SPECIAL PROCEDURES
UNITED NATIONS
HUMAN RIGHTS COUNCIL

Special Rapporteur on the human right to a clean, healthy and sustainable environment

Annex II
Good Practices and Effective Solutions

To the report of the Special Rapporteur on the human right to a clean, healthy and sustainable environment, Astrid Puentes Riaño, titled 'Priority actions towards breathing clean air, protecting public health and ensuring a healthy environment' (A/HRC/61/47)

This annex aims to highlight some practical, successful policies, actions, and measures taken by States and other stakeholders to tackle air pollution around the world. These model initiatives serve to generate ideas for how other stakeholders, within their own capacities, capabilities, and specific national and subnational contexts, can also combat air pollution and protect public health.

As the basis for this document is information received from submissions and consultations, further information and original sources can be found on the Special Rapporteur's webpage.

I. Comprehensive and collaborative monitoring practices

Many countries and cities have created air quality networks and systems. To mention a few:

- **Chile** created the National Air Quality System (SINCA) in 2022.
- **China** established a national urban ambient air quality monitoring network consisting of 1,734 monitoring sites, covering all cities at the prefecture level and above.
- **France** monitors indoor air pollution through the Indoor Environment Quality Observatory (OQEI), covering public and private spaces such as daycares, schools, nurseries, elderly care, and nursing care facilities that must be monitored as per the environmental code.
- **Mexico City** operates the Atmospheric Monitoring System (SIMAT) with more than 40 stations and real-time data. SIMAT enables communication of alerts to the population, targeted restriction of emissions, and the timely adoption of preventive measures.

At the same time, citizen-led monitoring has increased greatly and can help close the gaps in air quality information.

- AirCarto (**Marseille, France**) is a citizen collective that deploys microsensors to map air quality in the districts.
- RevolvAir (**Quebec, Canada**) combines awareness and deployment of sensors by citizens to better understand and reduce the exposure of local communities to air pollution.

- AirCasting (**United States and Europe**) enables individuals to carry or install sensors and share their data online.
- Smart Citizen/Smart Citizen Kit (**Barcelona**) provides open-source hardware and a platform for measuring PM, noise, temperature, and other characteristics. It is designed for education, collectives and urban projects.
- Sensor.Community (formerly luftdaten / Netzwerk) is a **global European network** of do-it-yourself sensors (SDS-type) managed by local communities; public cards published with open data. Ideal for deploying home sensors and contributing to a collaborative map.
- The **global** Purple Air map contains local monitoring data from 35,000 sensors used by individuals around the world to track particulate pollution (PM2.5), temperature, humidity and pressure.
- The VAYU platform is an open digital framework for air pollution management delivering real-time hyperlocal data and collaborating with state pollution control boards and urban local bodies to identify pollution hotspots within **Patna and Gurugram, India**.

Moreover, inter-sector collaborations are improving monitoring practices (including with low-cost sensors) and creating lasting results. For instance, the 'Breathe **London** Community Programme' (**United Kingdom**) has shown that designing sensor networks with community participation simultaneously strengthens grass roots capacity, redistributes decision-making power, and enhances the understanding of air quality policy decisions.

The Coalizão Respira Amazônia (Breathe Amazon Coalition) in **Brazil** brings together public and private entities with civil society organizations to promote air quality monitoring in the Legal Amazon, with a focus on the use of low-cost sensors and integration with other technologies. The joint initiative, which currently manages 187 sensors, seeks to encourage more impactful environmental policies and improve the response to climate challenges, protecting public health and the environment.

In the state of **Amazonas**, **Brazil**, the SELVA Platform (Electronic Environmental Surveillance System) was developed in 2019 and launched in a public application format in 2021 by the University of the State of Amazonas, responsible for integrating data on air pollution and fire hotspots in the Amazon region. The SELVA network was further strengthened when the Amazonas State Public Prosecutor's Office and the Secretariat for the Environment and Civil Defence of the State of Amazonas joined as partners and used their resources to acquire low-cost air quality measurement stations. These stations were distributed throughout the city of Manaus and other strategic municipalities and have remained operational since then.

Bogotá and Medellín, **Colombia**, developed citizen science programmes, such as 'Ciudadanos Científicos' (Citizen Scientists), which use integrated low-cost sensor networks to monitor air quality. These networks do not replace government-operated Air Quality Surveillance Systems (SVCA by its initials in Spanish) measurements, but they provide complementary information, increase the spatial resolution of monitoring, and strengthen participation. According to the Hydrology, Meteorology, and Environmental Studies Institute

(IDEAM), the use of low-cost sensors has become popular in various regions as a complement to SVCA. Likewise, industry, academia, and citizen groups use them to generate data for multiple purposes.

Air quality monitoring in **Gambia** is done via a strategic partnership between the National Environment Agency (NEA) and Permian Health Lung Institute. The monitoring network combines a single Beta Attenuation Monitor (BAM) reference instrument installed at the NEA headquarters in Kanifing with 32 low-cost sensors deployed across all regions of Gambia. The sensors are powered by solar panels equipped with 12V rechargeable batteries to ensure a continuous power supply. Data is transmitted using 4G LTE cellular SIM cards which upload the collected data to a cloud-based AirVisual Platform (IQAir, Switzerland) and is also shared openly on other platforms including Open AQ and AirQo. The BAM acts as the reference anchor allowing the use of low-cost sensors with wide, reliable coverage.

This network enabled the identification of **Tanji**, **Gambia**, as an air pollution hotspot requiring priority action. The town consistently exhibited elevated PM throughout the year, which led to the recognition of artisanal smokehouses in fishing villages as a significant source of air pollution.

As of 2025, the low-cost sensor network of the Iberoamerican University in **Mexico City** includes 12 monitoring stations in the city and more remotely, measuring ozone, $PM_{2.5}$, PM_{10}, CO, and meteorological variables. Data is uploaded hourly as open data. Students maintain sensors, review and graph data, and translate technical findings into accessible messages. This participatory dimension turns monitoring into both a scientific practice and a civic-learning experience. The network complements Mexico's official monitoring system by adding higher spatial resolution to understand neighborhood-level variations; mobile data that reflects street-level exposure; educational tools that help non-experts interpret air-quality information; and community engagement, especially among students, cyclists, and commuters.

II. Availability and engagement with air quality information

Many practices, tools, and mechanisms exist to make information available to the public. Some countries have concentrated efforts into developing mobile applications and websites, as in the case of **Nairobi** where data available to the public updates every two hours via the Nairobi Air Quality Portal: https://nairobiairquality.nairobi.go.ke/. Informal settlements are included in the monitoring, capturing the real lived experience of marginalized populations.

The **Tokyo** (**Japan**) Metropolitan Government launched the "TOKYO Atmospheric Information" app in March 2025, providing real-time air quality data to residents across the city. **Singapore**'s National Environment Agency releases both a 24-hour Pollutant Standards Index (PSI) and hourly $PM_{2.5}$ concentrations when there is transboundary smoke haze and also provides both metrics on its website.

While global datasets may be slower at updating information, their efforts aid in the creation of comprehensive, layered data, helping to contrast and complement other sources. The WHO Air

Quality Database compiles data on ground measurements of air pollutants from over 8,600 human settlements in more than 120 countries. The database is updated every 2–3 years, most recently in January 2024. Also, the European Environment Agency displays monitoring data for the EU region and the Lancet Countdown connects extensive academic, governmental, and citizen-led air monitoring initiatives. The latter platform includes annual data for contamination related to wildfires, sand and dust, ambient air pollution, household air pollution, and agricultural emissions over multiple years and at the country-level, with further downscaling possible in some cases.

Institutional infrastructure that makes air quality information available to the public and thus builds an informed and participating community promotes transformative, long-standing change for air quality matters. Over a five-year period, openly shared air quality data at **United States** embassies led to an average improvement of 10 $\mu g/m^3$ in annual $PM_{2.5}$ concentrations across the 50 cities with State Department monitors.

In **China**, the release of real-time industrial emissions data promoted citizen engagement via social media, which made the government more likely to inspect polluting facilities and led to a 12% decrease in air pollution. Further, publicly rating select Chinese municipal governments on their adherence to national environmental transparency rules increased transparency and government inspections, and decreased air pollution by up to 10%.

Efforts to improve air quality data communication to the public include the first national workshop in **Mexico** (March 2025) gathering authorities from 31 federal entities to ensure correct application and dissemination of the air-health index, especially on days and at times when air pollution exceeds national standards.

Likewise, academic efforts can support data dissemination and community engagement. The IBERO Air Quality Bot, from the Iberoamerican University in **Mexico City**, a Telegram-based chatbot, transforms real-time data into clear, understandable messages aligned with national and WHO risk categories. Users can view pollution levels, graphics, and short explanations without navigating technical dashboards.

III. Regulations, policies and actions to improve air quality

A. National level

The "Air Pollution Prevention and Control Law of the People's Republic of **China**", formulates and revises 42 standards, including ambient air quality standards and supporting air quality index technical specifications. This integrates health risk and air pollution prevention and control into the normative system, establishing ecological environment health monitoring, investigation, and risk assessment system, and publicly releasing information about major air pollutants.

In **Colombia** the Short-Lived Climate Pollution (SLCP) Strategy targets actions in the waste management, oil and gas, transport, and agriculture sectors. The SLCP strategy has led to improved diesel vehicle emissions standards and urban fleet modernization, recovery and use of

methane emissions, the diversion of organic waste from landfills, reduced crop residue burning, and pilot livestock management to reduce methane emissions. Colombia's 2025 Nationally Determined Contribution (NDC) embeds SLCP strategy targets, and it is one of the few countries with a separate black carbon goal.

Similarly, **Ghana**'s 2018 Short-Lived Climate Pollutants Action Plan and the 2025 Air Quality Management Regulations recognize clean air as a human right and emphasize the health benefits of clean air. This advance followed the 2015 "Urban Health Initiative in Accra" (UHI), developed in collaboration with the World Health Organization (WHO), to reduce deaths and diseases associated with air and climate pollutants by integrating health considerations into urban planning and policy decisions. Ghana's SLCP plan targets vehicle emissions, waste, agricultural practices, and promotes improved stoves and the use of Liquified Petroleum Gas to reduce indoor air pollution and black carbon. Though gas is a fossil fuel and can impact also indoor air, these regulations also strengthen enforcement and monitoring, aligning SLCP goals with public health protections.

Also, in 2024, **Mongolia** developed a multisectoral action plan on air pollution and health 2025-2030, which addresses air pollution as a public health challenge. The plan builds on Mongolia's core environmental legal framework, particularly the Law on Air, prioritizing the most vulnerable (low-income households, women, and children), and aligning air quality improvements with public health, social equity, and international human rights and sustainable development obligations.

Uzbekistan implements an air quality policy based on the principle of comprehensive protection of human health, social equality, and environmental justice. This process aims to ensure the right to live in a healthy and safe environment for all segments of the population. This approach is reflected in the Uzbekistan-2030 Strategy, the Law on Environmental Protection (new edition of 2023), and the Law on Protection of Atmospheric Air.

B. Subnational level

The 'Plan para la atención de episodios de contaminación del aire del área metropolitana de **Bucaramanga**' (Plan for attending air pollution episodes in the Bucaramanga metropolitan area) **Colombia**, mandates mitigation measures at specified contamination levels. For particulate matter and/or sulfur dioxide pollution and to protect children, classes are suspended throughout the area affected when there is an "Alert" level. At the "Emergency" level, the same order applies and the entire exposed population may also be evacuated.

The city of **Medellín, Colombia,** developed the 2017-2030 Air Quality Management Plan, which includes risk maps and establishes vehicle restriction zones and green corridors, integrating land use planning with public health objectives. Additionally, **Barranquilla's** (**Colombia**) Air Quality Management Plan from 2020 integrates public health goals based on WHO guidelines and links air-quality action with health surveillance. The framing is around integrating health, social (public-space), environment and recreation, thus touching on equitable access to green infrastructure and clean-air benefits.

The **Nairobi** (**Kenya**) City County Air Quality Act (2024) emphasizes ambient air quality tolerance limits harmonized with WHO guidelines, monitoring and emission reporting procedures to enhance data-driven decision-making, public participation and inter-agency coordination, linking environmental and public health priorities, and on-going consultancy processes to refine these provisions.

Provinces and cities such as **Sichuan, Zhejiang, Jiangsu, Shenzhen, and Wuzhishan City, Hainan**, in **China** demonstrate how centralized, government-led initiatives with multi-sector engagement can yield positive results. In 2018, the Ministry of Ecology and Environment launched national environmental health management pilots in multiple provinces, increasing health monitoring, risk assessment, source identification and control, and forest health preservation, among others.

Osaka Prefecture, **Japan**, implemented its own air quality standards, largely aligned with national regulations but including additional criteria for CO_2 and odour, demonstrating attention to localized environmental concerns.

Since 2013, **Barcelona, Spain**, has implemented a suite of urban "greening" policies to reduce traffic congestion and air pollution, resulting in a 30% reduction in NO_2 emissions. Expansion of metro and bicycle networks increased cycling by 56%, while creation of a Low Emission Zone (LEZ) in 2017 reduced journeys of the most polluting vehicles by 600,000 trips. Similarly, the LEZs in **Antwerp and Brussels**, **Belgium**, yielded improved air quality significantly faster than in other Belgian cities, on average 30% between 2016-2022 and 37% between 2017-2022, respectively.

The Clean Air for Health initiative in **Accra, Ghana**, takes an integrated approach to health-centred air quality governance and urban planning. While specific air-quality standards exist at the national level, Accra operationalizes them locally applying a health, equity, and evidence-based framework.

In **Rybnik, Poland**, city authorities collaborated with the advocacy organization Polish Smog Alert to reduce air pollution from housing. The initiative replaced old stoves in residential homes and provided subsidies for residents to transition to cleaner heating sources. As a result, Rybnik's air quality improved significantly, with its annual number of "smog days" decreasing from 130 in 2010 to 16 in 2023 and overall air quality improving by 70% since 2017.

C. Indoor air quality regulations

Belgium has implemented a comprehensive national framework to improve indoor air quality in all public spaces. By 2027, all public enclosed spaces must measure CO_2 and publicly display readings. In addition, by 2038 all public enclosed spaces must apply to receive certification and a corresponding rating assessing Indoor Air Quality. The European Performance of Buildings Directive (EPBD) was recast in 2024 to include indoor environmental quality (IEQ), which

includes indoor air quality, setting May 2026 is the deadline for EU Member States to transpose EPBD requirements into national laws.

In the **Unites States** thirteen states in the past five years (2020-2025) have passed indoor air quality legislation, with a focus on schools and public buildings. In addition, over 50 IAQ-related bills have been introduced or passed over the past five years. At the federal level, the Indoor Air Quality and Healthy Schools Act of 2025 was recently reintroduced to strengthen the Environmental Protection Agency's role in improving indoor air quality.

In 2025, **St. Kitts and Nevis** launched an Indoor Air Quality Task Force with a mandate of developing a National Indoor Air Quality Policy.

In **Ireland** the ban on smoking indoors implemented in 2004 yielded a significant decrease in respiratory symptoms and improvement in respiratory function among bar workers after just 1-2 months.

D. Policies to reduce air pollution from vehicles

Jakarta, Indonesia, set a goal to fully electrify its bus fleet by 2030. TransJakarta, the city's bus operator, began integrating electric buses (e-buses) in 2022. By the end of 2023, the fleet included 100 e-buses, with plans to expand to over 10,000 by 2030, including microbuses that account for nearly two-thirds of the target. Routine vehicle emissions compliance testing has been identified as one of the most cost-effective measures. Since 2020, Jakarta has mandated annual emission tests for all private vehicles over three years old and vehicles that fail the test are subject to fines.

Paris, France, cut air pollution by half and pollution-related deaths by a third between 2010 and 2019. A significant reason for this success was the encouragement of public and active transport, including the expansion of cycle paths which are set to reach 180km by 2026 and the addition of 130,000 bike parking spaces.

E. Child-centred policies

School Streets are measures where motorized traffic near schools or similar institutions is regulated to protect children's health and safety. Examples include:

- **London**'s (**United Kingdom**) School Streets programme temporarily closes roads around schools at drop-off and pick-up times. Results include reductions in NO_2 of as much as 23% during morning drop-off at participating sites and large increases in walking and cycling to school, demonstrating a direct, measurable child-health benefit and an equity/health-protection rationale for municipal action.
- **Barcelona**'s (**Spain**) Protegim les Escoles programme combines traffic restrictions, pavement and crossing improvements, and greening around schools. Evaluations report air-quality improvements (NO_2 reductions) and safety/active-travel co-benefits; the

programme prioritized schools in more exposed and socially vulnerable neighbourhoods, illustrating a socio-environmental justice approach in practice.

- **Paris, France**, expanded pedestrianised, car-restricted school streets as part of its urban mobility and climate plans. The Rues aux écoles are integrated with citywide air-quality and climate goals and have been prioritized in neighbourhoods with higher exposure to traffic pollution. In fact, a quarter of Paris School Streets must be located in underprivileged neighbourhoods. Municipal planning links School Streets to children's health, safety, and equitable access to safe public space. There are now over 30 School Streets in Paris.
- In **Vienna**, **Austria**, 82 of the city's 314 primary schools – more than one in four – are now in areas that are temporarily closed to through-traffic or permanently pedestrianised and physically redesigned to prioritise children's safety and comfort.
- In the **German** region of **Baden-Württemberg**, School Streets are one element within a broader programme to revive town centres. The programme empowers local communities to use street furniture and visualizations, resulting in a combination of barrier installations for school streets and spaces being created for parents to socialize.

F. Health-centred policies

In **California, United States**, Senate Bill 1137 establishes new safety measures to protect human health and the environment. This law creates Health Protection Zones (HPZ), in which new oil and gas wells are prohibited within 975 meters (3,200 feet) of homes, schools, hospitals, and other sensitive locations where people live, work, and gather. Existing oil and gas facilities in the HPZs must also comply with strict new regulations to control pollution, dust, noise and develop leak detection programs.

This law emphasizes the protection of public health, the environment, the well-being of the community and sustainable practices by recognizing that proximity to oil and gas extraction sites pose significant health risks, especially due to increased air pollution. The bill requires inter-sectorial coordination at national and local government level, and annually legislative review, including budgetary revision.

In **Tacoma, Seattle, United States,** replacing old diesel school buses decreased asthma, improved lung function and decreased school absenteeism in children. In 2001, **Japan** passed legislation to limited transport-related emissions causing $PM_{2.5}$ and NO_X to reduce by 2009, leading to a 0.6% and 1.1% reduction in the prevalence of paediatric asthma caused by $PM_{2.5}$ and NO_X respectively.

In response to high national $PM_{2.5}$ levels, a partnership between WONCA, the **Cameroon** Ministry of Public Health, and the Association for the Promotion of Youth Leadership, Advocacy and Volunteerism (APYLAV) trained over 2,000 students and 500 medical students in air pollution and health. Supported by the CLEAN-Air (Africa) project and the European Lung Foundation, these initiatives strengthened youth engagement and health sector awareness.

IV. Reparations and solutions to air pollution harm

As part of the reparation's measures required after the **Yokkaichi** Asthma event in **Japan** (described in the report) the International Center for Environmental Technology Transfer (ICETT) promotes dissemination of environmental knowledge and technologies globally, drawing from the social responsibility of the city with respect to environmental remediation and knowledge-sharing.

In **Brazil**, environmental agencies have strengthened enforcement in the **Amazon** by imposing fines, part of which are allocated to restoration projects and affected communities, creating a model of sanctions with a reparative function.

Across 47 areas in **Japan**, pollution-related health damage initiatives funded by the national government and polluters include asthma programs, with a particular focus on vulnerable populations such as children and those with pre-existing health conditions. **Japan** also engages in regional cooperation with **Korea** and **China** to mitigate transboundary air pollution, illustrating how environmental equity should extend beyond national borders.