions by 10% and nitrogen oxide emissions by 15% to control ozone pollution
- + Reduce pollutant emissions 'in conjunction with' a reduction in greenhouse gas emissions

2021: Government launches its latest five-year plan (2021-2025)¹³⁴

This plan outlines various pollution-oriented goals:

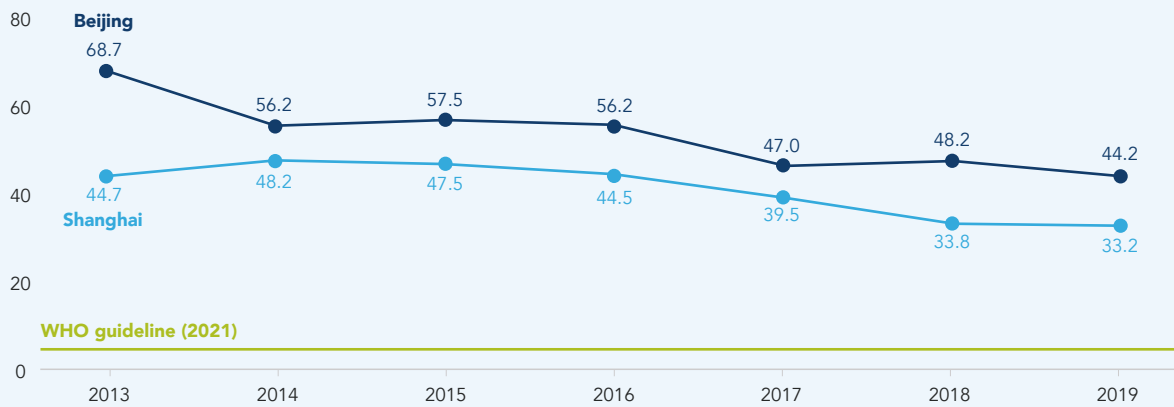
- + Sets a target of 'basically eliminating' heavy air pollution days by 2025
- + Major push for clean energy, with a target of 20% non-fossil energy in total energy consumption, and a target to reduce the CO2 emissions per unit of GDP by 18% between 2020 and 2025
- + Coal consumption capped at 4.2 billion tonnes in 2025—close to the current consumption levels
- + A nuclear power capacity target of 70GW in 2025, up from 52GW currently

2021: Government launches Human Rights Action Plan of China (2021-2025)¹³⁵

Under this plan, further action will be taken to:

- + Prevent and control atmospheric pollution and coordinate the government's commitments to reducing air pollutants and greenhouse gas emissions
- + Improve the eco-environmental legal system, strengthen government information releases and improve law-based disclosure of corporate information
- + Formulate and enforce environmental impact evaluation law and implement measures to facilitate public participation in environmental impact evaluation
- + Encourage and expand the scope of public-interest environmental litigation
- + Adopt a holistic approach to eco-environmental restoration and protection

Chart 10: PM 2.5 mean annual exposure (µg/m³), 2013-2019



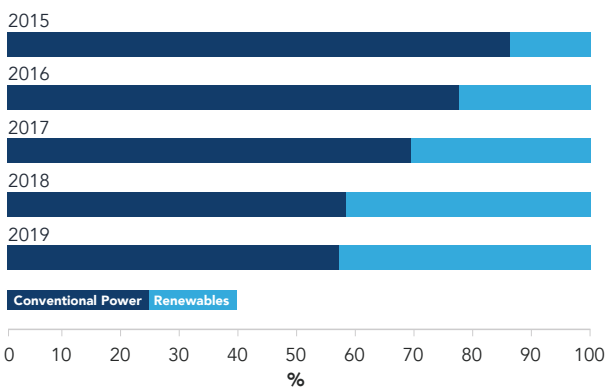
Source: Energy Policy Institute, University of Chicago (2018), The Air Quality Life Index.¹³⁶

c. Speeding up the energy transition for better air quality

Business enterprises involved in thermal energy production are among the largest direct contributors to air pollution. The burning of coal for energy is a leading cause of both climate change and air pollution and of the world's three largest coal-consuming countries, two are found in Asia. By transitioning away from fossil-fuel-powered energy to renewable energy sources, businesses can reduce their contribution to air pollution and address human rights abuses that arise as a direct result of their operations. The State can facilitate the acceleration of this transition by incentivising investments in renewable energy projects and by holding energy firms accountable for adverse impacts on the right to a clean, healthy and sustainable environment.

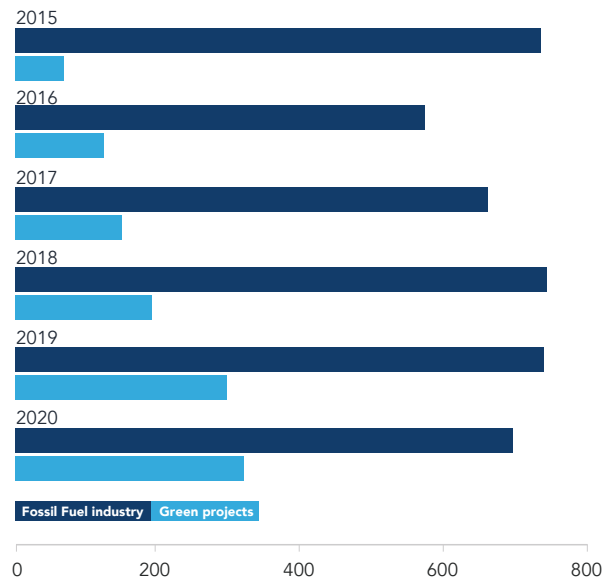
The transition from conventional power to renewables can help to significantly reduce air pollution from energy generation in Asia.

Chart 11: Investments in energy infrastructure, renewables vs conventional, % share, 2015-2019



Source: IJGlobal, 2019¹³⁷

Chart 12: Global debt issuance by banks 2015-2020 (US\$ bn)



Source: Bloomberg League Tables, 2021¹³⁸

There is growing evidence of increased interest from private investment firms in financing renewable sector projects. Since the signing of the Paris Agreement in 2015, bank lending to the green sector, which includes renewable energy, among other climate-friendly ventures, has more than quadrupled—from US\$68bn in 2015 to US\$323bn in 2020. By contrast, investments in fossil fuels—oil, gas and coal-related investments—have been on a downward trend since 2018.

Another important trend involves private sector players stepping in as corporate purchasers of renewable energy. Traditionally, the key purchasers for most energy projects are State-owned energy utilities. However, today multinational companies are signing corporate power purchase agreements (corporate PPAs) to purchase power directly from renewable energy producers in a bid to reduce their carbon footprint.

While this trend has been prevalent in the Americas and Europe, Middle East and Africa regions since 2013, corporate energy purchasing is now gaining pace in the Asia-Pacific region. For example, in January 2019, Google signed a long-term corporate PPA (>10 years) where it agreed to purchase electricity from a 10MW solar farm in Tainan City for its Changhua data centre. In 2018, Microsoft signed a corporate PPA with the Sunseap Group in Singapore to purchase 100% of the electricity generated by its 60MW solar rooftop portfolio. Through 2018 and 2019, Australia has witnessed a number of corporations, such as Telstra, Kellogg and Coca-Cola Amatil, signing up to purchase wind and solar power.

While these steps were primarily implemented to reduce their carbon footprint, the move to renewable energy can drive down demand for electricity derived from air-polluting coal.¹³⁹

Case Study: Emissions trading scheme for particulate matter – Surat, India

Surat, an industrial city in India known for its vibrant textile manufacturing industry, witnessed the launch of a global first in controlling air pollution: an emissions trading scheme for particulate matter. The scheme was implemented by the Gujarat Pollution Control Board in coordination with researchers from the University of Chicago, Yale University and the Abdul Latif Jameel Poverty Action Lab (J-PAL).

The pilot scheme started operating in September 2019. It aims to reduce particulate emissions by 29%. The emissions ceiling set by the Emissions Trading Scheme (ETS) is equal to the amount of air pollution that would have been released if all industrial units had complied with the norm of 280 tonnes per month.¹⁴⁰ Hence, the ETS monthly cap was set at 280 tonnes per industrial unit. Participating units can comply by either cutting their particulate matter emissions using appropriate technology or by purchasing emission permits to emit more than the government-specified limit. Units with surplus permits can sell excess permits to more polluting units for whom it is more expensive to install pollution-reducing technology.¹⁴¹ Existing pollution control measures involve installing bag filters and cyclone equipment to comply with pollution norms. Under the ETS, the average cost of reducing 1kg of particulate pollution was found to be less than the cost of installing the pollution control equipment.¹⁴²

The scheme is projected to foster economic growth by reducing compliance costs for industries and improving people's health by reducing particulate air pollution. Preliminary results indicate that pollution emissions witnessed a 24% decline among participating factories compared with the control units.¹⁴³

d. Leveraging trade policy to mitigate air pollution

Another potentially powerful tool States can leverage to mitigate air pollution is trade policy. Trade policy is an engine for inclusive economic growth and poverty reduction, but trade expansion can also lead to higher levels of pollution, particularly in countries with less stringent environmental policies. By contrast, research suggests that when preferential trade agreements (PTAs) include environmental provisions, they can promote domestic environmental legislation, which leads to a reduction in air pollution and emissions.¹⁴⁴

Case study: India's climateSMART city mission - measuring air quality

The inclusion of air quality as an indicator in India's climateSMART Cities Assessment Framework¹⁴⁵ aims to embed a green mindset in cities. The framework has five main pillars and a total of 28 indicators. 'Mobility and air quality' is a standalone pillar with five indicators that measure existing air pollution levels and clean air action plans.

The five indicators under the 'Mobility and air quality' pillar are:¹⁴⁶

- + Clean Air Action Plan (Planning and Implementation)
- + Level of air pollution
- + Non-motorised transport network coverage (pedestrian and bicycle)
- + Availability of public transport
- + Clean technology-shared vehicles

The inclusion of air- and climate-relevant parameters place green measures at the heart of the Smart City framework, an indicator of the government's commitment to improving air quality as cities develop and grow. The framework currently applies to 100 cities included in the Smart City Mission.

“By mandating that all smart cities monitor air quality and have a clean air action plan in place, it works very well for cities as it directly focuses on mitigation.”

Prarthana Borah, Director, CDP India

6. POLICY RECOMMENDATIONS

“Air pollution is not a law of nature, it’s a choice. Countries can choose to have lower or higher air pollution; it requires political will. This is the lesson we need to take away from cities that have succeeded in reducing air pollution.”

Dr Michael Greenstone, Milton Friedman Distinguished Service Professor in Economics; Director, Energy Policy Institute at the University of Chicago (EPIC); Director, Becker Friedman Institute, University of Chicago

Despite the mounting evidence of the harmful impacts of air pollution on human health and the economic losses resulting from it, few countries are able to meet the air quality standards prescribed by the WHO. However, past evidence from cities that have succeeded is proof enough that improving air quality is feasible and that focused legislative and policy action is the key to achieving clean air. Leveraging the framework of the UNGPs, this section outlines recommendations that can be adopted by States and businesses to improve air quality. The recommendations are global in nature and therefore, are applicable to countries at varying stages of economic growth and phases of their air pollution mitigation journey.

UN Guiding Principles: The State Duty to Protect Human Rights

States should actively work towards preventing adverse human rights impacts from air pollution by taking appropriate steps to identify risks, investigate sources, and where appropriate, punish and redress such abuse, through effective laws and policies.¹⁴⁷

Under Principle 1, States must protect against human rights abuse within their territory and/or jurisdiction by third parties, including business enterprises. To do so, States must first be aware of the extent and sources of air pollution. This requires effective data gathering and monitoring by investing in the right technologies to collect reliable, high-quality and internationally comparable data and building air quality monitoring centres. Some experts pointed out that the lack of uniform, standardised data collection guidelines, resulted in large gaps in analysis. Collected data could not be compared and contrasted.

Highlighted below are some suggested measures States could potentially adopt in building air quality monitoring capabilities:

- + **Update and build:** Governments should invest in updating existing air quality monitoring stations with the latest equipment. Expanding coverage by building new monitoring stations in previously uncovered areas could improve data collection.
- + **Calibrate instruments:** Instruments used in monitoring stations should be calibrated periodically to reduce measurement errors and ensure accurate data collection and greater standardisation in results that would help in making it internationally comparable.
- + **Increase grid density:** In locations where current grid density is found to be inadequate, monitoring and surveillance efforts should be expanded to cover rural and urban residential areas and not remain confined to industrial zones.
- + **Use satellite data:** To cover existing gaps in routine monitoring and steadily transition from manual air quality monitoring to automatic monitoring systems, data from existing equipment should be combined with satellite data. These systems generate high-volume, short-frequency data that can be helpful in covering gaps.
- + **Mobile monitoring:** Low-cost sensors and mobile monitoring should be deployed to measure local air quality to estimate improvements brought about by specific interventions.
- + **Data dissemination:** Collected data should be made publicly available to encourage research on the impacts of air pollution on human health and, where possible, to understand gender-disaggregated costs of air pollution.

Under Principle 2, States should enforce laws that require business enterprises to respect human rights and periodically assess the adequacy of such laws and address gaps. In the absence of clear laws and punishment mechanisms for non-compliance with air pollution regulations, there is little incentive for businesses to comply. Thus, in addition to ensuring adequate air monitoring facilities, States should also develop clean air regulations and monitor compliance. Principle 2 also provides that regulations may be applied to the extraterritorial activities of businesses domiciled in their territory.

Below, are regulatory and monitoring policies that the State could adopt to improve air quality:

- + **Update emission standards:** Regular updates to vehicular and industrial emissions standards should be stringent enough to reduce air pollution. For industries, advanced emissions standards should be designed for polluting entities such as iron and steel plants, cement factories, glass production, chemical industry, etc.
- + **Ban open burning of agricultural waste:** To prevent seasonal haze, States should introduce a ban on the burning of agricultural crop residue as a means of clearing fields. However, such bans must also be supplemented with adequate alternatives to clear crop residue. This could potentially involve providing farmers with affordable access to relevant technologies.
- + **Ban open burning of urban waste:** States should introduce laws to ban the open burning of urban waste as a means of waste disposal. Such a ban should be supplemented with alternative methods of urban waste disposal. This could involve policies mandating waste segregation at the household level to promote recycling initiatives.
- + **Mandate installation of pollution control equipment:** For industries that directly contribute to air pollution, such as coal power plants, cement industries, etc. mandate the installation of pollution control equipment such as smokestacks and scrubbers to prevent the emission of harmful air pollutants.
- + **Compliance and enforcement:**
 - Physical installation of air quality control monitors to ensure continuous monitoring and centralised inspection.
 - Regular pollution emission checks on polluting vehicles in the transport sector
 - Implement the use of policy performance bonds.¹⁴⁸ These bonds are an enforcement and assurance mechanism used in extractive industries. The bonds are a way of setting aside the financial resources required to terminate operations under situations where the issuing entity is unable to fulfil contractual obligations to limit ambient air pollution. Such a mechanism can be used to ensure compliance among polluting industries.
 - Enforcement through fines and penalties for polluting industries and individuals can set an important precedent to prevent future violations of regulatory standards. An interesting example of such an initiative is the Special Vehicle Pollution Control Fund started by the Philippines Government.¹⁴⁹ This is an emission reduction initiative where funds are generated from a charge on all motor vehicles, paid by owners.

As outlined in Principle 4, business enterprises supported or controlled by the State should set an example for private sector enterprises to emulate.

The State should leverage its role as a market actor to ensure business compliance with air pollution measures. For instance, conventional energy production facilities in Asia (major contributors to air pollution) are often either State-owned or State-controlled. Any heightened air pollution monitoring and reduction efforts employed by these facilities are likely to raise the baseline of behaviour for

other major market players. This is especially true when State-owned enterprises (SOEs) prefer to partner with ESG-compliant entities.

Principle 6 provides that States should promote respect for human rights by business enterprises with which they conduct commercial transactions.

State-owned and state-controlled enterprises regularly make high-value transactions as part of their business activities. These public contracts could be used as an incentive whereby entities in violation of air quality standards are excluded from these public contracts.

As outlined in Principle 8, States should enable greater policy coherence among State-based institutions that shape business practices and ensure that these institutions are aware of and observe the State's human rights obligations, including providing of training and support.

According to experts, inadequate enforcement of regulations is primarily due to the fragmented nature of accountability among regulatory agencies. In many countries there is no single ministry/department responsible for air pollution, which can lead to confusion and overlapping duties, making it difficult to enforce regulations and hence penalise non-compliance. In the absence of a singular point of authority accountable for enforcement, the many regulations are of little help.

Thus, States should consolidate air quality regulations across different government departments. This may involve fixing a central point of authority and equipping that institution with the legislative and financial power to implement policies. Such an institution should also be equipped with the required capacity, training and legislative powers to enable it to carry out its mandates, such as monitoring compliance with air quality standards and the power to issue penalties in case of violations. Under Principle 8 of the UNGPs, the appointed authority should work with businesses to raise awareness of the impacts of air pollution, promote due diligence practice and otherwise ensure compliance through the enforcement of existing laws.

As outlined in Principle 9, States should ensure there is adequate domestic policy space to meet their human rights obligations while signing trade and investment agreements.

Trade is a connector—of products, people and the planet—and can help drive collective action to facilitate solutions to environmental challenges, including air pollution. However, States should be cautious when signing bilateral or multilateral trade and investment agreements to ensure that domestic policy space is maintained to adequately implement policies aimed at protecting air quality.

In the past, the terms of trade and investment agreements have restricted the policy space for developing countries wishing to protect the right to health. Some States have been subjected to lengthy and expensive binding arbitration processes when, for example, they attempted to strengthen labelling requirements on tobacco products, sugary snacks and drinks.¹⁵⁰ With this in mind, States should avoid entering into international trade and investment agreements that could complicate air quality standards for vehicles or manufacturing facilities, subjecting them to investor-State dispute settlement (ISDS) processes.

UN Guiding Principles: The Corporate Responsibility to Protect Human Rights

As outlined in Principle 15, business enterprises should have policies and processes in place to both prevent and address adverse human rights impacts of their operations. States can facilitate action by mandating compliance through corporate or securities law.

In the context of clean air provision, businesses should communicate in a policy statement their commitment to addressing air pollution. They should implement due diligence processes to reduce negative impacts on human rights due to their operations, including along their supply chains. The key industries contributing to air pollution involve both large and small players. Each business enterprise—commensurate with its size and contributions—should have adequate processes in place to identify the direct contribution to air pollution as a result of their operations, including the burning of fossil fuels.

Business enterprises heavily dependent on fossil fuels—transport and electricity generation, heavy industries involving steel plants, cement factories, glass production and brick kilns—should develop internal processes to enable solutions that reduce their direct contributions to air pollution. Where they find health and other impacts, businesses should provide access to remedy.

Businesses in these industries could adopt suo-moto policies by including measures such as:

- + Investing in research and development to explore renewable sources of energy, such as solar, wind and hydro, which have the combined advantage of causing less air pollution while also addressing the challenge of global warming.
- + Actively investing in technologies aimed at reducing particulate matter emissions from conventional transport while simultaneously investing in research to build electric vehicles—applies to transport companies.

As outlined in Principle 16, business enterprises should demonstrate their commitment to respecting human rights by publishing a statement of policy that, among other things, is approved at the most senior level of the business enterprise; is informed by relevant internal and/or external expertise; and stipulates the enterprise's human rights expectations of personnel, business partners and other parties directly linked to the business.

Similarly, businesses should reflect their commitment to reducing air pollution in a public statement that might include planned technology upgrades, detailed efforts made to protect workers and communities, outlining investments in monitoring pollution and/or capacity building of business partners on the same. Other commitments might include using electric vehicles within factory premises, compulsory installation of smokestacks and scrubbers on chimneys to reduce particulate emissions and mandatory compliance with local air quality standards in all factory locations. A policy commitment might also involve plans to join a local cap-and-trade scheme to reduce air pollution emissions.

As outlined in UNGPs 17-21, business enterprises should carry out adequate due diligence to identify and address risks and any impacts of human rights abuses arising directly or indirectly as a result of their business operations.

To be aware of the true cost of their actions and address potential human rights violations linked to air pollution, businesses should conduct human rights due diligence (HRDD). Principles 17-21 of the UNGPs provide that businesses can conduct due diligence through four steps: identifying human rights risks, taking action and integrating measures to address the most salient risks, tracking the performance of those efforts and communicating the impact of their work to the public. Importantly, businesses conducting HRDD should consult with impacted stakeholders, particularly the most vulnerable sections of society and those who lack adequate political representation. Some measures aimed at reducing air pollution through due diligence that could be enforced include:

- + Actively measuring and tracking the impact of their business operations on local air quality. Such data should be consistently maintained and should be used to inform future growth strategies.
- + Employing external experts to assess their contributions to local air pollution and any impacts. Such exercises could be repeated on an annual basis and their results made available to the public on demand.
- + Ensuring proper stakeholder consultations are carried out before the commissioning of a new plant or factory, to take account of all stakeholders and their concerns. Under the UNGPs, businesses should also consult with the most affected and most vulnerable so that businesses can understand the range of impacts of air pollution on human rights and how best to mitigate risks. Such consultations should be repeated periodically to assess any new developments or changes that may have led to an increase in air pollution as a direct or indirect result of business operations.

UN Guiding Principles: Access to Remedy

Under Principle 25,¹⁵¹ States should draft laws and develop appropriate mechanisms and instruments that create avenues for civil society to seek remedies for human rights abuses due to business operations.

To fulfil their duty to ensure that affected populations have access to *effective remedy*, laws should be drafted allowing for public litigation to be filed. Furthermore, courts should be capacitated to account for damages relating to air pollution. States should also consider establishing an oversight board that has the authority to hold businesses accountable for rule violations when complaints are brought by local communities.

This report provided a brief overview of public litigation brought in pursuit of clean air. Public-interest litigation can complement State efforts in combating air pollution. However, these efforts are still at a nascent stage in many Asian countries. To facilitate greater access to remedy, States should consider the following:

- (a) Specialised bodies tasked with adjudicating environment-based litigation can deliver decisions faster than regular courts. Environmental cases can often be very time-sensitive, requiring a fast-tracked decision, which is often difficult to achieve in a regular court.
- (b) Creating a single point of authority responsible for air pollution can promote the ability of rights-holders to hold enterprises accountable for violations of air pollution regulations. A judgement in favour of the aggrieved will fail to achieve any real success if there is no authority to effectively carry out the measures pronounced in the court-issued judgement.
- (c) Court judgments have the potential to drive change. In some cases, the courts have prescribed the creation of national agencies with the appropriate powers to enforce laws. Such judgments can drive real change in achieving good air quality.

Other recommendations

Collaboration among stakeholders

Inviting public consultations in NAP processes, or other national strategies, with relevant stakeholders and knowledge partners can lead to innovative solutions on how to improve air quality. Developing synergies and multi-stakeholder platforms involving civil society, business and government can help to promote sustainable, local solutions.

Cooperation between State and private sector

A road-sharing scheme in the Philippines is often cited as a good example of how cooperation between the State and the private sector can reduce air pollution. Discussions involved participation from business chambers and several notable private corporations. Involving private entities in discussions from the planning stage allowed them to find business opportunities in the form of building cycling infrastructure in the cities. Finding such opportunities can ensure the involvement of businesses in air pollution mitigation strategies and enable them to pre-empt the violation of human rights caused by their business operations.

“International NGOs, or NGOs in general, should never underestimate the power of working together with more progressive member States’ diplomatic representatives in their communities. There is much to be learned from the experience of developed nations that have achieved a lowering of their air pollution levels.”

Kevin Punzalan, former Senior Policy Officer, Embassy of the Kingdom of the Netherlands in the Philippines. Currently an International Business Developer for VDE Renewables GmbH.

Community participation

Involving the community in discussions on air pollution mitigation measures can yield important benefits and viable solutions that are more useful in a local context. This includes consultations with marginalised groups, including Indigenous Peoples. For example, Nepal’s climate change policy of 2011 carried a strategic objective to ensure the participation of vulnerable communities in the implementation of climate adaptation and climate change-related programmes. Through the implementation of local adaptation plans of action (LAPAs), the government implemented over 2,303 adaptation actions benefitting over 600,000 climate-vulnerable people during the period 2013-2016. The plans were based on a flexible and inclusive decision-making structure with the aim of protecting the livelihoods of the most vulnerable.¹⁵² Including women in the discussions on air pollution mitigation measures can help reduce the risks and reduce the inequalities they face as a result of structural and biological factors.¹⁵³

Furthermore, public and civil society organisations can play an important role in monitoring air pollution by notifying regulatory authorities of a lack of compliance. For example, in Lahore, citizens are using air quality index (AQI) monitors and sharing information on real-time air pollution levels so that they can take effective measures. Citizens are actively joining ventures such as the Pakistan Air Quality Initiative, which aims to accurately report AQI numbers across the country.¹⁵⁴

Promoting knowledge sharing through city networks

City networks may be particularly well-placed to transfer knowledge between countries and cities, in part because they are more flexible than formal government-to-government arrangements. The Asia-Pacific region has several existing air pollution and environmental collaboration networks that have helped to share scientific understanding, strengthen monitoring and, in some instances, promote collective action. These include the Asia Pacific Clean Air Partnership (APCAP), which is co-financing this report together with the Climate and Clean Air Coalition (CCAC), the global network that is also helping to advance an action-oriented agenda through a better understanding of science and a series of initiatives targeting a particular sector or cross-sectoral concern.



7. CONCLUSION

Air pollution is among the most urgent challenges faced by Asia today. There is mounting evidence of health impacts in the shape of rising incidence of respiratory illnesses and air pollution-related mortality. Urban centres are witnessing a steady increase in the number of residents leaving due to hazardous levels of air pollution. The scale and seriousness of the problem has clearly come to a tipping point.

The debilitating impact of air pollution has huge economic and social implications. The public health and economic costs from air pollution can cause losses of up to 3.3% of global GDP, accounting for the loss of income, productivity, investment, urban competitiveness and biodiversity in a country.¹⁵⁵ Polluted air is a silent killer that is affecting the well-being and quality of life of future generations as well through its impact on maternal and neonatal health. However, the impacts and costs of air pollution are not borne equally. Vulnerable groups such as women, informal economy workers, low-income families and Indigenous Peoples experience much greater harm, especially when they lack the adequate platforms and political representation to voice their concerns or access remedy.

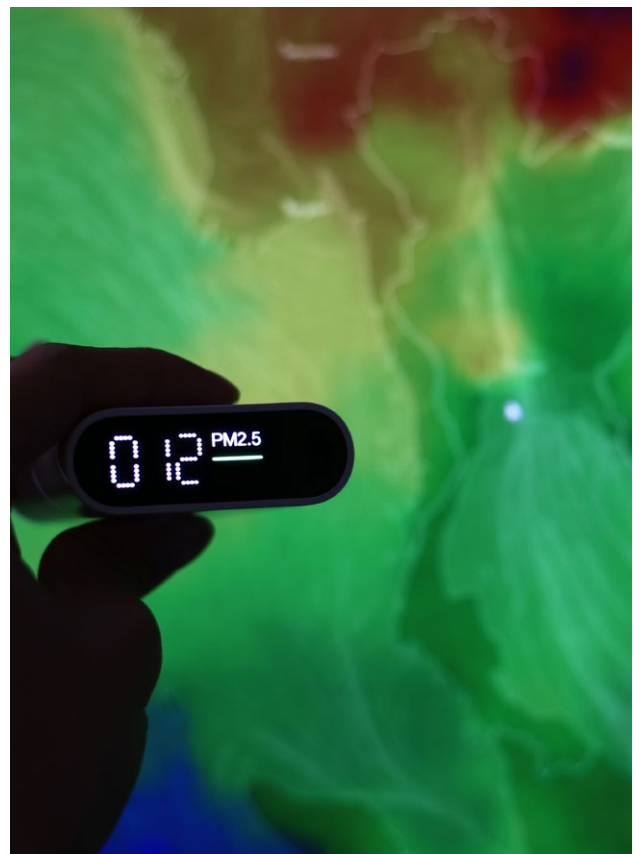
The UN resolution HRC/RES/48/13: ‘The human right to a clean, healthy and sustainable environment’ is a major step in the recognition of clean air as a basic human right. Despite the legally non-binding status, the resolution is expected to compel States and businesses to take action towards improving air quality. By recognising clean air as a basic human right, the resolution brings the issue of air pollution directly within the remit of the UN Guiding Principles on Business and Human Rights. However, a key challenge remains: industries directly contributing to poor air quality are also some of the largest drivers of economic growth in the region. Getting these industries to take concrete steps towards improving air quality requires dedicated legislative action from governments and a commitment from industry to embrace long-term thinking.

The UN Guiding Principles on Business and Human Rights provide a useful framework for States and businesses to begin taking steps to improve air quality. The three pillars of the framework—the State duty to protect, the corporate responsibility to respect, and the responsibility of both State and business to provide access to remedy—provide practical recommendations for governments and business to play their role in achieving the collective objective of improvement in air quality. To carry out its duty to protect, the State must mandate air quality standards, while monitoring compliance by both private and State enterprises. The State should also ensure policy coherence among ministries, develop

and update appropriate legislation and regulations, and leverage its role as a market actor to motivate private sector enterprises. The State must also ensure that affected populations have adequate access to remedy in the form of legal recourse.

Businesses should take measures to mitigate air pollution caused as a direct or indirect result of their operations. Business enterprises should demonstrate commitments toward reducing air pollution through policy statements, implementing due diligence processes, detailed stakeholder consultations and complying with local air quality standards. Businesses should also invest in research and development to identify new technologies and processes that could potentially reduce their direct and indirect contributions to air pollution.

Successes in achieving improved air quality in Asia is evidence that improving air quality is not an unattainable goal. Improving air quality requires dedicated and coordinated action from all stakeholders, including the government and the private sector. With the necessary political will and committed action from all stakeholders, significant improvements in air quality can be achieved.



ENDNOTES

- 1 <https://www.ccacoalition.org/en/content/air-pollution-measures-asia-and-pacific>
- 2 <https://e360.yale.edu/digest/air-pollution-from-fossil-fuels-costs-8-billion-per-day-new-research-finds>
- 3 For the full list of UNGPs, see > https://www.ohchr.org/sites/default/files/documents/publications/guidingprinciplesbusinesshr_en.pdf
- 4 <https://timesofindia.indiatimes.com/india/india-third-most-polluted-country-delhi-most-polluted-capital-report/articleshow/81537532.cms>
- 5 Greenpeace Southeast Asia and Centre for Research on Energy and Clean Air
- 6 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6923778/#B3>
- 7 <https://www.newyorker.com/news/dispatch/the-coronavirus-offers-a-radical-new-vision-for-indias-cities-pollution>
- 8 https://twitter.com/hp_tourism/status/1246017228274728960
- 9 <https://www.ndtv.com/cities/jalandhar-sees-dhauladhar-range-for-first-time-in-decades-amid-lockdown-2205943>
- 10 <https://www.who.int/news/item/04-04-2022-billions-of-people-still-breathe-unhealthy-air-new-who-data>
- 11 <https://www.ccacoalition.org/en/content/air-pollution-measures-asia-and-pacific>
- 12 <https://timesofindia.indiatimes.com/india/india-third-most-polluted-country-delhi-most-polluted-capital-report/articleshow/81537532.cms;world-air-quality-report-2020-en-pdf> (2020 Report-English - page 4, section on Executive summary) More recent data is available from the same source but was released after the report went into production.
- 13 US AQI > 100 <https://www.airnow.gov/aqi/aqi-basics/#:~:text=Think%20of%20the%20AQI%20as,300%20represents%20hazardous%20air%20quality;world-air-quality-report-2020-en-pdf> (2020 Report-English - page 21, section on Central & South Asia) More recent data is available from the same source but was released after the report went into production.
- 14 <https://timesofindia.indiatimes.com/india/india-third-most-polluted-country-delhi-most-polluted-capital-report/articleshow/81537532.cms;world-air-quality-report-2020-en-pdf> (2020 Report-English - page 21, section on Central & South Asia) More recent data is available from the same source but was released after the report went into production.
- 15 <https://aqli.epic.uchicago.edu/pollution-facts/>
- 16 <https://pubmed.ncbi.nlm.nih.gov/33735795/>
- 17 <https://www.stateofglobalair.org/>
- 18 https://www.iarc.who.int/wp-content/uploads/2018/07/pr221_E.pdf
- 19 <https://www.economist.com/asia/2021/11/06/indias-toxic-air-is-its-most-immediate-environmental-problem>
- 20 <https://ourworldindata.org/air-pollution#air-pollution-is-one-of-the-world-s-leading-risk-factors-for-death>
- 21 <https://ourworldindata.org/air-pollution#air-pollution-is-one-of-the-world-s-leading-risk-factors-for-death>
- 22 <https://ourworldindata.org/outdoor-air-pollution>
- 23 <https://www.who.int/news/item/22-09-2021-new-who-global-air-quality-guidelines-aim-to-save-millions-of-lives-from-air-pollution>
- 24 <https://www.who.int/news/item/22-09-2021-new-who-global-air-quality-guidelines-aim-to-save-millions-of-lives-from-air-pollution#:~:text=At%20the%20same%20time%2C%20however,more%20healthy%20years%20of%20life>
- 25 <https://energyandcleanair.org/publications/costs-of-air-pollution-from-fossil-fuels/>
- 26 <https://www.ccacoalition.org/en/content/air-pollution-measures-asia-and-pacific>
- 27 [https://www.who.int/news-room/fact-sheets/detail/ambient-\(outdoor\)-air-quality-and-health](https://www.who.int/news-room/fact-sheets/detail/ambient-(outdoor)-air-quality-and-health)
- 28 [https://www.who.int/news-room/fact-sheets/detail/ambient-\(outdoor\)-air-quality-and-health](https://www.who.int/news-room/fact-sheets/detail/ambient-(outdoor)-air-quality-and-health)
- 29 “Air quality guidelines (AQGs) released by the WHO provide recommendations on air quality levels as well as interim targets for six key air pollutants. These are based on the extensive scientific evidence currently available; the guidelines identify the levels of air quality necessary to protect public health worldwide. The AQGs also serve as a reference for assessing if, and by how much, the exposure of a population exceeds levels at which it might cause health concerns. They cover some of the most monitored pollutants critical for health, for which evidence on health effects from exposure has advanced the most in the past 15 years.” <https://www.who.int/news-room/questions-and-answers/item/who-global-air-quality-guidelines>
- 30 <https://www.iqair.com/blog/air-quality/2021a-WHO-air-quality-guidelines>
- 31 <https://www.sciencedirect.com/science/article/pii/S1352231015303320#appsec1>
- 32 <https://www.sciencedirect.com/science/article/pii/S0048969720336111>
- 33 <https://www.sciencedirect.com/science/article/pii/S0048969720336111>
- 34 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6923778/>
- 35 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6923778/#B3>
- 36 <https://undocs.org/A/HRC/RES/48/13>
- 37 United Nations, General Assembly, The human right to a clean, healthy and sustainable environment, A/76/L.75 (26 July 2022)
- 38 <https://documents-dds-ny.un.org/doc/UNDOC/GEN/G20/202/42/PDF/G2020242.pdf?OpenElement>
- 39 Interview insight - Dr Surya Deva
- 40 <https://undocs.org/en/A/RES/64/292>
- 41 <https://news.un.org/en/story/2021/10/1103082>
- 42 https://www.ohchr.org/en/NewsEvents/Pages/DisplayNews.aspx?NewsID=26116&LangID=E#_ftnref2
- 43 <https://www.ohchr.org/en/statements/2020/07/10th-anniversary-recognition-water-and-sanitation-human-right-general-assembly?LangID=E&NewsID=26116>
- 44 <https://ideas4development.org/en/right-water-fundamental-human-right/>
- 45 https://www.ohchr.org/en/statements/2020/07/10th-anniversary-recognition-water-and-sanitation-human-right-general-assembly?LangID=E&NewsID=26116#_ftn1
- 46 <https://shiftproject.org/wp-content/uploads/2012/11/How-to-use-the-UN-Guiding-Principles-on-Business-and-Human-Rights-in-company-research-and-advocacy.pdf>

47 https://www.ohchr.org/documents/issues/business/a-hrc-17-31_aev.pdf

48 https://www.ohchr.org/documents/issues/business/a-hrc-17-31_aev.pdf

49 <https://www.adb.org/sites/default/files/publication/659631/climate-litigation-asia-pacific.pdf>

50 <https://www.globalhealthrights.org/henares-and-ors-v-land-transportation-franchising-and-regulatory-board-and-ors/>

51 <https://documents1.worldbank.org/curated/en/685751588227715919/pdf/Dirty-Stacks-High-Stakes-An-Overview-of-Brick-Sector-in-South-Asia.pdf>

52 <https://documents1.worldbank.org/curated/en/685751588227715919/pdf/Dirty-Stacks-High-Stakes-An-Overview-of-Brick-Sector-in-South-Asia.pdf>

53 https://discovery.ucl.ac.uk/id/eprint/894/1/Millennium_rvw_final_october.pdf

54 <https://tcc-gsr.com/wp-content/uploads/2021/06/1.3-Asia-Regional-Overview.pdf>

55 Calculations by Economist Impact, based on data from <https://data.adb.org/dataset/asian-transport-outlook-database> (See Asia Transport Outlook Database – Excel file name > 'National air pollution and health', Sheet name > 'APH-VAP-031')

56 <https://www.channelnewsasia.com/world/explainer-power-impact-climate-change-1339031>

57 <https://www.economist.com/leaders/2019/08/22/asian-governments-are-the-biggest-backers-of-the-filthiest-fuel>

58 <https://www.stateofglobalair.org/data/#/air/plot>

59 <https://www.stateofglobalair.org/data/#/air/plot>

60 <https://e360.yale.edu/digest/air-pollution-from-fossil-fuels-costs-8-billion-per-day-new-research-finds>

61 <https://blogs.adb.org/blog/crystal-clear-asia-s-cities-are-finding-innovative-ways-clean-their-skies>

62 Figures are estimates from modelling exercises. Scientific studies that use computer models do not give results with absolute certainty. Instead a range is provided (known as an 'interval'). The 'confidence range' is the range that is most likely to contain the true value. A 95% confidence interval means that with 95% probability, reality is somewhere inside the confidence interval, and a 5% chance it is outside the interval (either higher or lower than the range of numbers in the range). The value with the highest probability to be the true value is called the central estimate. It is somewhere inside the confidence interval. The bounds of the confidence interval are called the low and the high estimate.

63 <https://www.greenpeace.org/static/planet4-southeastasia-stateless/2020/02/29e450ab-data-driven-media-briefing-110220.pdf>

64 These figures are central estimates. See footnote 60 for a definition of central estimates.

65 <https://www.greenpeace.org/static/planet4-southeastasia-stateless/2020/02/21b480fa-toxic-air-report-110220.pdf>

66 <https://www.unescap.org/sites/default/files/The%20Economics%20of%20Climate%20Change%20in%20the%20Asia-Pacific%20region.pdf> (Section on Highlights, page v)

67 <https://mitsloan.mit.edu/ideas-made-to-matter/psychological-economic-and-social-costs-air-pollution>

68 <https://mitsloan.mit.edu/ideas-made-to-matter/psychological-economic-and-social-costs-air-pollution>

69 <https://www.who.int/publications/i/item/air-pollution-and-child-health#:~:text=Globally%2C%2093%25%20of%20all%20children,indirectly%20related%20to%20environmental%20risks.>

70 <https://www.unep.org/news-and-stories/story/why-legislation-needed-curb-air-pollution>

71 <https://www.unep.org/news-and-stories/story/five-reasons-you-should-care-about-air-pollution>

72 <https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-018-6025-1>

73 <https://www.stateofglobalair.org/health/global#Millions-deaths>

74 <https://aqli.epic.uchicago.edu/the-index/>

75 <https://aqli.epic.uchicago.edu/the-index/>

76 <https://dalberg.com/our-ideas/more-than-a-public-health-crisis-air-pollutions-impact-on-the-indian-economy/>

77 <https://dalberg.com/our-ideas/more-than-a-public-health-crisis-air-pollutions-impact-on-the-indian-economy/>

78 <https://insights.som.yale.edu/insights/skilled-workers-flee-from-polluted-cities-hampering-economic-growth>

79 Ground level ozone is a pollutant formed as a result of chemical reactions between oxides of nitrogen and volatile organic compounds in the presence of sunlight. These chemicals are emitted from industrial plants, electric utilities, vehicle exhaust etc.

80 <https://www.asianscientist.com/2022/01/in-the-lab/ozone-emission-exposure-pollution-crop-loss/#:~:text=Ozone%20pollution%20has%20been%20linked,maize%20yield%20in%20East%20Asia>

81 <https://www.sei.org/featured/5-ways-reducing-pollution-can-improve-equality-for-women/>

82 <https://www.ft.com/content/ee08d61d-4c98-4398-9971-93036d67e91e>

83 <https://impact.economist.com/perspectives/sites/default/files/resettingtheagenda.pdf>

84 <https://theprint.in/environment/how-air-pollution-has-become-a-big-factor-in-indians-decision-to-work-in-delhi/316489/>

85 <https://theprint.in/environment/how-air-pollution-has-become-a-big-factor-in-indians-decision-to-work-in-delhi/316489/>

86 <https://insights.som.yale.edu/insights/skilled-workers-flee-from-polluted-cities-hampering-economic-growth>

87 <https://www.un.org/en/observances/biological-diversity-day>

88 <http://www.equilibriumconsultants.com/upload/document/airpollutionandbiodi4f9.pdf>

89 https://www.ilo.org/asia/media-centre/news/WCMS_627585/lang--en/index.htm#:~:text=population%20in%20...,More%20than%2068%20per%20cent%20of%20the%20employed%20population%20in,work%20and%20decent%20working%20conditions.

90 <https://www.rockefellerfoundation.org/wp-content/uploads/Health-Vulnerabilities-of-Informal-Workers.pdf>

91 <https://www.who.int/teams/environment-climate-change-and-health/air-quality-and-health/health-impacts>

92 <https://academic.oup.com/circovasces/article/116/14/2247/5940460>

93 <https://www.sciencedirect.com/science/article/pii/S0160412016305992>

94 <https://asiapacific.unfpa.org/en/news/rights-indigenous-peoples-must-be-protected-and-respected>

95 <https://www.worldbank.org/en/topic/indigenouspeoples#1>

96 <https://www.worldbank.org/en/topic/indigenouspeoples#1>

97 <https://airqualitynews.com/2022/03/22/97-of-global-cities-do-not-meet-latest-who-air-quality-guidelines/#:~:text=97%25%20of%20global%20cities%20and,The%20report%20analysed%20PM2>

98 <https://www.unep.org/news-and-stories/story/five-reasons-you-should-care-about-air-pollution>

99 <https://ourworldindata.org/grapher/pm25-exposure-gdp>

100 Interview insight from Prarthana Borah


101 <https://www.cleairfund.org/wp-content/uploads/2021/09/The-State-of-Global-Air-Quality-Funding-2021-report-compressed-2.pdf>

102 <https://www.ccacoalition.org/en/content/air-pollution-measures-asia-and-pacific>

103 <https://cil.nus.edu.sg/wp-content/uploads/2020/05/2013-Updated-APMS-1.pdf>

104 <https://www.eria.org/ERIA-DP-2015-82.pdf>

- 105 <https://www.greenpeace.org/southeastasia/press/3239/a-haze-free-asean-by-2020-are-we-there-yet/>
- 106 <https://theicct.org/sites/default/files/publications/Indonesia-sootfree-CBA-02182020.pdf>
- 107 <https://www.science.org/content/article/indonesias-fires-are-bad-new-measures-prevented-them-becoming-worse>
- 108 <https://www.climate-laws.org/geographies/indonesia/policies/presidential-regulation-5-2006-concerning-national-energy-policy>
- 109 <https://www.iqair.com/world-most-polluted-cities/world-air-quality-report-2020-en.pdf>
- 110 <https://www.unep.org/news-and-stories/story/air-pollution-choking-bangkok-solution-reach>
- 111 <https://cdn.sei.org/wp-content/uploads/2021/02/210212c-killen-archer-air-quality-in-thailand-wp-2101e-final.pdf>
- 112 <https://www.iqair.com/world-most-polluted-cities/world-air-quality-report-2020-en.pdf>
- 113 <https://www.mdpi.com/2032-6653/12/1/2/pdf>
- 114 <https://www.iqair.com/world-most-polluted-cities/world-air-quality-report-2020-en.pdf>
- 115 <https://www.who.int/vietnam/news/detail/12-12-2019-who-commends-can-tho-s-commitment-to-tackle-air-pollution#:~:text=HANOI%2C%2012%20December%202019%20%E2%80%93%20The,to%20safe%20levels%20by%202030>
- 116 <https://theicct.org/sites/default/files/publications/India%20BS%20VI%20Policy%20Update%20vF.pdf>
- 117 <https://www.pmuy.gov.in/about>
- 118 <https://indianexpress.com/article/explained/explained-what-is-grap-delhi-ncrs-action-plan-as-air-pollution-increases-6719746/>
- 119 <https://www.sciencedirect.com/science/article/pii/S2590162120300368>
- 120 <https://www.iqair.com/world-most-polluted-cities/world-air-quality-report-2020-en.pdf>
- 121 <https://www.npr.org/2019/07/30/727688757/mongolias-capital-banned-coal-to-fix-its-pollution-problem-will-it-work>
- 122 https://www.kasa.gov.my/roadmap/Roadmap_KASA_2020-2030-en.pdf
- 123 https://wedocs.unep.org/bitstream/handle/20.500.11822/20247/SouthEastAsia_report.pdf?amp%3BisAllowed=&sequence=1
- 124 <https://www.pna.gov.ph/articles/1159659>
- 125 <https://changing-transport.org/modernizing-public-transport-in-the-philippines/>
- 126 <https://www.officialgazette.gov.ph/2016/01/28/govt-supports-road-sharing/>
- 127 <https://rise.esmap.org/data/files/library/sri-lanka/Renewable%20Energy/RE%206.1%20Clean%20Air%202025%20Action%20plan.pdf>
- 128 <https://bmcpublichealth.biomedcentral.com/articles/10.1186/1471-2458-10-300>
- 129 http://plancomm.gov.bd/sites/default/files/files/plancomm.portal.gov.bd/files/68e32f08_13b8_4192_ab9b_abd5a0a62a33/2021-02-03-17-04-ec95e78e452a813808a483b3b22e14a1.pdf
- 130 http://plancomm.gov.bd/sites/default/files/files/plancomm.portal.gov.bd/files/68e32f08_13b8_4192_ab9b_abd5a0a62a33/2021-02-03-17-04-ec95e78e452a813808a483b3b22e14a1.pdf
- 131 [http://english.cbcsd.org.cn/SDtrends/20130922/73436.shtml#:~:text=on%20September%2010th-,The%20Airborne%20Pollution%20Prevention%20and%20Control%20Action%20Plan%20\(2013%2D17,at%20the%20Environmental%20Protection%20Ministry](http://english.cbcsd.org.cn/SDtrends/20130922/73436.shtml#:~:text=on%20September%2010th-,The%20Airborne%20Pollution%20Prevention%20and%20Control%20Action%20Plan%20(2013%2D17,at%20the%20Environmental%20Protection%20Ministry)
- 132 <http://english.cbcsd.org.cn/SDtrends/20130922/73436.shtml#:~:text=on%20September%2010th-,The%20Airborne%20Pollution%20Prevention%20and%20Control%20Action%20Plan%20>
- 133 <https://www.loc.gov/item/global-legal-monitor/2018-08-16/china-2020-air-pollution-action-plan-released/>
- 134 <https://energyandcleanair.org/china-14th-five-year-plan-carbon-neutrality/>
- 135 http://english.www.gov.cn/news/topnews/202109/09/content_WS6139a111c6d0df57f98dfeec.html
- 136 <https://aqli.epic.uchicago.edu/country-spotlight/china/>
- 137 <https://www.ijglobal.com/>
- 138 <https://www.bloomberg.com/graphics/2021-wall-street-banks-ranked-green-projects-fossil-fuels/#xj4y7vzkg>
- 139 https://www.aiib.org/en/news-events/asian-infrastructure-finance/2020/_common/pdf/AIIB_AIF2020_16April2020.pdf
- 140 https://epic.uchicago.in/wp-content/uploads/2019/10/ETS_INDIA_ResearchSummaryFinal-.pdf
- 141 <https://www.business-standard.com/article/current-affairs/this-pilot-trading-scheme-in-surat-could-help-firms-reduce-air>
- 142 https://epic.uchicago.in/wp-content/uploads/2019/10/ETS_INDIA_ResearchSummaryFinal-.pdf
- 143 <https://epic.uchicago.edu/news/worlds-first-emissions-trading-scheme-for-particulate-pollution-starts-in-surat/>
- 144 <https://www.tandfonline.com/doi/abs/10.1080/09644016.2017.1338213?journalCode=fenp20>
- 145 https://smartcities.gov.in/climatesmart_cities
- 146 https://www.niua.org/csc/assets/pdf/key-documents/phase-2/CSCAF-2.0-Brochure_24042020.pdf
- 147 For the full list of UNGPs, see > https://www.ohchr.org/sites/default/files/documents/publications/guidingprinciplesbusinessshr_en.pdf
- 148 <https://oxfordre.com/environmentalscience/view/10.1093/acrefore/9780199389414.001.0001/acrefore-9780199389414-e-718>
- 149 https://www.thai-german-cooperation.info/en_US/vehicle-pollution-fund-in-the-philippines-tackling-the-final-steps-towards-utilisation/
- 150 Garton, Kelly, Thow, Anne Marie & Swinburn, Boyd. (2020). International Trade and Investment Agreements as Barriers to Food Environment Regulation for Public Health Nutrition: A Realist Review. *Journal of Health Policy and Management*.
- 151 For the full list of UNGPs, see > https://www.ohchr.org/sites/default/files/documents/publications/guidingprinciplesbusinessshr_en.pdf
- 152 <https://unfccc.int/sites/default/files/resource/Considerations%20regarding%20vulnerable.pdf>
- 153 <https://www.sei.org/featured/5-ways-reducing-pollution-can-improve-equality-for-women/>
- 154 <https://medium.com/pakistan-air-quality-initiative/introducing-the-pakistan-air-quality-initiative-%D9%BE%D8%A7%DA%A9%DB%8C-d1f2f9ed7d11>
- 155 Not exhaustive



“The challenge of air pollution
can be addressed through focused
State interventions using the UN
Guiding Principles on Business and
Human Rights as a framework.”

*Asia in Focus: Clean Air and the Business
and Human Rights Agenda, 2022*

UNDP is the leading United Nations organisation fighting to end the injustice of poverty, inequality, and climate change. Working with our broad network of experts and partners in 170 countries, we help nations to build integrated, lasting solutions for people and planet. Learn more at undp.org or follow at @UNDP. For more information on the Business and Human Rights in Asia programme visit the B+HR website [here](#) or follow at:

 @BizHRAsia_UNDP

 /UNDPBHR