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1. **Strengthen emission standards for light and heavy-duty vehicles.** This includes introduction of the Euro 6-equivalent emissions standards and adopting standards for the sulphur content in diesel that is equivalent to ≤10 ppm.

2. **Regularly maintain and inspect vehicles and conduct emission checks and maintenance of school buses to reduce emissions.** Consider centralizing inspection and maintenance systems and establishing self-funding mechanisms for regular audits at test centres. Immediate measures can include eco-driving training for school bus drivers, providing proper ventilation inside vehicles and enforcement of no-idling in school premises or even at or near school gates.

3. **Mainstream electric mobility and low-emission vehicles.** This includes increasing the share of electric vehicles on the road and investing in clean energy and low-carbon infrastructure to enable fast and wide uptake of electric vehicles.

4. **Increase low-emission and child-sensitive mobility options and urban planning.** This includes improving public transport systems, promoting a shift from private passenger vehicles to public transport, and supporting infrastructure for non-motorized transport modes. This also includes child-friendly urban planning to provide more green spaces and pollution-free clean air zones for children around schools, playgrounds, hospitals and healthcare facilities.

5. **Volatile organic compound recovery from gasoline distribution.** This includes applying controls to recover volatile organic compounds from underground storage tanks and emptied vehicle fuel tanks during refuelling, especially in populated areas. It requires spillage management at gas (petrol) stations. Such stations should not be located near schools, kindergartens and health care facilities. Fuel-loading activities in such stations should be done late in the evening.
Provide clean cooking and heating options for the home. This includes increasing access to clean fuels (electricity and natural gas) and technologies for cooking and heating at home. Provide technological, financing and behaviour-change support for households so that each person understands the negative impacts of indoor air pollution on child and maternal health. Encourage households to reduce children’s exposure to indoor air pollution and to use less polluting and cleaner cooking fuel and technologies, such as LPG, solar power and advanced biomass cooking and heating stoves.

Strictly enforce bans on household waste burning. This should be complemented with a comprehensive solid waste management plan.

Improve solvent use and management of household chemicals. This includes using water-soluble latex paints instead of oil-based paints to minimize children’s exposure to volatile organic compounds and make sure there is good ventilation for indoor painting projects.

Promote child-centred green urban planning and avoid siting schools, playgrounds, and healthcare facilities nearby emission sources.

Better manage agricultural crop residues. This includes strict enforcement of a ban on open burning, which must be complemented with encouragement of alternative use of crop residues, technologies that plough residue into fields and no-till agricultural practice.

Prevent forest and peatland fires and reduce children’s exposure during haze episodes. Specific measures include enforcing sustainable forest, land and water management at all times and fire prevention strategies during droughts and haze season. Establish an early warning system for forest fires to avoid children’s immediate exposure, and provide personal protection for children during the haze episodes, such as clean air rooms in schools and villages that have high-efficiency particulate air filters.

Improve post combustion control with monitoring and enforcement of implementation. This includes introducing state-of-the-art end-of-pipe measures to reduce sulphur dioxide, nitrogen oxides and particulate matter at power stations and in large-scale industry.

Strengthen industrial process emissions standards.

Introduce efficient brick kiln technology.

Ban smoking in public areas.
16 Provide clean cooking options in commercial areas, including street markets and school canteens.

17 Strictly enforce bans on waste burning in areas within the vicinity of a school, complemented with a comprehensive solid waste management plan.

18 Control dust from construction sites and roads, including minimizing vehicle activity on unpaved roads near schools. Increase the length of paved roads around schools. And avoid construction activities near schools during school times or excavation work during dry weather and pollution episodes.

19 Control emissions from small industries, such as craft villages.

20 Provide capacity-development support and participation platforms for children and youth to learn about science-based clean air solutions and to identify and implement community-based clean air solutions as agents of change.
More than 90 per cent of the world’s population in 2019 were exposed to annual average ambient fine particulate matter concentrations, known as PM2.5, that were above the World Health Organization (WHO) air quality guideline of 10 μg per cubic metre. In Asia and the Pacific, annual average exposures are usually more than two times higher than the guideline. The WHO estimates that every year, more than 4 million die prematurely in this region due to household (indoor) and ambient (outdoor) air pollution. These two pollution sources together accounted for two thirds of the estimated 7 million premature deaths globally in 2016 (WHO, 2018). South Asia and Southeast Asia, East Asia, and Oceania saw steep increases in total deaths attributable to ambient PM2.5 during the last decade, according to the State of Global Air (HEI, 2020).

Children are highly vulnerable to air pollution due to their unique susceptibility and exposure: Children’s respiratory tracts are more permeable, their breathing rate is twice as much as adults, and they take in more air per kilogram (kg) of their body weight. Children’s bodies, especially their lungs and brains, are still developing, with narrower blood vessels. And their immune systems are weaker than adults; hence, polluted air affects children more than adults (WHO, 2018).

Exposure to pollutants, even at low levels, at vulnerable stages during a pregnancy and in infancy, can result in disease, disability and premature death (Landrigan et al., 2017). According to State of Global Air 2020 estimates, air pollution contributed to nearly 500,000 deaths (about 45 per cent in Asia and the Pacific) among infants in their first month of life in 2019. Most of those deaths related to complications of low birth weight and preterm birth (HEI, 2020). Many of the risk factors to newborn deaths are influenced by similar sociodemographic factors that increase women’s risk of being exposed to air pollution. As such, women in countries with low levels of sociodemographic development are at risk for adverse birth outcomes, with related consequences for their children. Air pollution affects a child’s development, learning, and well-being throughout their lifetime due to its impact on neurodevelopment (UNICEF, 2017).
Exposure of children to air pollution in-utero or through inhalation, ingestion or other routes of exposure can lead to illnesses and health burdens that last a lifetime. Major sources of pollution include inefficient energy use in households, industry, agriculture and transport, municipal solid waste, and coal-fired power plants. Children, from newborn to adolescent, have different routes of exposure to air pollution related to their daily activities. Exposure routes and sources of air pollution may be different between urban and rural children and depending on their age.

Typical daily routine activities of children, which vary by age and socioeconomic conditions, affect their exposure. Improving air quality in areas where children live, play, learn, or travel could significantly reduce their immediate exposure to toxic air pollutants. For example, children in waste-scavenging communities generally are exposed to emissions from open burning of solid waste, while children in urban areas are exposed more to traffic emissions. It is also important to note that children, especially younger children, depend on their mothers or caretakers to reduce their exposure to air pollution, such as from cooking fumes or industrial emissions.

Air Pollution in Asia and the Pacific: Science-Based Solutions Report (hereafter Solutions Report) provides a comprehensive scientific assessment of air pollution solutions in the region (UNEP, 2018). This Solutions Report identified 25 policy and technology clean air measures, categorized as conventional measures, next-stage and development priority measures, that could help achieve the WHO guidelines for PM2.5 for 1 billion people in Asia by 2030. Doing so would provide associated benefits for public health, economic development and the climate (UNEP, 2018). Implementation of these recommended 25 clean air measures will provide substantial health benefits to everyone, including children.

Building on the Science-Based Solutions Report (UNEP, 2018), UNICEF East Asia Pacific Regional Office and UNEP Regional Office for Asia Pacific have jointly developed this guide to promote 20 child-centred clean air solutions and ultimately help realize children’s fundamental rights to breathe clean air and live in a stable climate. This guide highlights the potential benefits specifically for children from the implementation of child-centered clean air measures. This guide also recommends additional clean air measures that can help reduce air pollution and exposure of children in microenvironments, engaging and empowering children and youth.
**Target audience**

This document is intended to be used by policy-makers, development partners, businesses, civil society actors and children/young people who are engaged in policies and measures to tackle air pollution and to protect children’s health and the health of the whole planet.

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**Scope and approach**

The child-centred clean air solutions highlighted in this guide were identified in terms of:

- the amount of air pollution emissions from target sources;
- the potential contribution of the source emissions to air pollution levels in the microenvironments (exposure concentration) where children spend time (exposure time): where and when they travel, where they live, where they play and learn;
- and other benefits for children, such as an increase in green spaces, parks, and playgrounds.

The 20 child-centred clean air solutions are based on expert judgment and a technical review of the clean air measures from the Solutions Report (UNEP, 2018). The recommended child-centred clean air solutions were grouped by the microenvironments in which children live, play, learn and travel.

The focus of this guide is on air pollutants that have the most impact on people’s health, specifically PM2.5. There is compelling evidence that exposure to PM2.5 and ozone are the most damaging to health and account for the largest attributable health burdens in Asia and the Pacific (UNEP, 2018).

The document also considers children’s exposure in certain microenvironments. Thus, emissions from cigarette smoking and non-combustion sources are covered, including fugitive road dust, construction dust, volatile organic compounds from gasoline stations and volatile organic compounds from household chemical products, among others.

**Limitation of the analysis.** Each country has its own situation and priorities, and not all these measures are necessarily applicable to all countries. Further technical assessment (such as analysis of emission sources and air quality levels, exposure assessments, etc.) and stakeholder consultations would be needed to determine which measures would be most appropriate in various national and local contexts. While 20 child-centered clean air solutions are highlighted in this guide, it is important to note that implementation of the recommended all 25 clean air measures from the Solutions Report (UNEP, 2018) would provide long-term benefits for everyone. This guide is intended to be updated and strengthened over time as more data and stakeholder feedback are gathered.

A technical annex will be added to an updated version of this report later as part of an iterative process.
2.1 Clean air solutions for when children travel

**Measure 1:** Strengthen emission standards for light and heavy-duty vehicles. This includes introduction of Euro 6-equivalent emission standards and adopting standards for sulphur content in diesel that is equivalent to ≤10 ppm

**Measure 2:** Regularly maintain and inspect vehicles and conduct emission checks and maintenance of school buses to reduce emissions

The European Union issues the Euro emissions standards to reduce or remove pollution from vehicles. There is usually a road map for the introduction of Euro technology advancement into Asian developing countries that specifies a time period for moving from one Euro-compliant standard to another. Considering the current fleet composition in many Asian developing countries, where a significant fraction are still pre-Euros and the most advanced is commonly only Euro 4 (Huy et al., 2020a; Kim Oanh et al., 2018b; Trang et al., 2015), it takes time for these countries to fully implement the proposed clean fleets of Euro-6-compliant vehicles. Countries must accelerate their introduction and full implementation of higher-emission standards for vehicles. But it is also important to introduce measures to immediately reduce large amounts of emissions released at breathing levels for children in the microenvironments of their typical activities. These two measures related to vehicle emission standards and maintenance for the transport sector would usher in short- and long-term health benefits for children and for the general population.

These measures are especially relevant in the context of growing and fast-urbanized developing countries in Asia, where roadside residences are combined with service businesses. These measures are needed to address the disproportionate effects on poor and marginalized children who often live in polluted, informal settlements near, along or under major roads in urban or peri-urban areas. Clean air in the streets would reduce the exposure of children when they travel in open-air vehicles (such as motorcycles in Viet Nam and songthaews in Thailand).

Together with these measures, additional measures to reduce children’s exposure to on-road traffic emissions should be considered. These include the emissions reduction to avoid children’s exposure, such as with school buses that use the most advanced engine and clean fuel, like electricity or compressed natural gas. School buses should undergo regular inspection and maintenance. Drivers should be trained to drive safely and not to idle at school gates. The buses should have proper ventilation inside (USEPA, 2021).

**Useful references**

- UN Environment and International Council on Clean Transportation (2016). Global Strategy to Introduce Low Sulfur Fuels and Cleaner Diesel Vehicles
Measure 3: Mainstream electric mobility and low-emission vehicles, including converting diesel-powered school buses

Consider converting diesel-powered school buses to electric and low-emission vehicles to reduce exposure of children when they commute to and from school. It is important also to ensure that electric vehicles are powered by clean energy and not by building more coal power plants in poor areas and peri-urban areas or by building hydropower plants that destroy protected forests upstream.

Useful references

Measure 4: Provide better mobility options, and advocate child-centred urban planning

This measure aims at improving public transport systems to encourage a shift from private passenger vehicles to public transport. This ambition should be integrated with sustainable child-friendly urban planning. Clean and convenient public transport (metro, Sky Train or Bus Rapid Transport) helps reduce children’s exposure to air pollution when they are commuting. It also provides other benefits, such as safety. Traffic congestion is common in many urban areas. Thus, the shift from private to public transport would help reduce congestion. This would lessen exposure of children while commuting in terms of the levels of pollution they are exposed to and the exposure time.

To implement this measure, local conditions of each city or country should be considered. For example, the large share of motorcycles in the on-road traffic fleet in urban areas of Viet Nam calls for collective actions to reduce their numbers. But in other cities, such as Bangkok, solutions are needed to reduce the number of private cars and to replace diesel vehicles. Investments in walking and cycling infrastructure (sidewalks and bike paths, sufficient lighting, bike-sharing options, etc.) to promote non-motorized transport modes will directly benefit children, including their overall physical and mental health from reduced pollution and increased physical movement. Child-centred urban planning should provide more green spaces for children to play in and introduce strict standards and measures to create a clean air space for children in schools, playgrounds and commuting routes. Clean air zones for children in cities, such as those in the United Kingdom, could be considered, where feasible.

Useful references
Large amounts of volatile organic compounds are released from gasoline distribution stations. This source usually does not receive enough attention for emissions control due to the lack of data on the emissions and associated effects on health. The United States Environmental Protection Agency (1985 and 2008) recommends applying Stages I and II control measures for emissions:

- **Stage I**: capturing volatile organic compounds that escape from underground storage tanks (during fuel loading, underground tank breathing and emptying), which reduces 93–100 per cent of those compounds emitted from the activity.
- **Stage II**: capturing volatile organic compounds that escape from emptied vehicle fuel tanks during refuelling, which reduces up to 90 per cent of those compounds.

There is limited information from local survey data about applying control measures for volatile organic compounds recovery in the region. However, based on the available reports, the Stage I control is already applied in many countries, while the Stage II measures control (recovery during refuelling) have yet to be widely implemented (Huy and Kim Oanh, 2020b).

Together with these measures, **additional measures to reduce children's exposure** could be considered. This includes avoid siting gasoline stations near schools, kindergartens, hospitals and health care facilities; limiting fuel-loading activities in gasoline stations to be done late in the evening; and implementing strict spillage management at all gasoline stations.

Useful references


2.2 Clean air solutions where children live

Clean cooking and heating require the use of clean fuel and stoves (using electricity, natural gas and LPG) in cities and urban areas. And it requires a shift to using LPG, solar power and advanced biomass cooking and heating using processed biomass (pellets) in efficient stoves equipped with chimneys (to vent out smoke) in rural areas. Implementation of the measure would significantly reduce the exposure of children of all ages to indoor air pollution, especially for children in poor rural communities where residential combustion still heavily relies on solid fuels.

Household air pollution persists as a major environmental health risk to children, posing a significant burden of disease. It starts from the prenatal stage, when expecting mothers are exposed while cooking. According to the State of Global Air 2020 estimates, indoor air pollution from cooking with solid fuels contributed to about 90,000 infant deaths in South Asia during their first month of life (HEI, 2020). This is equal to the number of deaths caused by the ambient PM2.5 originating from all the sources combined. The number of deaths in 2019 due to exposure to household cooking in South-East Asia and other parts of the region was about 12,000, which is almost equal to that caused by ambient PM2.5.

The problem of indoor air pollution from residential combustion is largely known. There has been encouraging progress in the region with increases in clean cooking access. But there is still work to be done to reach the universal goal of 100 per cent access of clean cooking fuels and technologies by 2030.

In-depth analysis on the technological, financial, sociocultural and policy barriers is needed in local contexts, considering, for example, socio-cultural norms, the hot and cold climate, urban and rural areas, the availability of cooking fuels (forest, crop residue, coal of different quality, natural gas, etc.) so that specific recommendations can be made to tackle the problem. Integrated policy measures are recommended, including fuel-cookstove technologies, subsidies (incentives, tariffs) as well as the creation of local business models that deliver manufacturing and maintenance of fuels and cookstoves at an affordable cost for communities.

Behaviour change is also critical to raise awareness of the negative health effects of indoor air pollution on child and maternal health and available clean cooking, heating and lighting technologies and fuel. Campaigns on practices to reduce exposure of children to toxic air pollutants and to improve air quality at home are needed. Local awareness-raising and behaviour change actions to immediately reduce children’s exposure to indoor air pollution from residential combustion include adequate ventilation of kitchens and separation of kitchens from living areas. Mothers and caretakers need education on how to avoid exposing children to cooking smoke. Initiatives to promote and support cleaner cooking, heating and lighting should be adapted to local culture and include a gender perspective, based on the full understanding of gender gaps and opportunities, the needs of women as consumers and as potential entrepreneurs. It should also build the capacity of rural women entrepreneurs’ organizations.

Successful implementation of measures for cleaner cooking demonstrates that collective actions from all stakeholders are required. The phasing out of kerosene use in domestic cooking was a success in Indonesia (Permadi, Sofyan, and Kim Oanh., 2017). And the phasing out of dirty honey coal briquettes in Hanoi (Thuy, 2021) emphasized the need for collective actions from the government to the individual to ensure success.
Measure 7: Strictly enforce bans on household waste burning, complemented with a comprehensive solid waste management plan

In many growing suburban areas in developing countries in Asia, open burning of solid waste is commonly practised and is a source of air pollution, especially in poor communities living and scavenging in dumpsites or open landfills. The ban of open burning should be complemented with a comprehensive solid waste management in place (covering collection system, sorting, recycling, waste treatment and awareness-raising). There should be a detailed road map to sustainably implement and finance this measure in a local context.

Keeping in mind that a full ban of solid waste open-burning needs time to fully implement, immediate actions should be in place to reduce children’s exposure. Recommended actions include a ban on the burning of solid waste near schools or near children’s playgrounds or health care facilities, especially in upwind locations. A ban on burning of solid waste is recommended when background air pollution levels are high, such as during air pollution episodes due to stagnant meteorology.

Useful references

Open burning of agricultural crop residues is commonly practised in the region to quickly clear biomass for faster rotation of crops. This activity releases significant emissions at breathing level. In the common land-use pattern in the region, agricultural land is scattered around urban and rural communities. The smoke from the open burning of crop residue can be felt in agricultural areas and urban areas in the vicinity. Eliminating the open burning of agricultural residue will reduce exposure risk for children, especially for children living near crop land (Chakrabarti et al., 2019; Rangel and Vogl, 2019). As the following box highlights, a comprehensive management approach should be implemented to avoid the open burning of crop residue.

**Principles for the prevention, control and reduction of open burning**

- **Prevent and control burning**, by conducting awareness campaigns, promoting burning-free agricultural practices and promoting eco-friendly production, along with supporting appropriate technology to replace burning. This should also include farming system management to allow machinery to easily access farm areas.
- **Promote alternative use of agricultural residues and by-products.** This includes innovation development to add value towards the circular economy concept and facilitation of marketing platforms.
- **Strengthen governance mechanism**, which can include rapid-response units for surveillance and monitoring, and provincial centers for burning management to meet administrative requirements and issue necessary commands.

Together with these measures, additional measures to reduce children’s exposure to emissions from open burning of crop residues should be considered. This includes a ban on burning near schools, playgrounds or health care facilities, especially in upwind directions. Many schools are located next to green fields, hence massive smoke from the open burning of crop residue during school hours could affect children. The size of the zone with banning (distance to the school) may be estimated using a simple modelling tool driven by prevalent meteorological conditions and topography of the area (Walk et al., 1998). A ban on burning should be enforced when background air pollution is high, such as during air pollution episodes due to stagnant meteorology.

Measure 9: Improve post-combustion control with monitoring and enforcement of implementation

Measure 10: Strengthen industrial process emissions standards

Measure 9 refers to state-of-the-art end-of-pipe measures to reduce sulphur dioxide, nitrogen oxides and particulate matter emissions at power stations and in large-scale industry. Examples include flue gas desulphurization for sulphur dioxide, selective catalytic reduction for nitrogen oxides and high-efficiency particulate matter controls like fabric filters and multistage electrostatic precipitators.

Both measures aim to reduce emissions from fuel combustion in power plants and fuel combustion and manufacturing activities in industrial processes. The emissions from large coal-fired industrial boilers and power plants are of great concern in many countries where coal is intensively used. Measures to reduce industrial emissions should be of priority to reduce the exposure not only for children but also for the public (Millman et al, 2008). But the policies for emissions control should be formulated and enforced by central and local governments, with strong commitment and accountability mechanisms engaging the industrial and power sectors.

Measure 11: Introduce efficient brick kiln technology

Polluting brick kilns scattered in populated areas in South Asia emit large amounts of pollutants. Children living in areas with a large number of polluting kilns are exposed to high levels of pollution. This measure aims to improve efficiency and introduce emissions standards to stimulate a shift to more efficient brick kiln technologies. This requires collaboration among kiln owners, technical experts and government to demonstrate the benefits of cleaner kiln technology.
Useful references

*Design Manual for Improved Fixed Chimney Zig-Zag Brick Kilns*

Measure 12: Prevent forest and peatland fires, including improving and enforcing forest, land and water management and fire-prevention strategies

This entails improving and enforcing forest, peatland, land and water management and fire-prevention strategies. It also includes establishing fire spread protection zones and a fire alarm and brigade system, controlling access to forests during droughts and banning land clearing.

While the forest and peatland fire locations may be relatively distant from populated urban areas, emissions may stay intensive for a few days and thus continue to pollute the air over a region and across national boundaries. The effects are commonly widespread inside a country where the fire occurs but it can affect neighbouring areas, posing a transboundary environmental pollution and public health challenge. This is particularly relevant for areas where forest and peatland fires have been observed and led to increase in air pollution-related illnesses among children and closure of schools, thus affecting children’s health and education across boundaries, including Cambodia, Lao PDR, Myanmar, Thailand and Myanmar around the Mekong sub-region as well as Indonesia and Malaysia.

While systemic action needs to be urgently taken to avoid, prevent and reduce forest and peatland fires, additional measures to immediately reduce children’s exposure to emissions could be considered, such as an early warning system for forest fires. It should include associated recommended actions to avoid exposure, such as avoiding outdoor activities. It also may include providing clean air rooms (equipped with high-efficiency particulate air filters) in schools and villages during extended haze periods.

Measure 13: Ban smoking, especially in public areas and in microenvironments of children’s activities

Cigarette or tobacco smoking is an important source of air pollutants to consider for reducing children’s exposure. Toxic smoke from traditional cigarettes is known to pose health risks to children due to the second-hand smoke exposure. Environmental tobacco smoke released from burning tobacco products contains fine particles and several human carcinogens, such as polycyclic aromatic hydrocarbons, benzene and nitrosamines (WHO, 2000). Smoking or vaping with e-cigarettes has increased in popularity, especially among the youth. It also causes health risks due to several potentially toxic substances (American Lung Association, 2018).
Measure 14: Promote child-friendly urban planning and avoid siting schools, playgrounds and health care facilities near to emission sources

Promote child-centred urban planning that provides more green spaces for children to play and introduces strict standards and measures to create clean air spaces for children in their schools, playgrounds and commuting routes. Clean air zones for children in cities, such as those in the United Kingdom, could be considered where feasible.

Useful references
Measure 15: Improve solvent use and management of household chemicals

Household chemicals are specific ‘sources’ of indoor air pollutants and are important to consider for reducing children’s exposure and subsequent health effects. These are non-food chemicals that are commonly used in homes for cleaning, pest control and for general hygiene purposes. Many of them are dangerously toxic if ingested, inhaled or absorbed through the skin (Cleveland Clinics, 2021). If not properly stored, applied and disposed, they can release chemical vapors, mainly volatile organic compounds, with serious health effects if inhaled. The awareness on the toxicity should be raised among caregivers so that actions are taken to reduce exposure, especially for their children.

One example is oil-based paint, which contains organic solvents. When applied in the home or in a school, it releases volatile organic compounds. Inhaling volatile organic compounds in paint fumes can result in headaches, nausea, dizziness and fatigue. Water-soluble latex paints should be used instead of oil-based paints to minimize exposure to the volatile organic compounds as well as ensuring good ventilation for indoor painting projects.

2.3 Clean air solutions where children play and learn

Measure 16: Provide clean cooking options in commercial areas, including street markets and school canteens

Intensive commercial cooking is common at street-side stalls and open-air markets in Asian cities. Solid fuels are still used in many cases. Large emissions, like residential combustion, released in populated urban areas cause health effects. Cooking in school canteens also can be considered as commercial. Measure 16 includes increasing access to clean fuels (electricity and natural gas) in street-side stalls, open-air markets and school canteens, among others, and emissions capture and control for grilling activities for street cooking.

Useful references
World Health Organization, Benefits of action to reduce household air pollution (BAR-HAP) tool, at https://www.who.int/benefits-of-action-to-reduce-household-air-pollution-tool
**Measure 17:** Strictly enforce bans on waste burning in areas within the vicinity of a school, complemented with a comprehensive solid waste management plan

Recommended actions include a ban on the burning of solid waste near schools, playgrounds or health care facilities, especially in upwind locations. Similar to Measure 7, a ban on the open burning of waste should be complemented with a comprehensive solid waste management plan (covering collection system, sorting, recycling and waste treatment) and awareness-raising.

**Useful references**

**Measure 18:** Control dust from construction sites and roads

This measure entails suppressing construction site and road dust through control measures, including road washing and cleaning, road paving, water spraying, installation of barrier protection and avoiding dust-generating work during windy days, etc. It also includes increasing green spaces, especially in cities and urban areas. Together with these measures, additional measures to reduce children’s exposure to emissions should be considered. This includes minimizing vehicle activity on unpaved roads near schools and increasing the length of paved roads around schools. Avoid construction activities near schools during the school time, and avoid excavation work during dry weather and pollution episodes.
Pollution from small industries is a special source category in some Asian developing countries. These are small industrial production units, normally at household scale, clustered as ‘craft villages’. They are found scattered in populated suburban and rural areas and commonly include production of products similar to larger-scale manufacturing (such as wet or dry rice noodles, ceramics, mechanical tools and furniture). Many craft villages still burn coal (for ceramic, mechanical tool production), dispose of waste by open burning, use solvents and paints (in handicraft making) or lead (scrap metal recycling) in the production. There is no or limited emissions control on craft villages from either a technology or legislation perspective. Many villages are highly polluting in air pollution emissions, discharges of wastewater and solid waste.

This measure includes better regulating pollution through, for instance, the development of an emissions control guideline tailored to small industries, such as craft villages, and providing technological, financial and regulatory support to reduce polluting emissions. The emissions control measures include switching to cleaner fuels; combining and converting to large production facilities to apply advance production and emissions-control technologies; minimizing the use of toxic materials in production or reclassify as ‘small industries’ and relocating them in industrial zones or parks.
As demonstrated in the recent global climate strikes and movement, children and youth are important agents of change when it comes to tackling the climate and environmental crises. Engaging children and youth in clean air solutions should include awareness-raising and empowerment of them as well as their parents, other caregivers and teachers on the impacts of air pollution and child-led clean air actions. It is important to involve parents and caregivers in forums, workshops and discussion meetings that are specially organized to empower children and youth. Young children are largely dependent on parents and caregivers to reduce their exposure to toxic air and to improve their local air quality.

This measure should include extracurricular events and developing curriculum for school children on pollution and promoting citizen science, such as children-led air quality monitoring using calibrated low-cost sensors. Children should be given the chance to comprehend the effects of air pollution on their own health and well-being and also their own exposure to air pollution during their routine activities by easy-to-understand air pollution data, such as colour schemes of Air Quality Index and flag colours of the School Flag Program of the United States Environmental Protection Agency.

Extracurricular events can be organized for school children (grades 6–12) to raise their awareness by monitoring with quality low-cost sensors to show their exposure to specific sources in their communities, such as rice straw burning, solid waste open burning and along the commute route to school. Once empowered, children are important drivers for clean air interventions at individual, household and community levels. Children can influence their parents not to burn solid waste, not to burn crop residue and to avoid idling their car when waiting to pick them up.

These clean air solutions should be considered within the umbrella of school frameworks and to embed environmental health in school programmes, such as safe schools or an eco-green school framework. These could also include guidance on actions that can be done by youth to contribute to improving air quality and on how to develop a clean air plan for schools or communities.

Supporting youth entrepreneurship is also an important measure to promote. So too is supporting business models that help reduce pollution, such as electric transport options and producing goods from recycled wastes, which can reduce waste and air pollution from waste burning.

Young people can explore business opportunities that bring benefits for air quality. These must be child-led activities and can include, for example, the ‘exchange’ of plastic waste, paper waste for decorating plants, production of ‘colourful bags’ and other ‘artifacts’ from waste programmes. The Philippines and Viet Nam, for example, have interesting examples of youth-led waste programmes. The air quality benefit links to the minimization of solid waste open-burning activities. Another example is the use of rice straw for mushroom production, reducing open burning of rice straw, thus reducing air pollution.

It is important that young people are given adequate support to access the best available knowledge, technology and financial mechanisms for developing green products and services with clean air benefits. Local, national, regional and international green youth entrepreneurship platforms should be developed to provide business development and networking services.

It is also important to include young people in climate and environment policies. Support advocacy for adolescent girls and boys to be included in global, national, and local dialogues on climate and environment policy, prioritization, legislation, and social accountability. Include representatives of children, adolescents, and young people, as well as of the social sectors most relevant to them, in climate and environmental negotiations. Identify platforms for these representatives in current climate and environment policies and facilitate their feedback into policy
revisions to press for the reduction of pollution and to encourage governments and businesses to create more opportunities in the green economy. A prominent channel for this has been an Intergovernmental Declaration on Children, Youth and Climate Action. This declaration is based directly on inputs from young people around the world and it commits signatory governments to accelerating inclusive, child-responsive climate policies. Other examples of what UNICEF has done in this area include the NDC Partnership Youth Engagement Plan, the U-report climate chat bot; voices of youth platform; and the toolkit for young climate activists.

**Useful references**
United States Environmental Protection Agency’s Air Quality Flag Program, at https://www.airnow.gov/air-quality-flag-program/
UNICEF Let’s talk air pollution: https://www.voicesofyouth.org/learning-module-2-air-pollution
REFERENCES


